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THE NATIONAL GEOGRAPHIC MAGAZINE

A Tale of Three Cities

By THOMAS R. HENRY

THREE sister cities came out of the heartbreak of war in mourning.

All three were beautiful with the pale, wistful sadness of a thousand years and more of history. Bloody, hungry, and ragged, all three faced an uncertain future in the strange new world of peace. They reacted in three strikingly different ways.

Dark-eyed Budapest danced a weird, wild dance, heedless of tomorrow. Fair-haired Vienna, ashen-faced, sank exhausted among gravestones of memories and wept in tragic hopelessness. Prague started to work with enormous energy, giving herself no time for tears or dancing.

One was the merriest, one the saddest, one the most energetic city in Europe.

All three had been sisters in the old Austro-Hungarian Empire of Franz Josef. They had gone their separate ways after the last war until they became involved in the world cataclysm which started on September 1, 1939.

The Soul of Prague on the Rack

For ten centuries Prague (Praha) had carried the torch of liberty in Central Europe, sometimes as the only light in a great darkness. For a quarter century she had been the capital of one of the most progressive free countries in the world.*

But none of the western lands which shared her blood and traditions had come to her aid in her hour of need. She had been abandoned heartlessly, she felt, to Hitler's wolf packs—to Heydrich the Butcher, to the glass-eyed and glass-hearted bookseller Frank, to the murderers of Lidice.

Vienna had yielded her honor without fighting. A progressive anemia had been in her blood since 1918. Weary of days and of hours, her glories of dance, pageant, music, and chivalry in the past, she had no energy to start life over in a new pattern. She was an old, old lady with a glamorous past, a great actress of another generation fallen upon evil days.

Budapest had gambled and lost. In reckless despair she squandered her substance like a broken gamester who gathers up the remnants of a lost fortune and goes on one wild night of dissipation, intending to blow out his brains in the morning.

Such is an impressionistic picture of the three cities as they seemed to me after the end of the war in Europe.

Allies Lenient with Conquered Cities

Among them were striking points of similarity, setting them apart from the other mourning cities of the Europe which had been held by the German Army.

All, for example, were occupied by Russian troops. The black-booted, smock-uniformed, highly decorated, square-headed men and women from the steppes thronged their streets, exercised a varying degree of control over their internal affairs, and fraternized with their citizens (page 645).

In Prague this occupation was purely protective and very light. There was virtually no interference with the Czech Government, which the Russians considered a war ally.

Within a couple of months after the collapse of Germany, when it was apparent that the government of President Eduard Beneš (page 668) was strong enough to handle its own affairs, men of the Red Army were being withdrawn, and the city was used only as a leave center.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Czechoslovakia, the Key-Land to Central Europe," by Maynard Owen Williams, February, 1921.

International News

A Vienna Mother Wears a Mask of Sorrows; Her Sons Show Little Concern

From forests on the outskirts, they return with firewood (page 655). Coal and gas are lacking, and electricity is turned on only briefly. The signpost is for the guidance of American and British troops. Sharing command of Vienna with the Russians, they and the French marched in last August.

After three months the Russians shared the occupation of Vienna with the United States, Great Britain, and France, although the major part of the city remained under their control when I was there. They never treated it other than as occupied enemy territory.

Their rule was harsh but efficient, gradually showing a good-humored benevolence. They even fed the Viennese enough to keep them alive. Street signs were in Russian. Gigantic paintings of Stalin and Lenin covered the fronts of public buildings. Russian was a common language on the sidewalks.

Budapest was occupied solely by the Russians. They had no reason to consider it otherwise than as a conquered enemy city. They had paid a heavy price for it. But fortunately their military government here was tolerant and efficient.

Another striking point of similarity was that the faces of all three cities were turned eastward—toward Russian ideology and political and economic philosophy. For these three hapless sisters there was a faint glimmer of sunrise over the steppes.

All their governments were "leftist." This was not due to Russian compulsion or propaganda. It is generally admitted that the Red Army avoided any evangelization. But during the war the Underground movements in

U. S. Army Signal Corps, Official

Waving Lilac Branches, Czech Girls Gave Yanks the Wildest Welcome Since Paris

In Pilsen (Plzeň), stragglers ran a gantlet of kisses. Every motorcycle, every jeep was cheered. Scarce as it was, Pilsener beer washed down K rations. Americans found Pilsen's famous Skoda arms works partly wrecked by bombing a few weeks earlier. "We Welcome Our Liberators" was one of many signs—English and Russian—prepared in advance by Czech towns for whichever army arrived first.

Austria and Hungary, and to a less extent in Czechoslovakia, had been made up of more radical elements for whom a German victory meant destruction.

The more prosperous, conservative elements had tended toward passive acceptance of the situation. There were, of course, many individual exceptions.

Underground Groups Head New Governments

When the time came to set up new governments, these leftist groups who had fought, suffered, and lost thousands in heroic battle against the Axis had first claim to consideration. In all three countries the governments were chosen by mutual agreement among the parties whose members had taken part in the Underground movements. They were to be ratified later by general elections.

This turning eastward seemed much less apparent in Vienna than in either Prague or Budapest. The home of the waltz and the capital of Austria hardly had the energy to turn to a new social philosophy. It could only accept passively what was nearest at hand.

Thus the three pallid sisters blinked their watery eyes in the light of the new morning

Buda

A War Casualty Was Graceful Elizabeth Bridge Connecting Buda with Pest (Background)

Germans left its long single arch in the Danube. Russians repaired the bridge with a temporary span. Ferries carry the overflow, though stray mines are still a hazard. Taking dollars into inflation-ridden Budapest, the author lived like a millionaire. Silks and diamonds flowed "out of the ground" where they had been buried (page 649).

and started their weary trudge into the future.

Spectacle of silk-swathed luxury and wild revelry among the ruins was Budapest in the months immediately following the war.

It seemed like a witches' dance to weird gypsy music among open graves in the thick blackness of a starless night — altogether the most fantastic picture presented by any of the cities of Central Europe.

The capital of Hungary — which is split into two cities, Buda and Pest, by the clouded Danube—was badly damaged. For almost two months, starting the day after Christmas, 1944, when the Russians surrounded the city, it had been a major battlefield. Stalingrad alone had made a more stubborn resistance.

When the Red Army finally entered Pest, Axis forces had withdrawn to Buda, while the troops in the hills to the west fought desperately to relieve the encircled garrison. Day after day a fierce artillery battle continued while the terrorized, helpless citizens hid in their cellars. Day after day Russian bombers dropped their loads on the city.

As a consequence, Buda is almost as badly smashed as mid-Berlin. Most houses were either flattened into piles of trash-filled rubble or left floorless, roofless, windowless shells. There were thousands of dead in the rubble piles. Some were extricated and buried in shallowest of graves, for the ground was frozen hard.

Many dead were left in the ruins, as appears to have been the case in most heavily bombed cities except those in England. The physical labor of getting them out was overwhelming for the enfeebled populace.

AP from Press Ass'n

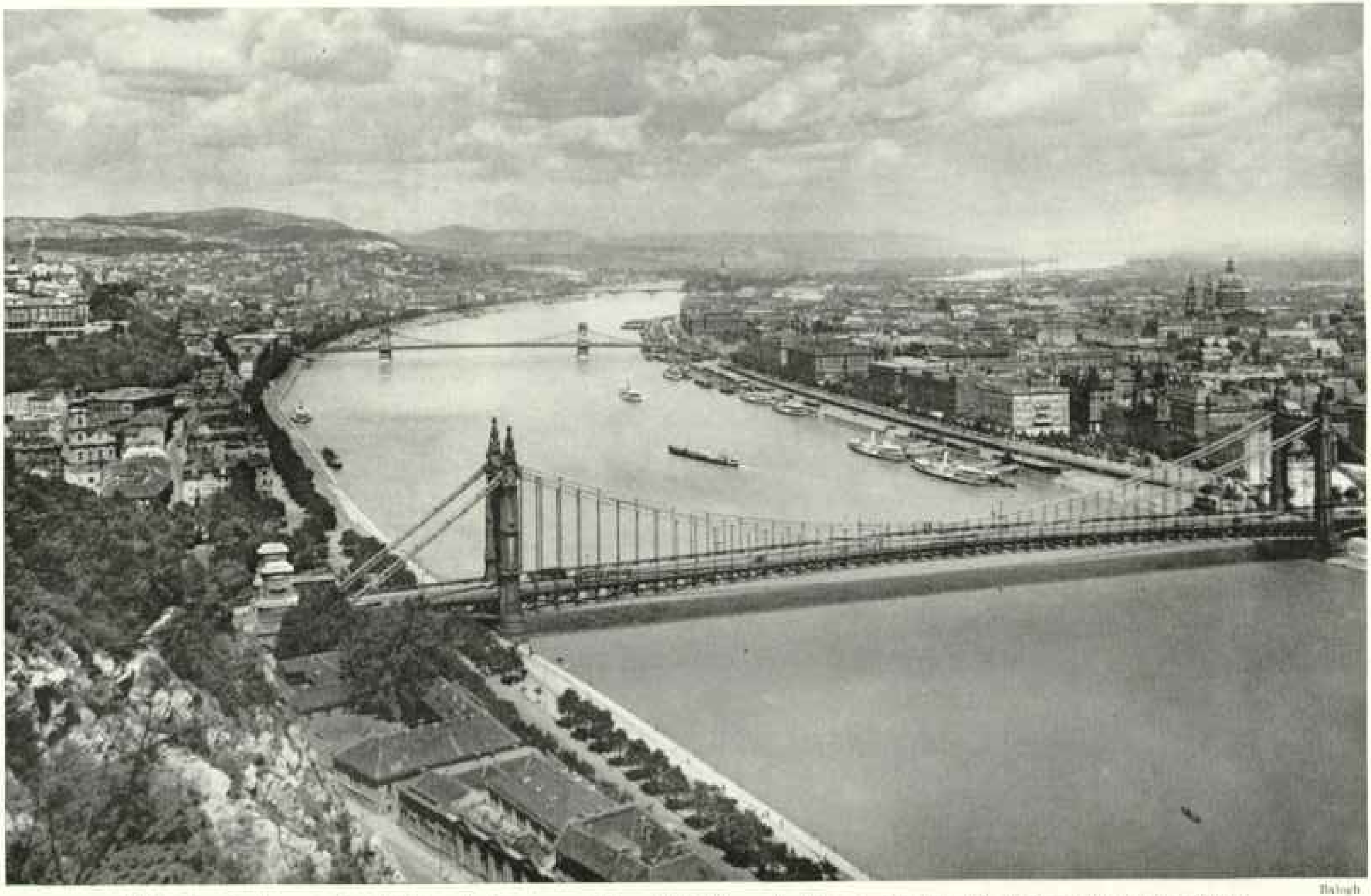
Russian Women MP's Tell Budapest to Stop and Go

Everywhere in Soviet-occupied Europe, women control the roads. They signal with red and green flags. In long blouses, tight skirts, and high boots, they impress Americans as looking soldierly. Solemn and imperturbable, they seldom smile. Their sentry box bears the hammer and sickle.

All bridges over the Danube were demolished (pages 646, 647). Some of Buda's greatest monuments, symbols of heroic history, appear lost forever.*

Perhaps the greatest single loss was that of the 860-room Royal Palace on the Danube. This was begun two centuries ago by the young Empress María Theresa, a few years after her famous appeal to the Hungarian nobles for help when her Austrian armies were crushed by Frederick the Great. In the reign of Franz Josef the palace was enlarged to its present size.

* See, in the National Geographic Magazine, "Budapest, Twin City of the Danube," by J. R. Hildebrand, June, 1932.



Balogh

This Was Budapest. Last Winter the Germans Defended It House by House, Block by Block, in a Two-month Siege

Victorious Russians found 49,000 Axis troops dead in the snow. All bridges, including Elizabeth (foreground), Chain, and Margaret, were down. Historic buildings were demolished, their archives scattered. Buda (left) suffered more damage than its twin, Pest, the commercial quarter across the Danube.

International News

In Budapest an American Photographs Ruined Chain Bridge, Called the "World's Eighth Wonder" When It Was Opened in 1849

On the Danube heights stands the skeleton of the domed Royal Palace, begun for the Empress Maria Theresa two centuries ago (page 645). Its walls survive, but little remains of its 860 sumptuous rooms. Soldiers mined the palace rubble heaps for Hapsburg souvenirs. Along the Buda waterfront empty windows gape.

Elizabeth Pongratz Jacobi

Each Year Budapest Clergy and Nobles Bear the Relics of St. Stephen in Procession

King Stephen I, who Christianized Hungary, died in 1038 and was canonized in 1083. Before the war, his "incorruptible" right hand was kept in the Royal Palace. When Budapest was falling to the Russians, Fascists absconded with the relic. Americans recovered it near Salzburg, Austria. Together with Stephen's crown, a gift of the Pope in 1001, the hand was returned by a U. S. Army chaplain.

It was undoubtedly one of the most elaborate, luxurious dwellings on earth. Through the years it had been chiefly a show place, used as a residence by the imperial family for the few weeks each year which they spent in Budapest. Since the last war it had been the residence of the Regent, Admiral Nicholas Horthy.

Palace of Hapsburgs a Hollow Shell

This palace with its great central dome was a landmark and consequently a convenient target both for bombs from the air and for artillery (page 647).

The latter proved much more destructive. At the end of the war only the walls were standing. Every floor and every window were knocked out. The interior was filled with desolate piles of rubble in which stone and plaster were mixed inextricably with costly tapestries, imperial portraits, fragments of marble statuary, gilt furniture and dishes, all the period splendor of the Hapsburgs.

Russian soldiers, and later British and American, picked up many minor treasures by grubbing in these rubble heaps. The palace gardens were a tragic mess of plaster, charred timbers, twisted wire. All around, the houses

were flattened. Very few buildings in Buda remained in any way habitable.

The twin city, Pest, escaped with much less damage. There was relatively little fighting here, once the Russian troops entered, and almost the entire damage is attributed to rather ineffective Axis artillery from the hills beyond Buda. Pest was the major commercial and hotel district. The bank of the Danube was lined with luxurious hotels which were world-famous. Just beyond them was the shopping district. The hotels themselves are empty shells which must be entirely rebuilt to be habitable.

Many of the stores are roofless and windowless. Four months after the end of hostilities, streets were blocked with rubble piles and there were dead still unburied.

It was in the stores that the fantasy of Budapest was to be seen at its weirdest. The windowless shops were piled high with silks, crystal glass and gilt furniture, cameras, watches, and radios.

Wild trading was in progress everywhere. Cafes were crowded. Meals were excellent. Wine, brandy, whiskey, and all kinds of cocktails were abundant. Everywhere gypsy orchestras were playing. People were dancing.

The women of Budapest long have been known as among the most beautiful and well-dressed in the world. Three months after the war in Europe ended they were as beautiful and well-dressed as ever. They wore silks cut in the latest styles. Few were without real silk stockings of the finest quality, a luxury everywhere else.

Especially at night, the scene became fantastic beyond belief. The streets were in total darkness. The odor of the dead was strong in the summer air. The darkness was filled with unearthly music, punctuated with occasional shots and whizzing bullets from street fights between soldiers and civilians.

It is rather difficult to explain this scene. Whence came all the luxury? Budapest was looted by two armies. First the retreating German and Hungarian forces took away everything they could carry. Then came the Red Army. It had been in the field more than three years. It was cold, ragged, and hungry. Everything needed was requisitioned. The people of Budapest suffered severely.

Luxury from Buried Treasure

Yet there seemed no end to the silks, watches, and diamonds. Where they came from is a mystery.

"Out of the ground," say the merchants. This is probably literally true. During the first years of the war enormous amounts of luxury goods were stored in the city. As Russian armies swept over the plain of the Danube, huge quantities were buried. When danger of looting was passed, they were brought out of hiding and placed on sale.

A store might be entirely sold out in the late afternoon. It would open the next morning with a fresh stock which the owner presumably had dug up from his back yard.

Perhaps the chief factor in setting off this wild gypsy death dance was the inflation of the *pengö*, the basic Hungarian currency unit. Before the war the exchange rate was about five pengös to the dollar. After the collapse of Hungary before the Russian assault, the pengö declined rapidly to about 150 to the dollar.

This was the rate when the first American and British officers of the Allied Control Commission entered the country. At this value prices were high, and the troops had a hard time living on their pay.

Early in August the exchange rate skyrocketed. I arrived in Budapest one afternoon to find the pengö quoted at 1,350 to the dollar. When I came on the street next morning, the quotation was 1,510. By two that afternoon it had gone up to 1,840 to the dollar!

Prices, of course, could not keep up with such wildfire inflation. A similar situation had arisen once before, after the last war. Now Hungarian money was rapidly becoming worthless, and the salvation of the individual was to obtain at any price American dollars or British pounds, the only surely sound currencies in the world. Silks and diamonds were sacrificed.

Silk Stockings at 25 Cents a Pair!

In our party were two women correspondents. They could not restrain themselves when they found they could buy the finest-quality silk stockings, unavailable at home for several years, for about 25 cents a pair and lovely silk evening dresses for $2 each.

Fine Swiss watches at $10 and the best-grade German cameras at $50 proved too great a temptation for the men. We paid, of course, outrageous prices according to Hungarian standards.

When we dealt in pengös, we carried around armloads of them. A single American dollar represented a good year's pay for a Hungarian skilled artisan and approximately one-third of the yearly salary of the Prime Minister, Col. Gen. Béla Miklos.

I have no doubt that we were charged at least double for everything we purchased. It made no difference. We were in such a frenzy to take advantage of the market that when

Surfoto

From a Gallery of Rubble, Viennese Survey the Ruins of Their Beloved St. Stephen's

Fire, following shells, spread from buildings next door. Walls and tower stood, but parts of the ornate roof fell in (page 653). The interior was a wreck, its great cross broken. It took almost two centuries to complete the cathedral. Last summer a small band of artisans, some of them women, started repairs.

we dropped a few thousand pengös—say the equivalent of General Miklos's salary for a year—we did not even pause to pick them up.

We slept that night in a convent, the center of a street fight with bullets crashing through the windows. On the breakfast table the next morning we threw all the pengös we had not been able to spend before the stores closed. The whole sum represented nearly a year's prewar income for the good sisters.

Perhaps the most fantastic part of the whole strange picture came about 50 miles out of Budapest the next day, when we were stopped by Russian sentries. While examining our papers, they observed the new watches on our wrists and insisted on paying each of us $400 for one. We had paid about ten dollars.

We told the Russians they were being cheated. They refused to listen. The result was that we all arrived back in Vienna with cars loaded down with silks, furs, cameras, and watches—and with more money than when we had entered Budapest two days before. We had been millionaires for two days, had spent wildly with no thought of tomorrow, and yet we retained all our original capital.

Such is the result of unrestrained inflation combined with poor communications and transportation. All over the occupied areas of Central Europe Russian soldiers, who had received much back pay, were willing to pay almost any price for watches.

This was one reason why American troops stationed in Berlin, for example, were able to send home in one month several times the amount of the total Army payroll there. In mid-August, however, American troops were forbidden to transmit home more than their month's pay plus an extra 10 percent.

Diamonds Galore, but Little to Eat

It was easy to see that this sudden inflation meant rough waters ahead for Budapest and all Hungary. The gay, luxurious life of soft silks, glittering diamonds, wines, and violins of the city's shopping and cafe center hardly could be other than superficial. Throughout the country there was a distressing shortage of food. Prices for all the basic necessities of life were out of sight.

The silk-clad ladies with pearl necklaces and fingers glistening with rubies and amethysts, who danced with gayly uniformed hussars at the night clubs, were only the froth on an ocean of unutterable misery, whose waves moaned under the surface of the ruined land. But in some way poverty and starvation kept out of sight.

Ordinarily the Hungarian Plain, for which Budapest is the metropolis, is one of the great bread baskets of Europe. This year heavy fighting was in progress during much of the normal planting season. Soldiers were tramping over the fields which farmers should have been plowing.

In addition, there was a large-scale redistribution of land. As a result, this year's harvest yielded considerably less than half a normal crop. Wheat and corn were blighted and wilted. Only the great fields of sunflowers, a specialty of Hungarian agriculture, promised an abundant yield.

Even if the harvest had been good, transportation was so bad that little of the grain could have reached the cities. The armies had appropriated most of the livestock. Animals left were so poorly fed that the cows were yielding little milk and the horses were bags of bones.

Yet choice steaks, butter, and fresh eggs could be had for almost nothing—if paid for in American or British money—at the Budapest restaurants. From the Hungarian point of view, however, the price we paid for a steak, about 600 pengös, represented a year's rent for a good Budapest apartment. Still, many Hungarians were eating steaks.

Budapest seems to have taken little thought of the winter. Theoretically, basic commodities like bread were rationed and a ceiling was set on prices. Actually, the ration system was not enforced and prices skyrocketed.

This was strikingly different from the situation in both Prague and Vienna. In Czechoslovakia the harvest was good. There was plenty for everybody, but no dependable surplus. As a result, there was a strictly enforced ration system. The richest citizen could not buy more bread, or pay any more for it, than the poorest. In Vienna, also, there was a strict ration system and price control—but there was not enough bread in the markets.

Budapest and all Hungary have paid dearly for the war and still have a great deal to pay before the debt is settled. A major item is $300,000,000 in reparations, payable in commodities, for the damage done by the Hungarian armies. Of this Russia alone is to get $200,000,000 in six years. Czechoslovakia and Yugoslavia are to receive the balance.

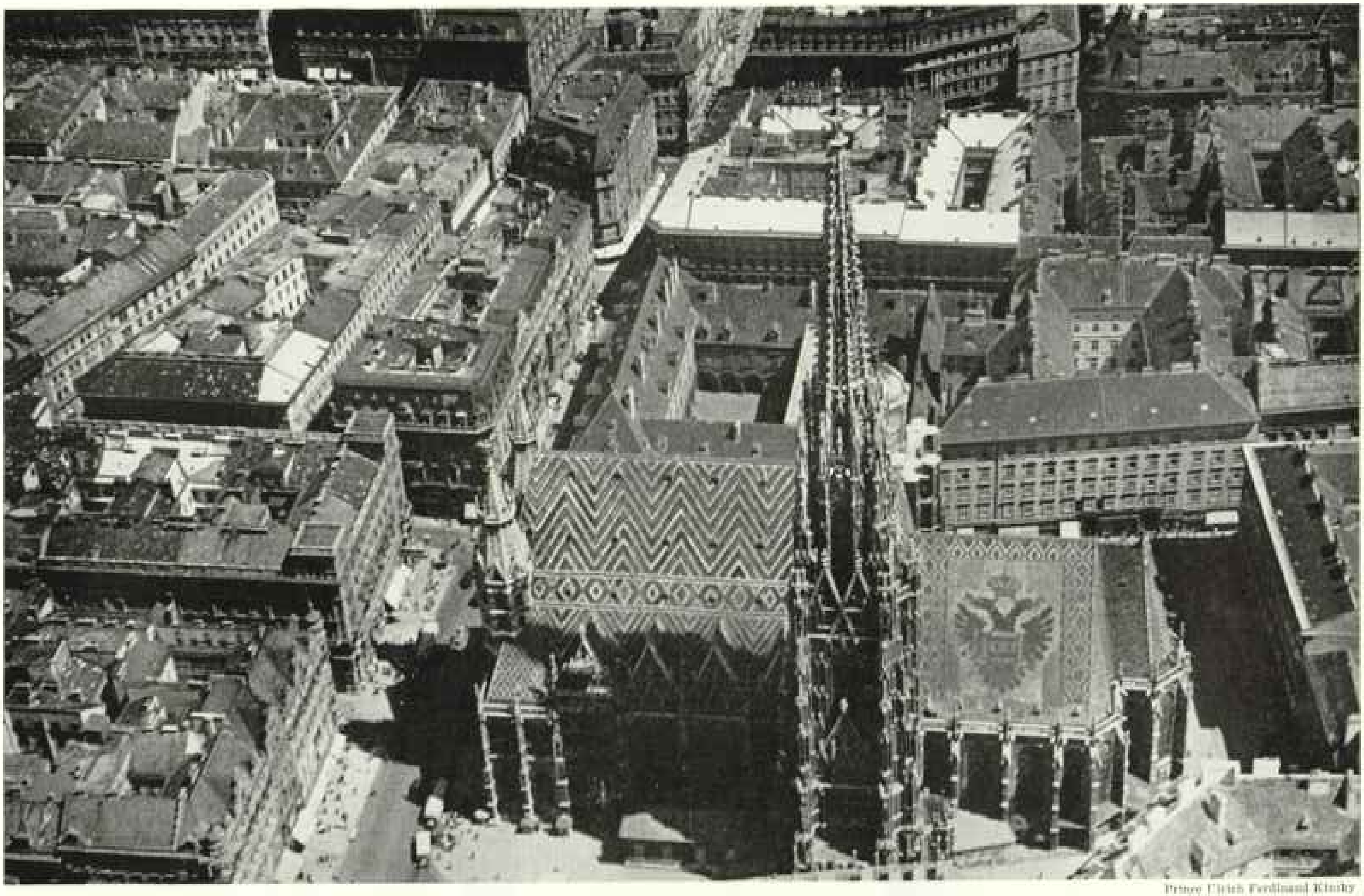
But a still greater item, one fears, will be the starvation and stark misery of a foodless, fuelless winter.

The Hungarian Government under General Miklos, which was recognized by the Russians from the start, is cooperative and sincere, despite its failure to prevent inflation or to enforce price control for basic necessities. It leans decidedly to the left.

Sovfoto

Thirteen Russians—What a Load for an American Weapons Carrier! Past Vienna's Burned-out Houses of Parliament They Roll

Here in March, 1938, weeping Viennese learned that Hitler was about to march in. "God help Austria!" their Chancellor, Kurt von Schuschnigg, cried. Seven years later the famous Ring-Strasse, a broad belt of avenues occupying the site of demolished fortifications, was littered with battle debris (left).



Prince Ulrich Ferdinand Kinsky

Before the Holocaust: St. Stephen's Cathedral Presided over the Destinies of Vienna for Almost Seven Centuries

Last April this Gothic structure was struck by Nazi shellfire. From its tower fell the 19-ton bell *Bummerin*, cast in 1711 from Turkish cannon. As by a miracle, the 449-foot spire survived, but the glazed-tile roof collapsed (page 650). The old Inner City surrounds the cathedral. Some of its buildings were lost.

Bar Foto

Red Flags, Russian Faces, and a Banner, "Glory to the Red Army," Make Vienna an Imitation Moscow

Only one Danube bridge was left when the Nazis pulled out. Glad to be rid of the Germans, Viennese cheered the Soviet forces. The Russians' popularity was short-lived. Grimly collecting reparations for their own devastated homeland, they shipped away from Vienna machinery, trucks, furniture, and telephones.

AP from Press Ass'n

Hunger and Misery, Graven on the Faces of Fuel Hunters, Tell Strange "Tales from the Vienna Woods"

Wiener Wald, which inspired the composer Johann Strauss II with gaiety, is the scene of despair. Daily, hundreds of housewives walk miles to the woods, gather huge loads of faggots, and trudge wearily back (page 664). On seeing this picture, the author commented: "Unless something is done, some of these old people will die this winter." By now the wrist watch (left) doubtless has gone into the black market.

Keystone

Pulling Their Sole Belongings, Viennese Return to a City That Doesn't Need Them

Out of hiding, they drifted back following the Red Army's triumph. They found streets and squares heaped with rubble and garbage, parks and gardens turned into cemeteries. Prewar Vienna contained 1,800,000 inhabitants; now there are an estimated 1,300,000. Tiny, war-ravaged Austria cannot support such a capital.

One of the most prominent political leaders is a remarkable woman, Mother Superior Margrit Slachta, head of the mother house of the Sisters of Social Service.

This order of Hungarian sisters has convents all over the world, including several in the United States. The Mother Superior was the first woman member of the Hungarian Parliament. She is an eminent social philosopher and the author of fairy stories for children.

We correspondents were her guests for two nights and came away convinced that she is one of the strongest and most hopeful figures in the present confused Hungarian picture.

During hostilities she used her convents throughout Hungary as hiding places for hunted Jewish women and believes that she saved the lives of several hundred. She was active in forging identity papers. Once she was detected and was under sentence of death, but the execution was put off by legal delays until she was saved by the end of the war.

Only one of the nuns who assisted in these Underground activities was executed. The story, as told by Mother Superior, is one of the most dramatic I have heard in the war. The nun was Sister Sarah Salkahazi, member of an old Hungarian noble family.

Apparently this young woman, who had put on the gray convent robes after living for years in luxury as the daughter of a wealthy father, was so affected by the misery she saw about her that she became obsessed with the idea that the wrath of God was being visited upon her people and that this wrath might be appeased by the willing sacrifice of her own life. One morning before the other nuns assembled in the convent chapel she appealed to the Almighty to accept this sacrifice.

It so happened that she was betrayed by an employee at the convent, a woman whom she had befriended. On the last day before the Russians entered Pest, she was executed by rifle fire on the bank of the Danube, and her

AP from Press Aero.

In "Gay Vienna, City of Laughter," Children Gaze Hungrily at Their Skimpy Supper

Already their daily quarter loaf apiece has been wolfed down. There remains a handful of peas cooking on a makeshift stove. Fuel is combed from the ruins. Mother's face reflects her sacrifices. Having stockings, she is lucky, but they no longer fit her emaciated ankles. Home is a dugout beneath a railroad platform.

body was thrown into the river. Then the war ended. The nuns can hardly be blamed for feeling that there was some supernatural influence at work.

The Hungarian Nazis were known as the Party of the Arrow Cross. Presumably they were a small minority, but they were strong enough to help bring the country into the war on the side of the Axis. Their deeds bear comparison with those of SS, or *Schutzstaffel*, members everywhere in German-controlled lands.

Now they are being hunted down in their hiding places by the police of General Miklos's government and given summary trials before people's courts. Many have been hanged, and many others have been sent to prison for long terms.

There was a great religious celebration in Budapest on August 20. On that day the nation's most precious relic, the embalmed right hand of St. Stephen, was brought home. It had been taken from Budapest by the Nazis and hidden near Salzburg in Austria.

It was recovered, as were the crown of St. Stephen and the royal jewels, by American troops (page 648).

Stephen is the patron saint of Hungary. He was the first king and converted the country to Christianity.* Seldom in its long history has the great, gay, ruined city experienced such religious emotion. The return of the relic seemed to symbolize to the people the end of their long ordeal of blood and tears.

Still the wild gypsy death dance reeled on through the black night on the shore of the Danube. Scenes of drunken revelry continued in the night clubs. All this was in striking contrast to the deep devotion shown over the return of the relic. Perhaps the two scenes represent two opposing forces in Hungarian

* See, in the National Geographic Magazine, "Saint Stephen's Fête in Budapest," by De Witt Clinton Falls, August, 1907.

U. S. Army Signal Corps, Official

"Home! Girls! Our Own Language!" The Czechoslovak Brigade Ends a Six-year Exile

Scattered by Hitler's partition, members wandered across Europe. Some fought beside France until she fell. Retrained in England, they returned to France in 1944, besieging Dunkerque. Last May these members of an armored column joined the American march into Pilsen. British battle dress did not deceive their countrymen. With kisses and tears they welcomed their heroes home.

life—one of earnest aspiration, the other of suicide to gay music. Only time can tell which force will triumph.

Viennese Trade Heirlooms for Food

In mid-August the chill of an early autumn could be felt in the evening in Vienna's Karlsplatz.

It accentuated the sadness of one of the saddest spots on earth. The great public square, stretched in front of an old baroque church, was thronged with people trading rings, watches, brooches, silk gowns, family heirlooms of all sorts for small packages of meat, butter, flour, and sugar.

Many of these represented the old Viennese aristocracy. There were counts and baronesses among them. The poor no longer came to Karlsplatz. They had nothing more to trade. The cash of even the well-to-do long since had gone for the bare necessities of life.

The men with the meat and butter were the most arrogant and greedy of profiteers. They had looted food warehouses in the confusion which came with the collapse of the city as the Red Army moved westward over the Austrian border.

A colorful element of the picture was the behavior of the Russian soldiers who mingled with the crowds. They were, for the most part, naive peasants, and they had a great deal of money in their pockets. They were looking for watches and eagerly paid hundreds of dollars for any timepiece that ticked. Some of them had as many as six watches strapped on their wrists.

All sorts of weird deals were in progress. A Viennese street gamin who appeared to be about ten years old was offering 40 *schillings*, the equivalent of $4, a pack for American chewing gum. He had a big roll of bills in his hands. Somewhere the little rascal could sell at a neat profit chewing gum bought at $4 a pack!

Butter More Costly than Gold

The old folk wept as they parted with their treasures. Tears could not raise the value of a gold ring an extra ounce of butter. There was a deathlike pallor on the faces of many elderly men and women. It was obvious that they had been deprived for a long time of some necessary element in their diet. They behaved more like helpless, suffering children than

adults. Some of them will not live through the winter.

They may have been the cavaliers and their ladies who danced at the stately balls of the imperial court in happier times. They are what is left of the Vienna of song and romance.

For weeks—in some cases for months—they had survived on a scanty diet of bread and a few dried peas (page 657). Even this they owed to the Russians, who had made a small supply available to keep the city alive. The ration stopped the gnawings of hunger, but it provided little nourishment. Younger people were thin, listless, sallow. But they did not have the death pallor so striking on the countenances of the old.

This Karlsplatz scene could be duplicated on a smaller scale in a dozen other places about the city. Here, probably, was Europe's worst, most heartless black market. The old people were taking the easiest way. They did not have mental or physical energy left to devise any other solution for their problems than the sale of their few remaining treasures. When these were gone? Some wept as they begged for scraps of American Army rations.

I talked with a general in the old imperial army. He was 74. He told me he and his wife had eaten nothing but bread for three weeks. He was tearfully grateful for a pipeful of tobacco.

Viennese Offered No Alibis

Another striking fact about the Viennese I met is that they have no alibis. In German cities people will generally protest that they do not deserve their suffering because they were only helpless victims of the Nazi Party. They were always, they say, opposed to it in principle and never actively cooperated with it. I never yet have met an avowed member of the party and sometimes doubt if any existed! The Viennese, whose part in the war actually was small, seldom protest that their sufferings are unjust. They bow to the rod.

"It is only right that we should suffer for what we did," the old general's daughter told me.

Perhaps the people lacked the energy to protest, to think up excuses. One gets everywhere the impression of this outstanding weariness unto death. The spiritual anemia had started its malignant progress before the war with the breakup of the old Austro-Hungarian Empire, of which Vienna had been one of the twin capitals.

The city was too large for the little German-speaking State which remained, strangled with customs and immigration barriers.* Commerce and industry had declined. Age-old racial hatreds stood in the way of a logical settlement of the problems of the Danube Valley. As a result, Vienna had known almost continuous hard times since 1918. Many economists say that the great economic depression which fell upon the whole world in the late twenties began in Austria.

So beautiful Vienna, once the gayest and most accomplished of the three sisters, lived like a great actress of another day whose fortunes had declined. Pathetically she strove to cover traces of tears and sleepless nights of worry with face paint and powder. She showed outbursts of healthy energy at times.

Nazis Take Over Apartments

One of the saddest sights of the city today is the former Karl Marx apartments settlement on the Danube Canal (page 660). In this city-owned project, workers could rent three-room flats with modern conveniences for a few schillings a week.

One of the first acts of the Nazis after the *Anschluss* (union with Germany) in 1938 was to dispossess the workers and fill the apartments with minor party officials. Now the former tenants are moving back and striving to bring some order out of the wreckage of their ruined homes.

Such outbursts of energy during the prewar years were spasmodic. Always there was the underlying mood of weariness and nostalgic yearning for the past. During the war there was a revival of prosperity. Here, as elsewhere throughout Nazi domains, substantial wages were paid. There was work for everybody, but nothing to buy. Food and clothing purchases were rigidly rationed. Consequently the workers were forced to save.

When defeat came, most families had enough cash on hand to live comfortably for a few weeks, even in the face of skyrocketing prices. But most of these savings were exhausted long before midsummer, and the hysterical trading of watches and jewels for food began.

Unscathed City a Target in 1944

Vienna came out of the war with relatively little physical damage—at least as far as the commercial and residential sections are concerned. Compared with Berlin, Budapest, Cologne, Munich, and Hamburg, it seems almost unscarred. Most dwellings are intact, there is city water and electricity, and streetcars are in operation. Few areas of rubble cover more than a block.

*See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Vienna—A Capital Without a Nation," by Solita Solano, January, 1923.

AP from Press Ass'n

Pride Forgotten, Vienna Trudges Across a Makeshift Ramp. Retreating Nazis Blew All Bridges over the Danube Canal

Fire-swept apartment houses (left and right) reflect not the American precision raid of March, 1945, but April's Russian-German artillery battle. Along this canal, which runs through the heart of the city, SS troops made a last-ditch stand. A survey showed 40 percent of Vienna's buildings damaged.

U. S. Army Signal Corps, Official

Beneath the U. S. Coat of Arms, Czech Girls in Native Costumes Dance Before Allied Officers in Pilsen's Town Square

Not everyday finery, their costly embroidery is reserved for special occasions. Only a few girls wear old-style knee-high boots. Slippers' greater comfort is changing this fashion. Some girls, having grown up during wartime, couldn't get the leather. Americans, Britons, and Russians are in the reviewing stand (page 665).

It was nearly four years before the war was brought home to Vienna. The city was a long way from the bases in England. Until late 1943 the Luftwaffe-held airfields on the Foggia plains in Italy gave it almost complete protection from the south.

But by the spring of 1944 a radical change had taken place. Increasing raids of RAF and American bombers against industry in western and central Germany forced the Nazis to move many wrecked plants to the relative security of the Austrian capital. The section around Vienna had become a very important aircraft-building center.

Bombers Wrecked Oil Wells

Romanian and Hungarian oil wells were wrecked by bombers from Italy, and transportation up the Danube was effectively halted by mine-laying planes. Thus Germany was shut off from her chief source of petrol. There was a relatively small oil supply in the Vienna basin itself. This became of vital importance.

A third realm of importance lay in the city's highly developed transportation system. A ring of highways and rail yards circled Vienna, connecting it with all Axis Europe through four natural gateways which had made the capital great in the Middle Ages.*

The Danube Valley leads to Budapest and the Balkans. To the north are the fertile valleys of Bohemia and Moravia, to the west the Danube enters Bavaria, and to the south a tortuous route goes down to the Adriatic. Thus during the last 18 months of the war the ancient city became one of the Germans' most important strategic centers.

The first great bomber raid on Vienna proper came in March, 1944. From that time until the end of the war nearly 12,000 bombers dropped some 27,000 tons of bombs on targets in the city and adjacent towns. When the city finally fell, the industries which still functioned were minute, the oil refineries were bomb-twisted masses of metal, and the rail yards were clogged with battered rolling stock.

This damage is not apparent unless one looks for it. The bombers sought and, for the most part, found precise targets. There was no terror bombing of Vienna. The greatest single loss came in April, 1945, when, meeting little resistance, Marshal Fedor I. Tolbukhin's Third Ukrainian Army entered the city.

Nazis retreating westward spattered the business section with incendiary shells and succeeded in burning out the interior of St. Stephen's Cathedral, chief religious edifice of the city and one of the most beautiful in Europe. The walls are still standing (pages 650, 653). But all the windows are smashed, and the interior is a mass of rubble. Many precious relics were lost. Optimists believe the building itself can be restored in a few years.

Only small bombs fell here and there outside the industrial areas. On most streets one or two buildings are gutted, but on the whole the damage to Vienna hardly seems so great as that suffered by London.

For the past century Vienna has been one of the great world centers of higher education and scientific research. Students have flocked here from all over the world, especially students of medicine. The University went undamaged, except for one bomb which fell through the roof of the law school.

But halls and classrooms were empty. The courtyard was grown high with weeds. Thick coatings of dust covered the marble faces of the busts of the great physicians and physicists who have taught and worked here for the last ten generations. During the war most of the faculty members were replaced by Nazis, and Vienna University became a center of scientific war research.

Nazi Fanatic Destroyed a Gem of Science

Here was developed a powerful electronic microscope, capable of magnification up to 100,000 diameters. Its lenses consisted of huge clusters of wire electrified by a 100,000-volt current. Now it is only two tons of scrap iron.

After the development of the instrument, the Nazi Government sent here Prof. Jorn Lange to take charge of the physics laboratory.

As the Russians approached, he declared that his orders were to smash the microscope with a sledge hammer rather than let it fall into their hands. This seemed like sacrilege to his fellow professors. They plotted to prevent the destruction. Finally they agreed to lure Lange into a small annex and gas him if he made the attempt.

The fateful moment came. Two professors, alone with Lange at the time, saw him go to a cupboard for his hammer. One stayed behind to reason with him while the other slipped out to put through a call to the resistance movement. He came back with one of the Austrian Underground soldiers just in time to see Lange leap at the huge instrument and begin striking the delicate parts.

All three tried to rush him. He knocked out the resistance man with a hammer blow. Then, using a table as shield, he edged to a drawer and got his revolver.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Danube, Highway of Races," by Melville Chater, December, 1929.

Melville Bell Grosvenor

Guarded by Bohemia's Patron Saints, Prague's Medieval Bridge Tower Survives the War

Charles Bridge, spanning the Vltava, is approached through the arch. Saints' statues line the span. A bronze marks the spot where Wenceslaus IV is said to have had a priest thrown to his death in the river for refusing to reveal secrets of the queen's confession. That priest became Bohemia's St. John.

U. S. Army Signal Corps, Official

Czechoslovak Flags, Not Seen in Prague for Six Years, Wave for the Homecoming Army

"RG" on the white armband denotes a member of the Revolutionary Guard. He has exchanged the Underground's nondescript attire for a military uniform. Children in the crowd are behind in their learning. Many schools were closed by the Nazis. Some children were taught only German history.

One professor, rushing forward to restrain him, was shot dead. The other hurled himself at Lange's legs. He too was shot dead.

Lange afterward was arrested as a major war criminal. Even in the depths of its despair Vienna showed episodes of heroism.

The winter will be tragic. Food promises to be even more scarce. There will be no coal for heating homes, and the cold autumn rains probably will mark the beginning of the most tragic episode in the city's history.

Every afternoon the fabled Vienna Woods are thronged with women gathering in baskets stray sticks of wood for cooking (page 655). Few have been able to lay by any reserve.

Almost Everyone Gets Same Pay

Vienna is perhaps the one place in the world where almost everybody who works gets exactly the same pay.

Gen. Theodore Koerner, the burgomaster, and the humblest street cleaner each get 150 schillings a month. This, at the exchange rate fixed by the American and British armies, is approximately $15. It is enough to pay the rent for a small apartment and to buy all the bread allowed by the ration restrictions for a family of three. There is no surplus. This money is paid on account.

Some day, when the city's finances are in order, perhaps the people will receive the back pay which now is withheld.

If either General Koerner or the street cleaner got his full pay now it would do him no good, unless the increased income was in terms of thousands of schillings a month. If the street cleaner received 500 schillings instead of 150, he could not, by law, buy any more bread, and the increase would hardly procure him an ounce of butter or a half pound of sugar.

Vienna by late summer had reached the stage where money had little meaning. The black-market operators wanted stable goods

in exchange for the morsels of food they offered. In terms of money their prices were unimaginably fantastic.

All legitimate trade soon stopped. There is hardly a store in the city, other than those dealing in bread under government license, whose windows are not empty and whose door is not locked.

Thus the great city goes its way in an ominous twilight which promises a starless night.

Lilac Time Grim in Czechoslovakia

It was lilac time in Bohemia. The May night was filled with the fragrance of lilacs, and in the square below girls in native Czech costumes were dancing and singing, with lilacs woven in their hair. Pilsen (Plzeň), entered by two American divisions after six years of German occupation, was holding a wild liberation fete.

But in division headquarters overlooking the square there was being pieced together, from telephone messages and the dramatic descriptions of an escaped British war prisoner, quite another story of events in the nation's capital 50 miles away, a story which gave no cause for rejoicing.

Prague had heard that American troops were approaching from the south and west, Russian troops from the east and north. The German radio was proclaiming that the war was over, although there had been no official announcement by General Eisenhower.

Everywhere, it was reported, German troops were throwing down their arms—everywhere but in Czechoslovakia where Field Marshal Albert Kesselring had made no move. He was the same "fox of the Apennines" who caused the Allied armies such heavy losses in Italy two winters before.

This was the moment for which Prague had waited for six years.

Resistance Forces Issue Ultimatum

Two days earlier the extremely well organized secret resistance forces had come from their hiding places, many of them wearing uniforms, and served an ultimatum to the German commander.

His position was hopeless. He agreed to quit the city with all his troops. The "revolution of the lilacs" apparently had been won with hardly a shot fired.

Then somebody broke the truce. The people of Prague never have blamed the Wehrmacht itself. Presumably the prime movers were some SS elements in the Prague garrison, spurred by Nazi district leader Karl Hermann Frank, the glass-eyed madman who saw only the gallows ahead for himself and wished to sell his life as dearly as possible.

German intelligence learned that the Americans did not intend to proceed beyond Pilsen. That was the line which had been set by agreement with the Russians. The nearest Russian troops were 60 miles away. The Prague Underground had only small arms with which to fight German tanks and artillery.

The revolt, as had been the case in Paris under somewhat similar circumstances, was premature. The result was a massacre. The people of Prague fought desperately behind street barricades built by tearing up paving stones. Firing into houses, German tanks went wildly through the streets, with women lined up as screens in front of them.

I was one of three American correspondents who entered Prague the next day, passing for 50 miles through the disorganized ranks of the retreating German Army. They had taken to flight when they learned that the Russians were closer at hand than they had believed. They did not bother us as we zigzagged through their ranks. They sought only to get inside the American lines to surrender, for they had a deathly fear of becoming prisoners of the Russians.

Prague, in the Wake of Massacre

We were the first men in any Allied uniform in Prague. The first Russians did not arrive until nearly two hours later. We found the streets littered with dead and a lone German fighter plane still strafing whenever a crowd congregated.

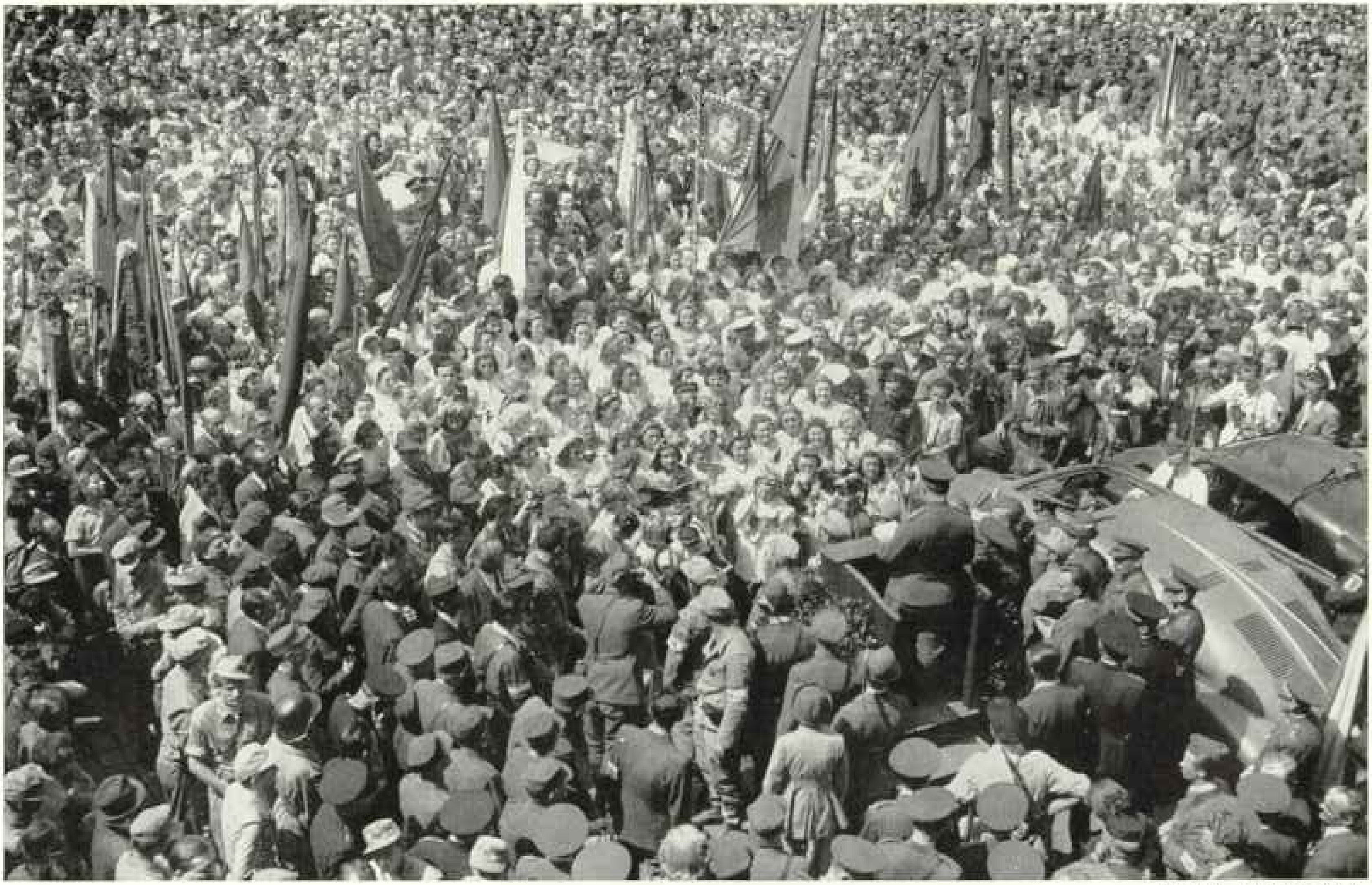
This was Prague's first and last battle in the war. Much of the destruction suffered was wrought by the guns of German tanks. They had dashed back and forth along stately St. Wenceslaus Square, the business center of the city, and left piles of rubble here and there (page 666). They had shot up the big modern Woodrow Wilson Railway Station, named for the American President, whom the people of Czechoslovakia regard almost as a patron saint.

The greatest loss was the Town Hall in the Old Town, which was bombed in a last-minute raid by four German planes. Part of this building dated back to the 14th century. Still serene and undamaged in the square stands the statue of tall, lean, bearded John Huss (Jan Hus), the Bohemian religious reformer who was burned at the stake in 1415.

Otherwise Prague was left essentially unchanged by the war. She was the least bloody of the three tragic sisters. She was occupied by friendly troops who sought only to bring about a quick restoration of normal living.

Astride His Charger in Downtown Prague, Good King Wenceslaus Inspired Patriots Rising Against the Nazis' Last-ditch Garrison

In prewar uniforms, Czechoslovak soldiers (right) view St. Wenceslaus Square from the National Museum terrace. Streetcars (center) drive left; Germans reversed their direction. While liberating armies were miles away, trolleys gave the signal for the May 5, 1945, uprising by racing with Allied flags flying. Behind paving-block barricades, lightly armed citizens fought tanks (page 665). In St. Wenceslaus Square, scarcely a windowpane survived, but only a building or two fell. St. Wenceslaus escaped damage. Tenth-century unifier of the Czech tribes, he is immortalized by the English Christmas carol "Good King Wenceslaus."



U. S. Army Signal Corps, Official

Prague, Only Winner among Old Austria-Hungary's Three Sister Cities, Celebrates Its Own Victory after V-E Day

A Russian officer addresses the crowd. Round hats are worn by Czechoslovak regulars. Captured German helmets and *Afrika Korps* caps clothe patriots who fought at the barricades May 5-9. Right: a Tatra car, made in Czechoslovakia before the war, has its motor in the rear; sliding panel reveals the driver.

Acme

America and Czechoslovakia Clasp Hands

In Pilsen, Maj. Gen. John M. Devine meets President Eduard Beneš, just returned from his second wartime exile. During the first World War he worked with the Allies. With the late Thomas G. Masaryk, Beneš became cofounder of the Republic. Munich drove him from his country again. Briefly, he taught at an American university. With the new war, he organized the provisional Czechoslovak Government.

True, food was scarce. But with enforcement of a rigid rationing system there was enough to keep everybody in good health. There was no appreciable black market.

Loot of Retreating Germans

The stores, of course, were nearly empty. The retreating Germans had looted nearly everything they could take away. From the moment the Germans left, there was no disorder. Throughout the Bohemian countryside an abundant wheat crop was harvested in August. Despite a shortage of fuel and scanty transportation, Prague looked forward to a reasonably comfortable winter.

But under the German heel for six years her sufferings had been terrible. Perhaps nowhere in Europe, outside Poland, had the Gestapo been more cruel.

An Assembly Line for Mass Murder

The most gruesome place I ever saw was the combined courtroom and execution chamber in the old Pankrac Prison on the outskirts of the city. Here hangings and guillotinings were carried out literally with an assembly-line technique, with overhead pulleys to move the victims from the place of sentence to the gallows or guillotine and thence to the rendering works.

Unless one gives full consideration to the country's sufferings under German occupation and remembers such incidents as the annihilation of the village of Lidice, the spirit of Prague is likely to seem narrow and vengeful. Property of Germans was being confiscated ruthlessly, and the delay imposed by the Allied authorities in ousting upwards of 2,000,000 persons of German blood from the Sudetenland was causing hard feeling.

This move was not necessarily against Germans who had proved traitors to Czechoslovakia during the war. Some had been loyal Czech citizens. The mere fact of having a preponderance of German blood was enough, unless one could prove that he had taken an active part in the resistance movement.

The object was not primarily to punish disloyal elements, although this incidentally would be achieved. It was to "de-Germanize," to make Czechoslovakia as nearly as possible a land for Czechs and Slovaks.

The provocations which the Bohemian

people had suffered through their long and tragic history and which had reached their climax since 1938 were not fully appreciated by American troops stationed in mixed Slav - German areas. The Sudeten Germans, clutching at straws, were hospitable and ingratiating. Many of their girls were lovely corn-haired sirens.

A Hard Language to Learn

The honest Czech was hospitable enough, but he saw no need to go far out of his way to court the favor of the occupation troops. His women attended to their own business and left soldiers alone. Language was an almost insuperable barrier.

The average American could master enough German in a few weeks to carry on a flirtation with a Sudeten girl. Czech, perhaps the most difficult of the Slav languages, was completely beyond his reach.

Even the Czechs themselves smile at some of the difficulties of their language for anyone for whom it is not the mother tongue. One phrase they like to quote is: "*Strč prst skrz krk.*"

There is not a vowel in the sentence. Fortunately it is not a phrase which one would have occasion to use often in polite conversation. It means "Stick your finger down your throat."

This same linguistic barrier made it easier for American military government officers to deal with the Sudeten Germans than with the Czechs, and even they often had no conception of the bitterness of the race hatred which existed in the area.

The result of all this was, so the Czechs were claiming in August, that the Americans were showing undue favoritism to the Sudetenlanders, allowing them to cry on their shoulders and lending ready ears to their tales of injustice. Doubtless there was some basis for the claim. It was an additional factor in turning the eyes of Prague eastward where, she felt, she could find better understanding of her problems.

Thus the three sister cities of the Danube Basin emerge from the war—one in hysterics, one heartbroken, one cold and vengeful and full of confidence.

There is little doubt that steepled Prague will live and prosper. Only time can tell the fate of the others.

U. S. Army Signal Corps, Official

A Smile, a Hug, but—They're Speechless

Boy-meets-girl formula encountered an insurmountable barrier when the Yanks entered Czechoslovakia. Men who could master "flirtation" German fairly choked on consonant-ridden Czech.

Major Symmes B. Smith

Warrior of Ifitamin, Remote Fastness in North-East New Guinea

Barbs in nostrils imitate antennae of insects. Cowrie-shell tiara and pigs'-teeth necklace are prized ornaments. American flyers built an airstrip in Ifitamin during the New Guinea campaign. Two hundred miles northwest, in Netherlands New Guinea, they rediscovered mysterious Grand Valley, dubbed "Shangri-la."

New Guinea's Mountain and Swampland Dwellers

By Col. Ray T. Elsmore *

"COLONEL, if we slip over that ridge, we'll enter the canyon that winds into Hidden Valley."

The words came to me over the intercommunication system as I patrolled a zigzag course with my C-60, twin-engined Lockheed *Lodestar*, at 10,000 feet over the mountainous interior of Netherlands New Guinea. Here and there I could see a hole in the billowing cumulus clouds.

The voice was that of my co-pilot, Maj. Myron J. Grimes. A week before he had located New Guinea's Hidden Valley while probing back and forth, seeking a lower pass through the rugged and towering peaks of the Oranje Mountains (Oranje Gebergte).

The valley's existence had been revealed to the world in 1938 by the Richard Archbold-American Museum of Natural History Expedition.†

Now, for a second time, white men were to penetrate this mile-high, walled-in fastness which the Archbold Expedition, we later learned, had named Grand Valley (Color Plate IV-V).

Searching for a Landing Strip

Instead of American and Dutch scientists, this time the invaders of this remote "Shangri-la" were American soldiers. Our men were looking for possible landing fields to use against the Japs.

When General of the Army Douglas MacArthur began his leapfrog military campaign up the New Guinea coast, our only air route for flying supplies to him lay over the Owen Stanley Range in the southeastern end of the 1,500-mile-long island. When Hollandia was taken, a shorter route became imperative, to keep air transport abreast of MacArthur's advances.

Lt. Gen. (now Gen.) George C. Kenney, commander of the Allied Air Forces in the Southwest Pacific, ordered the opening of an air route from the base at Merauke to Hollandia. At least one intermediate landing strip had to be located, built, and put to use.

Major Grimes had been sent to reconnoiter and had charted two tentative routes. He was enthusiastic about Grand Valley and its possibilities as a landing strip. The second route lay through Ifitamin, about 200 miles southeast of the valley. So we started on our tour of inspection.

Grand Valley, a mile high, nestles deep in the Oranje Mountains, a part of the Snow Range explored by Mr. Archbold.

Within steep walls of these mountains dwell strange, isolated tribes, sequestered from the world and often cut off from each other.

Two hundred miles of swampland and a cloud-bathed canyon shut off Grand Valley's entrance from the south. Steep cliffs, punctuated with 14,000-foot peaks, wall it in on the east and west. The only practicable entrance is from the north (map, page 674).

At dawn the silver *Lodestar* took off from Merauke, with fourteen aboard. At 500 feet we ran into solid overcast. Tops of the clouds were at 8,000 feet.

Land of Head-hunters and Crocodiles

Between Merauke and the foothills of the Oranjes we flew across the 200 miles of swampland, level as a billiard table. The scattered tribesmen who inhabit it are head-hunters. They are as menacing to man as the fierce crocodiles that abound here. It was easy to see why the Netherlands penal colony at Tanahmerah is one of the most effectively guarded in the world.

The only way of escape for a prisoner is down a well-policed river. If he flees into the swamps he has a Hobson's choice of being beheaded or devoured by crocodiles!

Cloud ceilings rose as we neared the Oranjes, but an overhanging bank shrouded most of the range. Above Grand Valley floats a seldom-lifted cover of white, fleecy clouds. We could see an occasional rift, but we knew that peaks lurked in its innocent white walls. Higher peaks extended above the clouds.

We had to fly over the Oranje Mountains to find a way down into the valley from the north. We climbed to 17,000 feet before it seemed safe to level out and fly through or around the gigantic cloud banks. We saw the white-capped peak of 15,584-foot Wilhelmina. What a strange sight—snow close to the Equator!

We flew for 30 minutes and then started letting down. Successive ranges, with peaks diminishing from about 13,000 to 6,000 feet,

* Colonel Elsmore served as Director of Air Transport, Allied Air Forces, in the Southwest Pacific, under Gen. George C. Kenney. He was a flying instructor in World War I. He has flown nearly 15,000 hours.

† See "Unknown New Guinea," by Richard Archbold, National Geographic Magazine, March, 1941.

Ray T. Elsmore

Valley Dwellers Turn Swampland into Myriad Patches of Sweet Potatoes

Deep ditches drain these alluvial flats. Taro, sugar cane, cucumbers, gourds, spinach, and beans are minor crops. Nearly all the original forests were destroyed years ago to clear land for crops. Bananas and tobacco are grown only in village enclosures. Some Grand Valley bananas are eaten without removing skins.

U. S. Army Air Forces, Official

Colonel Elsmore Takes a Prisoner in the Southwest Pacific

The author hasn't named his pet monkey yet. When he got the little fellow back to the United States, he assigned that task to his daughter Joan. Colonel Elsmore made numerous flights over Grand Valley and directed rescue operations when an Army transport plane crashed there last May (page 680).

extended clear to the north coast of New Guinea. Between each range a river flowed sluggishly through swamplands.

Suddenly, as Major Grimes pointed to the top of a ridge with an overcast only 300 feet higher, his welcome words, "Slip over that ridge," came through the intercom.

So over the hump we went, into a canyon, and throttled back to keep below the cloud level. The lower we descended, the narrower the canyon became and the steeper were its walls.

We rounded a bend. Straight ahead loomed an almost perpendicular cliff. I jammed the throttles full on and started to do a hasty about-face. But again Grimes called:

"There's room between the top of that cliff and the overcast. Push on through. The valley is just beyond."

A River Tunnels a Canyon Wall

As we flew over the cliff, we observed a natural grotto or tunnel (Plate III). Its arch was at least 300 feet high, and the small Warok River that had been below us was suddenly swallowed up in the side of the canyon wall.

On the other side of the ridge we saw native villages stretching over the floor of the canyon and extending up the almost vertical walls into the clouds (Plate II). A mile farther down the canyon the Warok emerged from another hole in the mountain and continued its jagged course.

Through a sudden break in the clouds we saw the fabulous Grand Valley spread out before us.

We had a panoramic view of a strange community nestled in the heart of this vast range of mountains.

A large river, the Balim, runs the entire 30-mile length of the valley. It tumbles in torrents from a canyon in the north end and flows lazily through the valley (Plate I). Then it enters another steep-walled canyon to leap and fall in swift rapids until it reaches sea level on the south side of the Oranjes.

Almost the entire valley floor, as well as the steep hills that edge the towering peaks, was in an extensive and efficient type of cultivation. It differed from that in any other part of New Guinea.

The farms were enclosed by a complete network of drainage ditches (Plate VI). Crops were in full growth everywhere and, unlike the scene in most tropic lands, the fields were

High Mountains Wall in Grand Valley, "Shangri-la" to U. S. Flyers in the Pacific

The Richard Archbold-American Museum of Natural History Expedition of 1938 discovered the valley in the Oranje Mountains of Netherlands New Guinea. When American airmen were searching for possible landing strips during General MacArthur's New Guinea campaign, the valley floor was considered a likely site. Later it was rejected in favor of a field at Ifitamin, 200 miles away in North-East New Guinea. Grand Valley was the scene of a tragic U. S. Army transport plane crash in May, 1945, when 21 military personnel were killed.

literally alive with men, women, and children, all hard at work.

It was only natural that these isolated people should be frightened by the sudden appearance of an airplane. As we approached at well over 200 miles an hour, they scattered in all directions, some crawling under the sweet potato vines and others diving into the drainage ditches.

An amazing thing about Grand Valley was the precision of its ditches and villages (page 672). Even with modern farming implements such perfect patterns would be difficult to fashion. The fields were laid out in checkerboard squares as perfectly formed as the farm lands of the Snake River Valley in Idaho. The entire valley and its growing crops were a riot of dazzling color.

Hillside Farms Touch the Clouds

The cultivation was not confined to the valley proper. It extended up breathlessly steep walls that an American farmer would hesitate to climb, much less till.

The steep hillsides were neatly terraced, and communities ranging from one or two native huts to whole villages were built on the mountainsides, extending into the ever-present cloud layers.

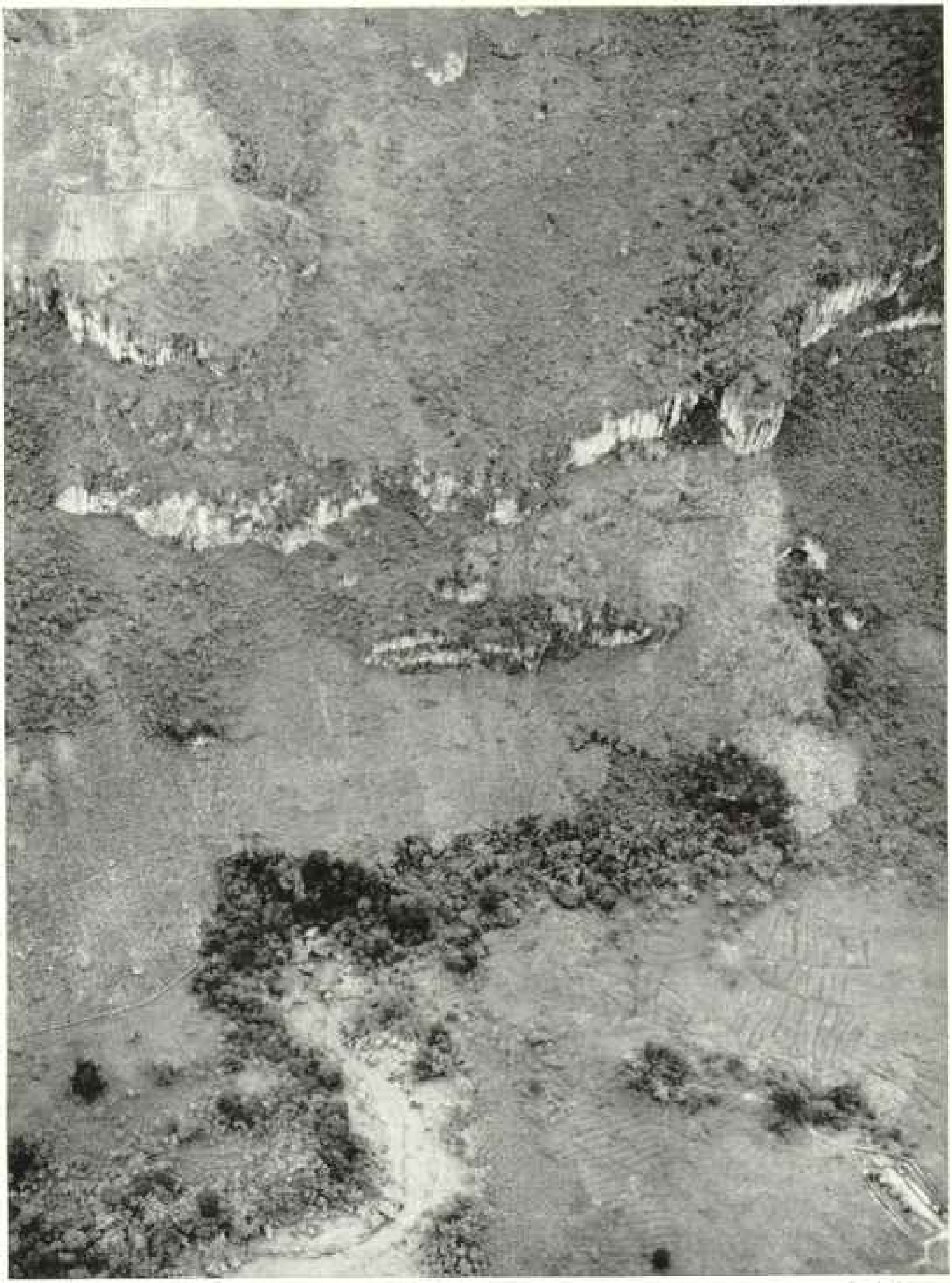
Each village had an elaborate and carefully engineered system of stone or wooden fences. We could also see a series of lookout towers spotted throughout the valley.

We flew right off the deck of the valley to get a good look at these. Each was a high pole or cut-off tree—we couldn't tell which. On a platform atop each pole stood a guard (page 676).

Our plane disrupted the guard system, for the moment at least. As we neared each tower, we could see the guard scampering down the pole, usually racing at top speed to reach a near-by shack.

Long spears leaned against some of the guard shacks. On a later flight over the valley, an Army Air Forces pilot saw a tribesman throw a spear at his plane as he flew low over a village.

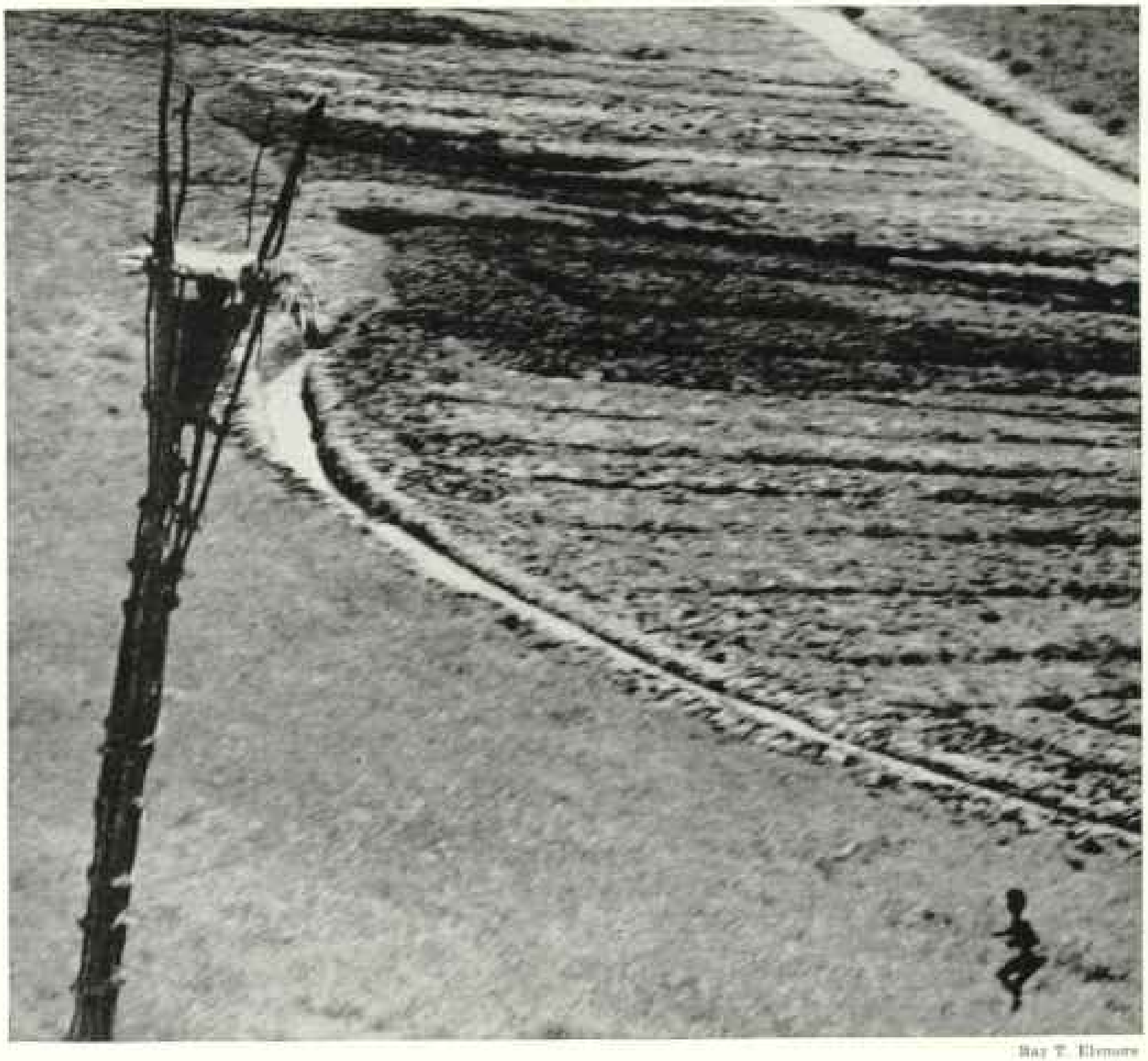
It was obvious that the winding river, with villages built on both sides, was a natural barrier for warring tribes. There were no bridges visible, and no boats or canoes could be seen



Ray T. Elmore

"Now You See It, Now You Don't"—Warok River Vanishes under a Mountain

This tributary of the Balim follows a subterranean course for a mile, then pops out of the earth to flow into Grand Valley. A path leads from the river, at the point where it disappears, to the stone-walled village at lower right. Beyond the village, terraced gardens cling to the slope until it becomes too steep to cultivate.



Ray T. Elsmore

Terrified by the Plane, a Lookout Ducks Beneath His Tower Platform

As Colonel Elsmore flew low toward the watchtower, he did not observe the woman (at right) fleeing toward a shack at the base of the tower, but the camera caught her. Guards were posted on numerous towers throughout the valley, to scan the countryside and warn villagers of hostile warriors. Intertribal fights in Grand Valley are frequent.

from the air. But the natives do know how to build bridges.

Later, as we flew near the walled canyon into which the river flows, we saw a suspension bridge (opposite page).

We learned little of the people on this survey flight and were able to photograph only a few. From the air they looked larger than the average New Guinea native we had encountered. They appeared quite unlike the ones at Sentani Lake (Sentani Meer), near Hollandia, for example, who have been given such a thorough GI indoctrination that they will yell at the Americans from their villages, "Hey, Joe—hubba, hubba—buy War Bonds."

Later in the war we were to learn more, at first hand, of the 60,000 inhabitants of the Grand Valley. On this flight we did notice other differences from the average New Guinea tribesman. Many of their homes, for example, were built like igloos, round in shape.

Other buildings were of oblong construction. Both were located near trees. The panorama of these hundreds of villages from the air is one of the most impressive sights I have ever seen (Plate VIII).

Photographs Help Identification

We flew away from Grand Valley with a basketful of notes and a lot of photographs for comparison purposes. Then we sped 200 miles farther to the southeast to observe the alternate site for a landing strip at Ifitamin.

Back at Merauke we considered the two

Archbold Expedition

Valley "Engineers" Built This 150-foot Suspension Bridge over Balim Rapids

Poles and forest vines were their principal materials, stone axes their tools. The decking of split timber is more than a yard wide. Pole trestlework of the land abutments shows remarkable skill. Members of the Archbold Expedition saw as many as 20 people crossing it at one time.

routes the survey party had studied. Distance, weather, and navigation weighed heavily in favor of the strip at Ifitamin.

But the deciding factor was the discovery that a few years before an Australian missionary had made his way through the mountain fastnesses to Ifitamin and had found the tribesmen friendly. Not only were we anxious to avoid incidents and bloodshed, but we wanted to employ native labor on the construction project.

From our Dutch and Australian friends we could learn of no record of a white man's having been in Grand Valley. In fact, we had the impression that the Grand Valley discovered and explored on foot by the Archbold Expedition in 1938 and our "Shangri-la" were two distinct valleys.

Since then, I have corresponded with Mr. Archbold and compared his photographs with ours. Undoubtedly our Hidden Valley, or "Shangri-la," and his Grand Valley, which he pictured and described in the NATIONAL GEOGRAPHIC MAGAZINE for March, 1941, are the same.

Flights to Mystery Valley

With the Ifitamin route chosen, a practical war mission for Grand Valley disappeared, but its mystery lingered on.

As a matter of standard practice, newly arrived flyers were thoroughly indoctrinated in New Guinea terrain and weather, for Nature was as much a menace as was the Jap. Thus frequent flights were made to Grand Valley, and romantic adventure stories were written by

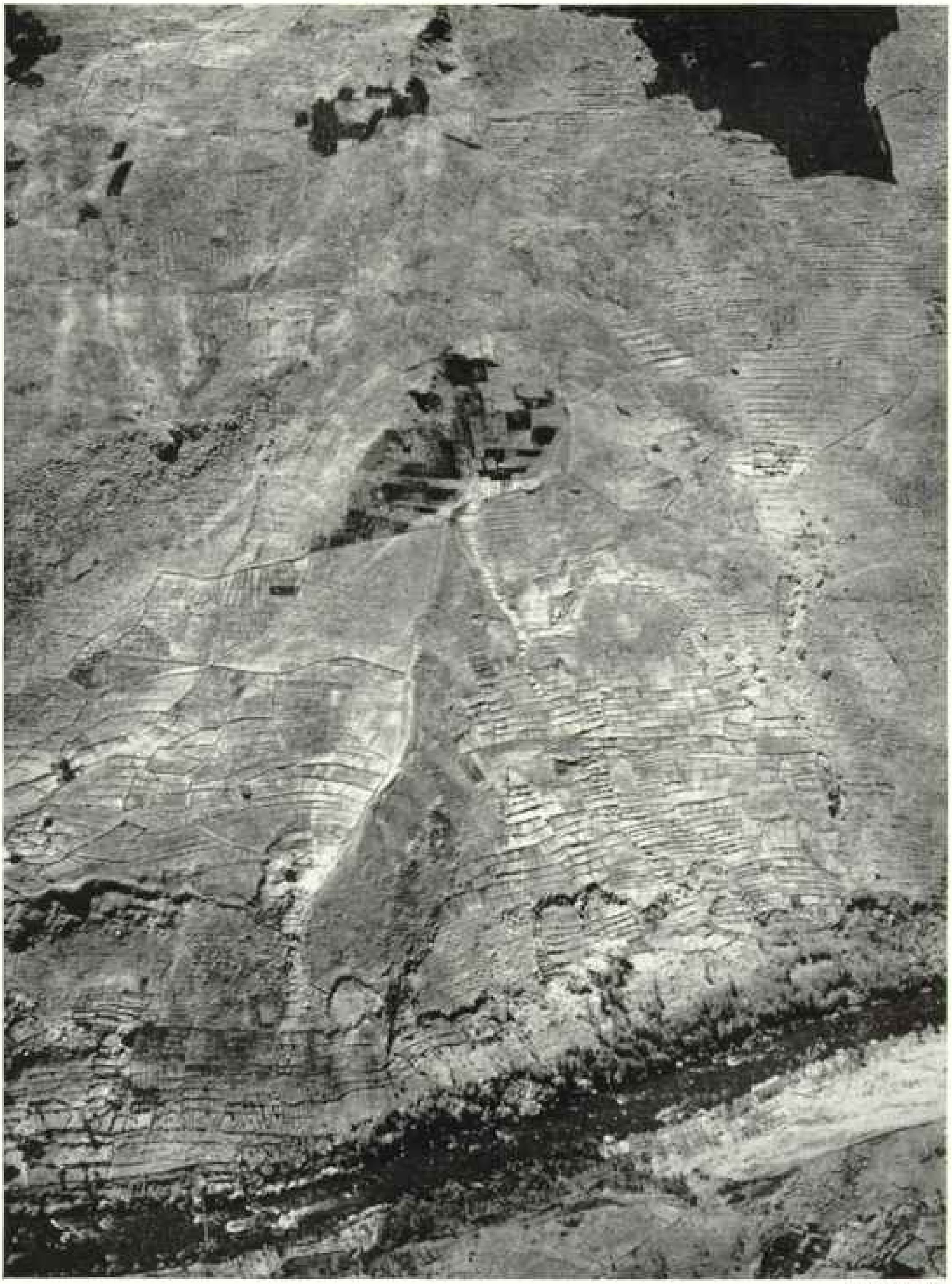
To Roast Pig à la Grand Valley, First Heat Rocks over a Grass-lined Pit

While the stones are in the fire, the pigs are singed over a small blaze to remove skin and bristles. Then stones, pigs, and sweet-potato tops go into the pit. In a few hours the feast is ready.

Archbold Expeditions

Fiber-cord Hair Nets Hold Unruly Locks in Check

Grand Valley women wear carrying nets which hang down their backs like snoods. Man at right has a pig's tusk passed through his nose. All wear pigs' tusks in their necklaces.



Ray T. Elmore

Stone Walls Prevent Erosion of Gardens on Steep Canyon Walls

Sweet potatoes grow in permanent, walled-in patches, many of which are fertilized from drainage ditches. With virtually no new land available for cultivation, valley dwellers work hard to keep fertile what soil they have. Digging sticks, more or less flat at one end and pointed at the other, serve as spades.

war correspondents. George Lait and Harry E. Patterson, whom I flew through the valley, named it "Shangri-la."

We learned that, although we could not enter Grand Valley by way of the southern canyon, we could leave by that route, keeping below the overhanging clouds. Our flights down this steep and winding canyon, a Columbia River gorge in miniature, defy my powers of description.

Flying around successive horseshoe turns, we found the steep canyon walls for the first ten miles terraced and farmed up to the point where they touched the clouds. Almost every foot of these walls was terraced and cultivated.

Each field was enclosed by a rock fence. "Igloos" perched on terraces and complete villages stood wherever a ledge would permit. Ten miles down the canyon the cultivation suddenly thinned out and then entirely disappeared.

"Shangri-la Society" Formed

Soon the number of New Guinea personnel flown over Grand Valley had grown large enough for an organization of visitors to be formed. Many of our war winners have returned to their homes as members of the "Shangri-la Society" and have received certificates that give the dates of their flights over the valley.

On one of these indoctrination flights, in May of this year, Grand Valley once again was opened by the white man, tragically. With military personnel aboard, one of our transports crashed high on the palisades of the valley wall and was consumed by fire. Five of the 24 survived the wreck itself, including three members of the Women's Army Corps who had served the Hollandia base so well.

Within 24 hours, two of the WACs died of injuries sustained in the accident, but the other WAC and two servicemen miraculously lived to tell their story to an eager world (page 693).

In the rescue operations, which I directed, much of the mystery of Grand Valley disappeared, and we unexpectedly found the answers to many questions about its people that had puzzled us.

Nearly seven weeks elapsed from the time of the accident until operations had progressed enough to permit a glider pickup of the trio and their rescuers.

Medical Corpsmen and engineers were parachuted to the valley floor to bring relief to the survivors and to construct a landing strip on which a glider could be safely landed and be picked up again by a low-flying transport plane (page 693).

Much public attention was directed to the valley as a result of these operations. Supplies and food were dropped to the scene whenever weather conditions permitted. By walkie-talkie equipment, also dropped from the sky, we could talk back and forth with the rescue base in the valley, and we even broadcast news summaries to the party stranded in this remote and isolated land.

It was a happy moment for me when the last gliderload of survivors and rescuers was safely back at our Hollandia base.

But twenty-one grave markers remain in Grand Valley, mute testimony that its secrets were again unlocked for a brief period as the Pacific war was drawing to a conclusion.

The presence of WAC Cpl. Margaret Hastings in the valley as a survivor of the plane wreck gave the rescue story that much more appeal, and her personal narrative was widely read in newspapers throughout the United States (page 694).

To our surprise, the natives were neither friendly nor unfriendly. They kept at a respectful distance from the white men, but brought food to them. The men of the tribes were not so fabulously tall as we had originally estimated, but they were certainly of larger stature and had lighter skin than other New Guinea tribesmen we had seen. They had a language of their own, which the party was unable to link with any other tribal jargon on the island.

Both the Archbold Expedition and the Army Air Forces' unscheduled entry into the valley confirmed many deductions I was able to make from aerial photographs and personal observation from the air.

The New Guinea tribesman often is described as a "fuzzy-wuzzy." This applies principally to Melanesian types in Port Moresby and farther east. Grand Valley dwellers are of Papuan type and have fuzzy hair, but not to a pronounced degree. A few have long, straight hair, more like the hair of our American Indians, that lies tight and flat against their heads.

They have a culture all their own. The architectural design of homes and other buildings, the orderly arrangement and beauty of villages, and the high degree of agriculture and industry are unique.

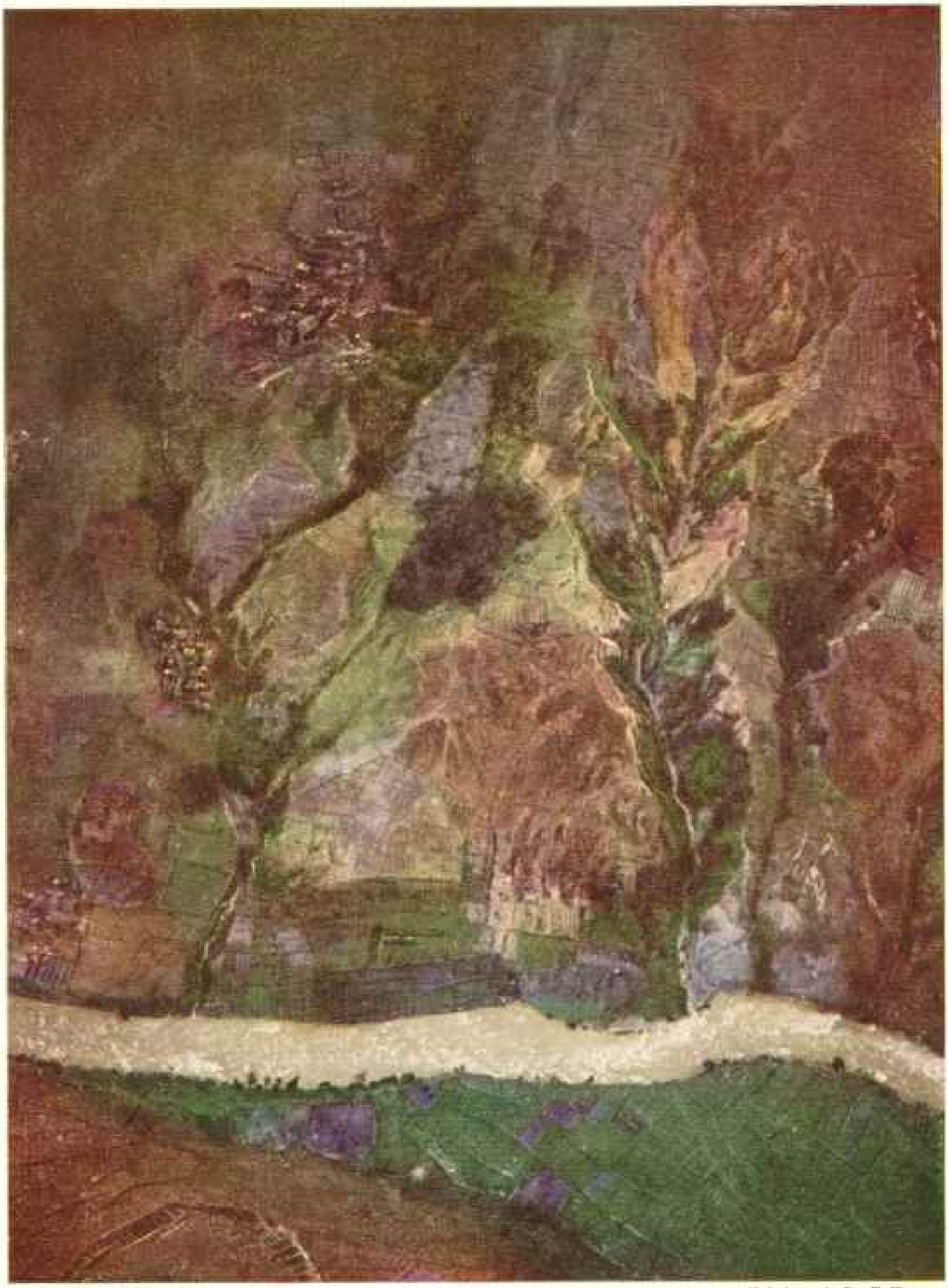
Pigs are highly prized, and the slaughter and eating of a pig is a ceremonial occasion. Some of their pigs grow to enormous proportions before being killed for a feast.

At Ifitamin we encountered a different type of New Guinea tribesmen (page 670).

 Kodachrome by Ray T. Dimmick

Lazily the Balim River Meanders the Full Length of New Guinea's Grand Valley

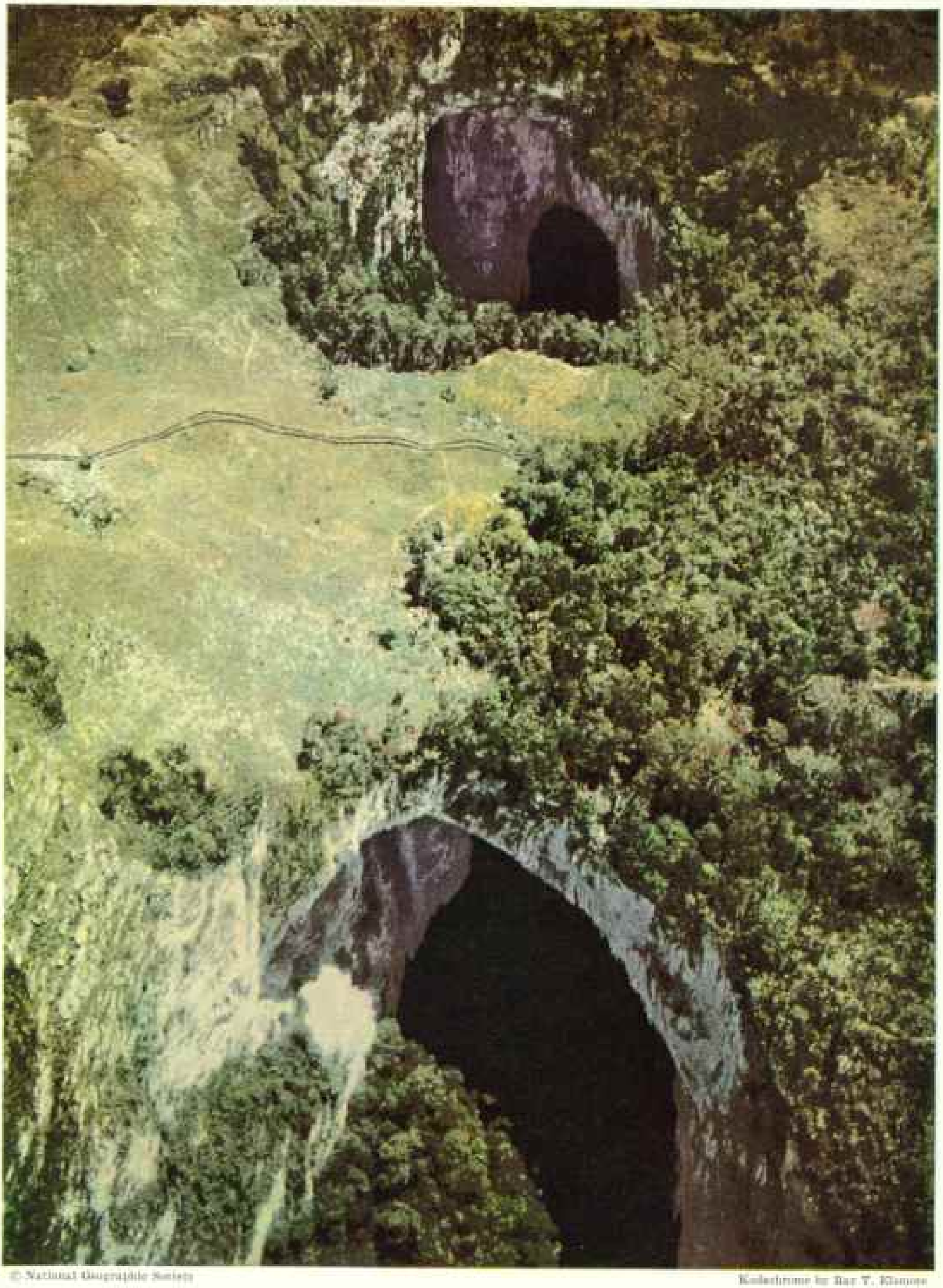
The stream passes through a patchwork of farms, handiwork of a strange community cut off from the outside world. Walled villages cluster on the river banks. Here the flooded Balim carries huge quantities of yellowish sediment. Known also as Hidden Valley and Shangri-la, this isolated area lies high in the Oranje Mountains.



Kodachrome by Bay T. Elmore

Tribesmen Cultivate Steep Canyon Walls up to the Overhanging Cloud Banks

Ridges with almost perpendicular sides wall in the valley, 30 miles long and about 4 miles wide. They are punctuated by 14,000-foot peaks. Tiny villages, built on nearly every available terrace, dot the cliffs. Clamped over the whole valley, a lid of fleecy white clouds clings to the tops of the ridges.



Kodachrome by Rar T. Elsmore

Through Underground Grottoes the Warok River Penetrates into Grand Valley

Northern entrance to "Shangri-la" is by a steeply walled canyon down which the stream makes its way until it seems to disappear at the base of a perpendicular cliff. Here it flows under natural bridges of limestone, arching some 300 feet above its bed. Newly cleared gardens, planted in sweet potatoes, lie at upper left.

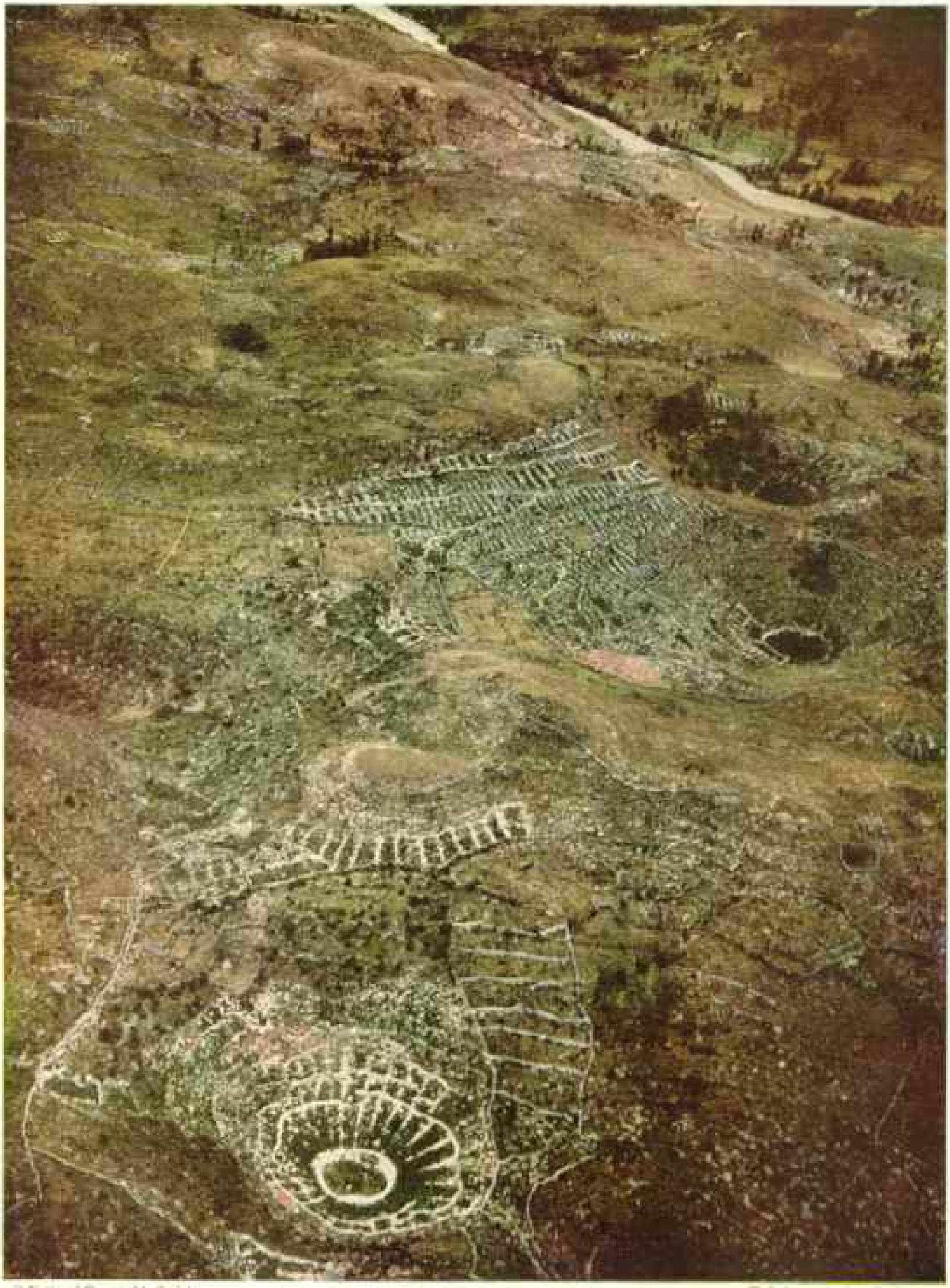
Stone-walled Gardens, Terraced Slopes, and Smoke-blackened Huts Dot "Shangri-la"

When Colonel Elsmore flew over Grand Valley, he found crops growing luxuriantly and the fields filled with men, women, and children hard at work. As the plane approached, they fled in terror. Some sought refuge in the network of drainage ditches which surrounds the fields; others, close to the villages, ran indoors.

The round roofs of the men's houses are soot-covered. The buildings have no chimneys, although fires are always needed at this chilly altitude. Smoke escapes at the junction of walls and roofs or through the thick thatch.

Men of the valley of the Balim River wear gourd "aprons," but virtually no other clothing. Women are content with only "fig-leaf" tufts of grass, fore and aft, for their attire.

Grand Valley was so named by its discoverer, Richard Archbold, and described in his article "Unknown New Guinea" in the National Geographic Magazine for March, 1941. Colonel Elsmore and his party called it Hidden Valley. News correspondents later nicknamed it Shangri-la.



 Kodachrome by Ray T. Elmore

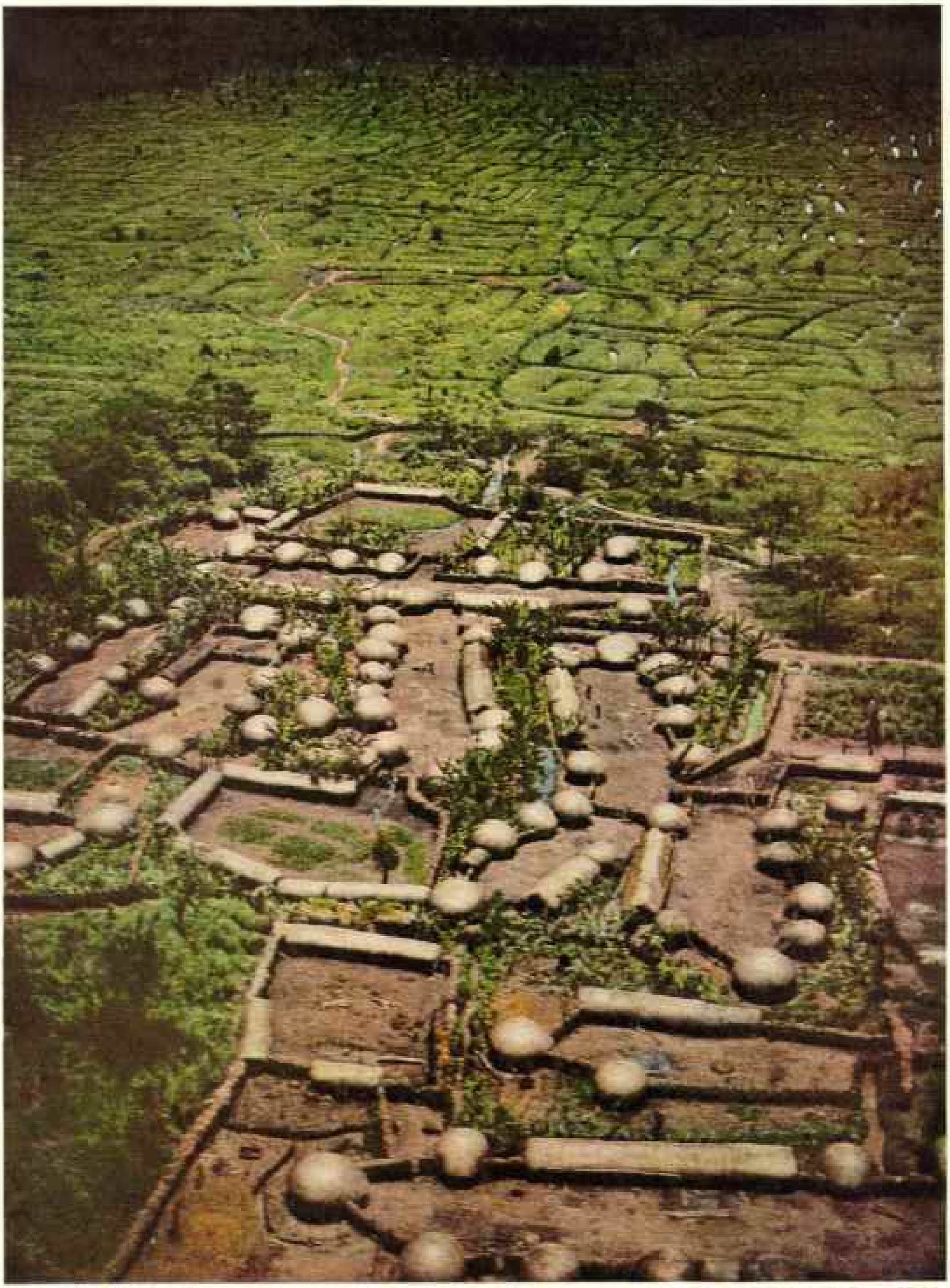
Like Spokes in a Wheel Are Stone Fences Edging Gardens in a Limestone Sinkhole

Wherever tillable land is found, tribesmen put it to use. Villages, drainage ditches, and fences are laid out and built with precision, although valley dwellers have only primitive building and farming tools. Agricultural methods differ from those of other areas in New Guinea, testifying to the valley's complete isolation.

 Kodachrome by Ray T. Elmore

Tall Brown Casuarina Trees Line the Banks of Balim River in Grand Valley

Hillside woodland with pale and dark-green foliage is second growth. The sides of the thatch-roofed houses in the village at left are built of stone. Surrounding walls of stone and wood appear thicker than they are because tribesmen cover the tops with pulled-up weeds. Limestone outcroppings show clearly in the cultivated areas.



 Kodachrome, U. S. Army Air Forces, Official

Valley Men Live in Round Stone Houses; Women in Long Rectangular Halls

Each village is laid out in orderly fashion. Banana trees with their spreading branches line the lanes. Footpaths lead across the drainage ditches to each field in the green patchwork beyond. Fields are planted with sweet potatoes. Most natives have rushed indoors, but two in right center dare to watch the circling plane.

One day these people were startled to see a fleet of six C-47's towing gliders appear overhead.

The gliders landed safely on a grass-covered ridge. They unloaded personnel and engineering equipment to get the strip under way. A small bulldozer, a grading machine, food, and other supplies were included in the self-contained airborne unit.

Although the tribesmen of Ifitamin were known to go on head-hunting expeditions against neighboring tribes, they were friendly to the white man. In fact, they were soon at work by the hundreds, digging drains, clearing rocks, and placing them on the runway site which the engineering equipment was leveling out.

It wasn't long before this work had progressed enough so that we could land there in a light twin-engined airplane (a Lockheed 12). Soon the runway was ready to receive our supply- and personnel-carrying transports, and tactical airplanes found the site a haven in bad weather.

Ifitamin also became an important base for rescue planes, which could go hunting for airmen forced down in the vastness of this jungle land.

Ifitamin Huts Are Square

The Ifitamin tribesmen are of pygmy type and are dark-skinned. Their huts are approximately square, with thatched roofs, and are floored with bamboo. These homes were totally unlike the "igloo" house of Grand Valley. There was only one small entrance, approximately three feet above the ground.

After a boost and a squirm, I dropped onto the swaying split-bamboo floor of one such hut. There were no chairs, beds, blankets, or furniture of any kind in the single room—not even a crib for the babies. In two corners were flat piles of rocks with fires smoldering on them.

Green vegetables of various sorts were arranged in piles. Stalks resembling celery were pushed under the hot ashes of the fire.

With me was a major of the Australian Army, a New Guinea pioneer with many years of contact with the tribes of the island. He took some of the "celery" from the ashes and peeled off the outer cover. The stalks were hot and perfectly roasted. We ate them and found they had the flavor of sweet corn.

The greasy black ceiling indicated the need for a chimney. The only way smoke could escape was by filtering through the thatched roof.

Looking into one of the other huts, we saw a woman holding an unwashed, unclothed baby that could not have been more than a few hours old.

In the same hut were three younger women with suckling pigs held in their arms in the manner a mother would hold her child. In fact, we saw more women with suckling pigs than we did with babies in their arms (page 692).

The major told me that pigs are very important to New Guinea natives since they are one of their chief sources of food.

Except for shells and other ornaments, the women wore only tufts of grass fore and aft. These "fig leaves" were held on by bands of vine rope wound round their waists. The pint-sized, creased, and wrinkled women, old before their time (forty years is their average span of life), do all the wood cutting and carting of food. We saw several come into the village carrying burdens heavier than they were.

The major explained that the women performed nearly all labor. The tribe was not far removed from the full-fledged head-hunters of New Guinea.

Though the women did the heavy work, men were considered the stronger of the sexes; so to them fell the fighting. If a man was burdened with a load of food or wood, his womenfolk might lose their heads before he could let down his pack; so he had to be unencumbered, ready to fight at any moment. Thus the native women of Ifitamin did most of the work. Perhaps this was just recompense in this primitive state—they kept their heads on longer!

Speaking of head-hunters, a missionary at the Netherlands penal colony at Tanahmerah told me that a head trophy could be white or black, large or small, and of man, woman, or child. He described to me in detail the practice of head-hunting by the Tanahmerah cannibals.

A Tanahmerah Head-hunt

Head-hunting is carried out during the dry season, July to December. The whole village packs up and goes with the head-hunters. They must be away for two weeks. The women do the cooking.

The victim is first of all speared or arrowed. Then his head is cut off with a razor-edged piece of bamboo.

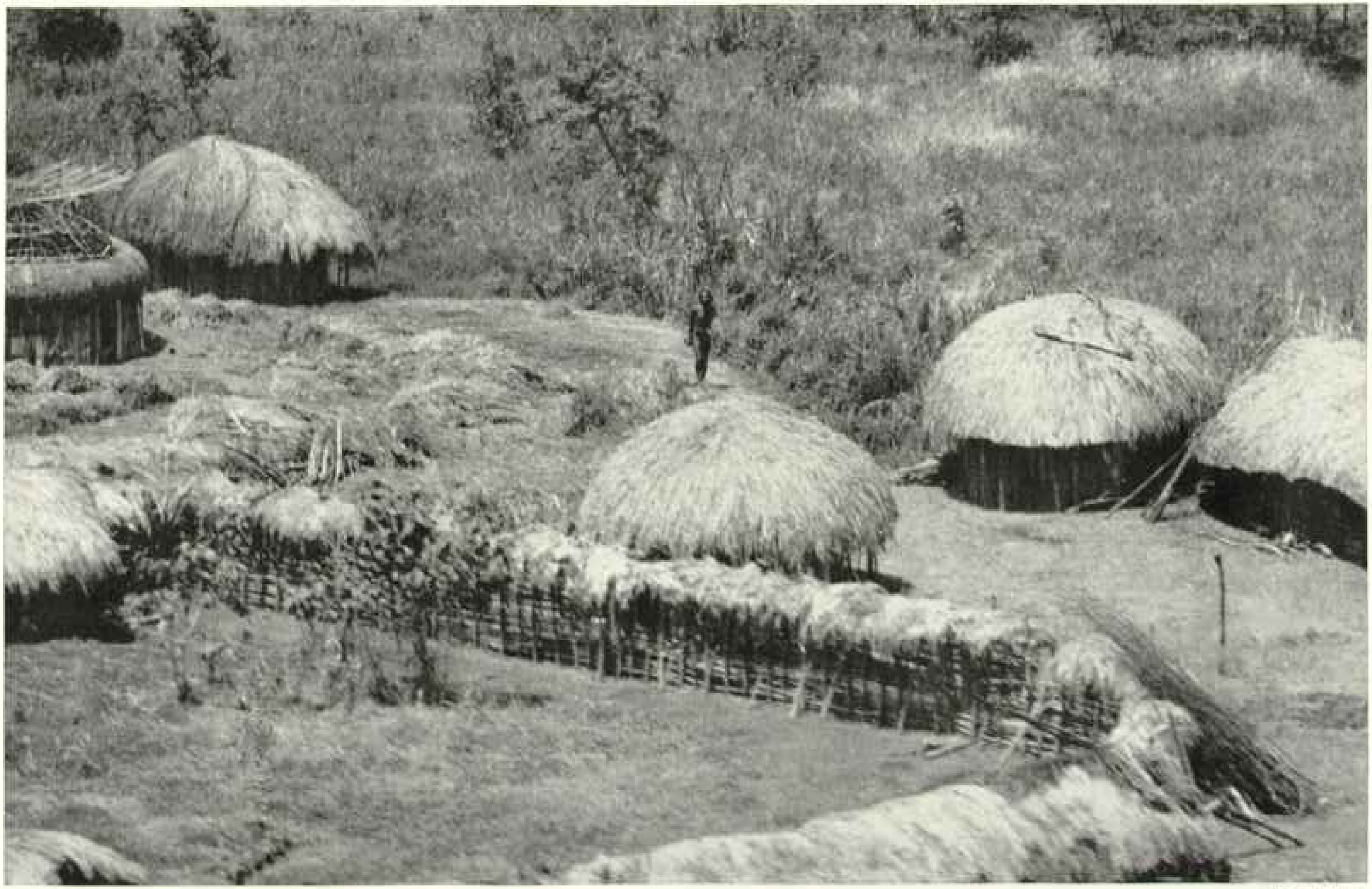
The head is skinned and dried, and the scalp is worn as an ornament by the owner of the head. The body is roasted and eaten by all the village.

The attack usually is carried out about dawn, the time at which the menfolk are believed to be weakest. Natives in this area

Archbold Expeditions

When Not in Motion, Men's Canoes on Sentani Lake Call for Skillful Paddling and Balancing to Stay Upright

Women and children use dugouts that are more cumbersome but safer than these trim craft. About 7,000 tribesmen live in thatched-roof huts built on piles in this lake near Hollandia. In pre-colonial days of constant tribal warfare, the lake dwellings were safe from attack by marauding landlubber bushmen.



Ray T. Elsmore

Real Estate Development in Grand Valley—a New Village Goes Up

Here the walls of the houses, as well as the fences, are hardwood stakes. A pile of poles for additional building rests against the fence. Round, basketlike grass roofs are thatched from bottom to top (left). Untilled grassland will be turned into gardens.

Major Simmons S. Smith

Many Iftamin Women Nurture Pet Pigs on Human Milk

Here the author saw more women with suckling pigs in their arms than with babies (page 689). The custom is common in many backward New Guinea tribes. Pigs are a valuable source of food.

cannot marry unless they can give two heads to the bride, as we give a ring.

In 1941, the missionary told me, one village collected 100 heads. Prior to that, they had not cut heads for four years and no marriages took place. After taking the 100 heads they all married. No heads, no marriages!

Marriage customs are singular. Each man must buy his wife. He approaches the father of the girl with a certain type of shell, or some dogs' teeth, to make the purchase.

Several families live in the same small hut. The menfolk sleep and eat on one side, the women and children on the other. If a man and wife desire privacy, they must go away into the bush.

Single men and women may not associate with each other, but when a man marries there is nothing to prevent him from having a number of wives. Then all must live together.

When a woman is about to bear an infant, in some tribes, she must care for herself. In others, another woman may assist her. A small hut is set aside for bringing children into the world. Children are not washed after birth. The natives do not like water and do not wash themselves. They are even afraid of rain.

The marriage ceremony is a gathering of the village around a fire. The brides, with both arms raised, are lined up facing the bridegrooms. Each bridegroom places one cut head on each arm of his bride. The strongest man of the village usually officiates at the ceremony. He is the man who has cut the most heads.

It is not permissible for father to marry daughter, son to marry mother, or brother to marry sister. Courtship before marriage is forbidden, but sometimes is done clandestinely.

Queer Tribal Customs

If a Tanahmerah woman has twins or triplets, all after the first-born are killed, since they are deemed children of the devil.

A man may have as many wives as he desires, but a wife can have only one husband.

A husband may separate from his wife, at will, but she cannot leave him except by mutual agreement.

A man who has not cut heads may marry a woman who has separated from her first husband, but he may not marry a single girl.

Astonished Tribesmen Cluster Around a Rescue Glider in Grand Valley

A paratrooper talks in sign language to the group at left. When the invaders from the sky departed, they left behind about a ton of GI equipment and supplies, although they removed all ammunition. They are still speculating on the use to which this treasure-trove will be put by the simple valley dwellers.

Netherlands Official

Three Survivors of Grand Valley Plane Crash Dine with Their Rescuers

Beneath a tent made from a parachute, the trio (at right) share a meal with Filipino Medical Corpsmen who dropped from the skies to help them. The three were aboard an Army transport plane when it struck high on the valley wall on May 13, 1943. Twenty-one of their comrades were killed (page 680).

Netherlands Official

WAC Cpl. Margaret Hastings Looks Aloft for a Way out of "Shangri-la"

Seven other WACs perished in Grand Valley's Army transport plane crash. The relief camp was built by Filipino paratroopers, who also constructed a glider landing and take-off strip on the valley floor. Planes dropped supplies to survivors and rescuers by parachute (page 680).

Other general tribal customs the missionary described as follows:

When a man who has cut heads dies, he is placed in a canoe which is raised 25 feet above-ground at a convenient spot near the village. The body is left there until it rots. The head may be taken away, provided another is put in its place.

Women are disposed of in similar fashion when they die, but children are placed in bamboo boxes and buried. Men who have not cut heads are also buried.

Wherever the husband goes, the wife follows. If the husband is employed as a carrier, the wife, too, acts as a carrier.

Tanahmerah tribesmen prefer sago and sweet potatoes and certain types of roots as food. They do not mind bully beef and biscuits.

In the event that one or two members of a village die suddenly, the entire population packs up and moves elsewhere to camp.

Tribal weapons are hard black wooden bows, bamboo arrows tipped with hardwood, and spears.

Grand Valley, Ifitamin, Tanahmerah—as long as I live these names will conjure up for me a host of memories. Now that I am back in the United States, the desire rises strong within me to go back to New Guinea, particularly to make my own trip of exploration into Grand Valley.

But should we take our civilization, with its advantages and vicissitudes, to the happy valley dwellers? Or should we leave them as they are, a people apart, to till their farms and terrace their lofty mountainsides, to live as they please and to die as they will?

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The Saguaro, Cactus Camel of Arizona

By Forrest Shreve

OUTSTANDING features of the Arizona desert are the mountains and the plants. Both come in all sizes, shapes, and colors, and together they give southern Arizona a landscape that seems to the traveler to be "out of this world." In all this strange land the strangest sight, and most characteristic, is the giant cactus (*Cereus giganteus*), known as the saguaro (or sahuaro).*

The principal characteristic of a desert is its little rain, but this desert is freakish in its rainfall. When it is dry, it is exceedingly dry. When a summer rainstorm breaks, the whole country is awash.

The plants of arid regions solve the problem of an irregular water supply either by sending their roots deep toward moisture or by developing large masses of tissue in which water accumulates during the wet periods and forms a reserve to be drawn upon in the long dry spells. In the cactus family, of which the saguaro is monarch, the habit of maintaining a reserve of water is most conspicuously developed.

Cacti Omit Leaves to Save Water

Cacti found in the Southwest are composed entirely of stem, the leaf having been dispensed with as an extravagance from the point of view of water economy. The stems have a green surface, which enables them to carry on the important leaf function of food making. In the saguaro, the bisnaga, and other tall cacti, these thickened stems develop into massive columns.

The endmost branches of the saguaro at their wettest are 90 percent water. After eight or nine months without rain, this percentage falls to a much lower figure. The problem for the cactus, as for the Arizona farmer, is how to equalize an irregular supply of water. By constructing dams such as the Roosevelt and the Coolidge, man spreads the water of wet years over intervening periods of drought (Plate VII). The saguaro and other giant cacti have a comparable technique.

Over a large part of southern Arizona there are two rainy seasons, a gentle, prolonged one in the late winter and a shorter, more violent one in midsummer. The part of the country visited by rain twice a year is more favorable for plants than the region of winter rain to the west and that of summer rain to the east. Dr. Ellsworth Huntington dubbed southern Arizona "the greenest of deserts."

The saguaro is found in varying abundance over almost all of Arizona where altitudes are below 4,000 feet. It constitutes a unique part of the landscape. It is infrequent or small along the Colorado River and on the nearly level plains of the lower Gila Valley. On higher ground, rocky slopes, and canyon walls it is common. In some of its best localities it forms veritable forests.

For a plant that rarely exceeds 40 feet in height, the saguaro is one of the heaviest and most massive members of the vegetable kingdom. Its erect trunk and gracefully curving branches may contain as much as six or seven tons of water, all accurately poised on a slender base.

Yet this ponderous bulk is elastic enough to sway in the wind and strong enough to defy all save the most violent storms.

A large portion of the tissue of the saguaro is much like an unripe watermelon, but there is a central skeleton of woody ribs, forming a cylinder that is remarkably stout at the base and tapers to slender, unconnected rods near the top. Strength is also added to the columns by the ridges and grooves which run from base to top.

The Saguaro Wears Accordion Pleats

Because of the intake of water in a rainy season and the gradual loss of much of it in dry periods, there are great variations in the diameter of the trunk.

When the stems are gorged with water, the spiny ridges are far apart, and the grooves between them are shallow. When the water content is low, the diameter of the whole stem is less, the ridges are closer together, and the grooves are narrow and deep. It is obvious that the accordion-pleated surface is essential to these adjustments of volume.

When the saguaro reaches a height somewhere between 6 and 20 feet, a small spherical bud breaks through one of the ridges and a branch begins to appear. It grows outward and then upward in a sweeping curve and finally takes a position almost parallel to the main trunk.

In favorable situations several branches may be formed, usually one at a time, and they are always so placed as to preserve the symmetry of the plant and to maintain a balance in its continually increasing weight.

When there is a long dry period, the

* See "Saguaro Forest," by H. L. Shantz, in the National Geographic Magazine, April, 1937.

branches droop slightly; when the water content is restored, they move upward again nearly to their former positions. Sometimes, however, branches droop even below the level of their base and bend to one side in a position from which they never recover (Plate IV).

In April or May small spherical flower buds appear on the tops of the trunk and large branches. In about a month these buds begin to open, crowning the cactus with large creamy-white flowers and giving the stocky plants a new touch of color and grace. The individual flowers are short-lived, and the flowering period is rarely more than two or three weeks.

The fruits, which mature a few weeks later, have somewhat the same form and structure as figs. Before falling, the fruit splits open and reveals the red jacket and pulp, in which are imbedded hundreds of black seeds. The pulp is rather sweet, and the seeds are thin-coated and full of nourishment.

Immediately, the enormous crop of fruit is set upon by birds, rodents, and coyotes, as well as by the Indians of the area. Almost every fruit that falls is soon divested of its pulp and seeds. Probably not more than one seed in 10,000 ever germinates.

The young seedlings of the saguaro are extremely small and poorly rooted, but they are succulent and soon show their nature by producing a small tuft of weak spines. Germination takes place only in the first week after the beginning of the summer rains, and the seedlings are hidden in the litter under bushes or among the small stones which cover the ground.

For several years the seedling is so small and inconspicuous that it may escape the eye of the most careful seeker. During this time it leads a precarious life, for it may be washed out by rain, discovered and eaten by some bird or insect, or stepped on by a wandering animal or nature student.

The early growth of the saguaro is at an uncertain rate. A plant one foot high may be 40 years old or only 18 or 20. The rate of growth increases slowly in larger plants and reaches an average of about four inches a year in mature plants.

No Sure Way to Tell a Saguaro's Age

There is no direct method for telling the age of the saguaro, for the woody skeleton shows no such clear-cut rings of annual growth as are found in trees. On the basis of the rate of growth at different heights, it may be estimated that the largest saguaros are about 175 years old. There are probably many large ones that are only 150 years old, and there may be a few veterans that are more than 200. The end comes usually as a result of wind and the accumulated weakness caused by injuries.

In spite of its bulk and tough skin, the saguaro is highly sensitive to infection. The loss of a limb, or even a slight injury to the surface, such as a knife thrust, may shorten the life of a fine plant. In dry weather many of the natural injuries are healed by the formation of a stout callus around the wound.

The nests made in the saguaro by woodpeckers are heavily lined with callus, which resists decay long after the fall of the giant in which it was formed (Plate VI).

The saguaro has a number of close relatives which are all similar to it in their modes of adjustment to desert life. Most of them, however, are so unlike it in appearance that they can easily be distinguished half a mile away.

Only one of the relatives, the slender, graceful organ-pipe cactus, is commonly found in Arizona. The others are scattered over Mexico, the West Indies, and South America.

Cacti of Many Kinds

In Arizona about 80 species of cacti are known. These include the barrel cacti, broad but rarely more than 5 feet high; the bushlike, or arborescent, cacti, from 2 to 15 feet high and richly branched; the prickly pears, with flat, round, or oval joints; and the many small forms. These last show wide variety in the length, arrangement, and color of their spines and have beautiful brilliant flowers.

The very spiny cholla is reproduced by its fallen joints far more often than by seed (Plate III). The cholla is often called the "jumping cactus." Its joints are easily detached and are difficult to remove from one's clothing or hands.

By no means all desert vegetation is of the cactus clan. The mosaic of shrubs and bushes in gray-green, blue-green, yellow-green, and olive-green, with touches of red and yellow, does much to make the vistas of the desert an unforgettable memory. The green trunk and limbs of the paloverde tree are hidden every spring by a wealth of yellow flowers.

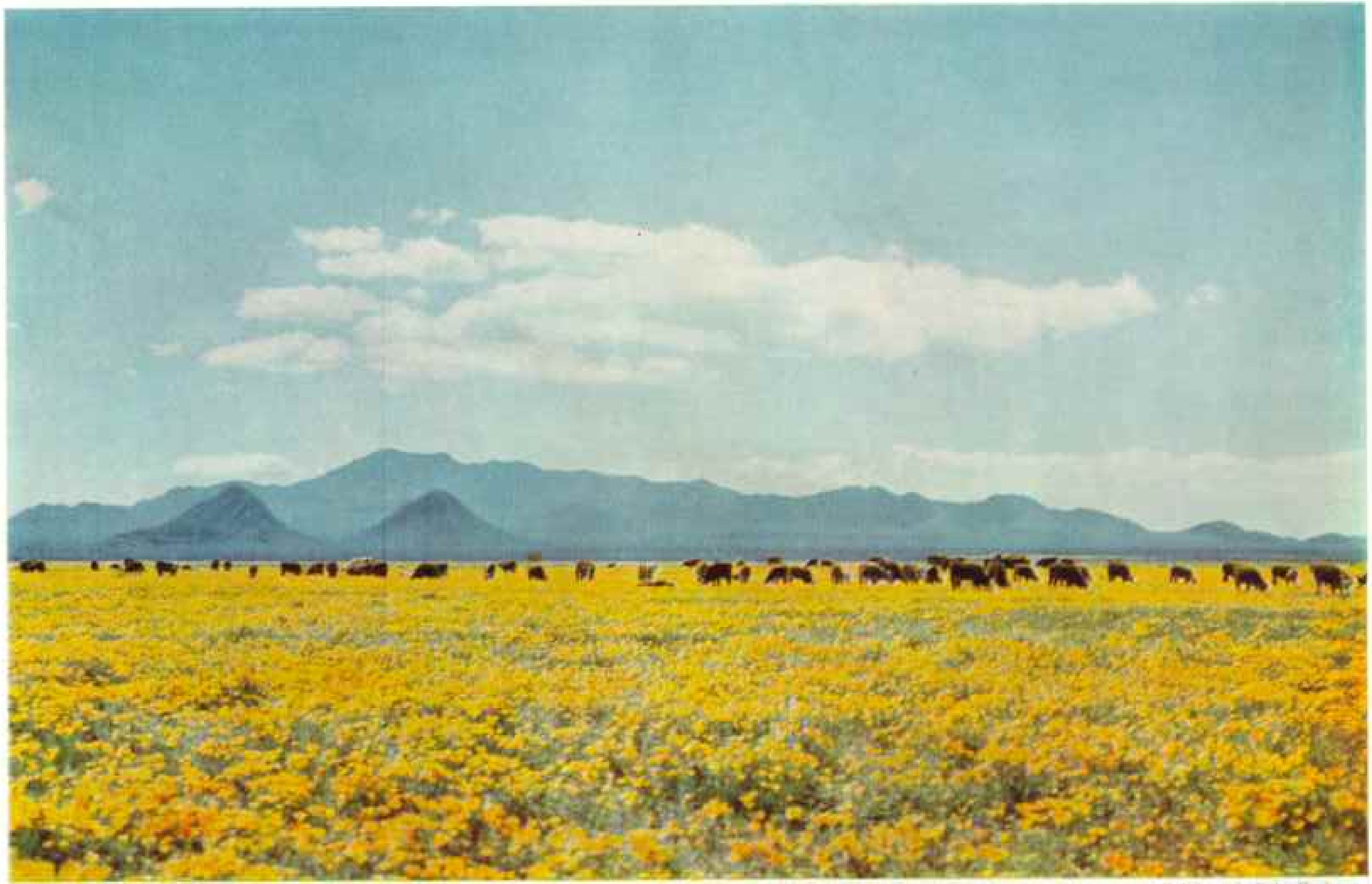
The ocotillo, looking like a cluster of loosely held wands, is spiny from base to top, but has seasonal crops of leaves. In the spring each wand is tipped with a flamboyant spike of scarlet flowers. The creosote bush, commonest of all the shrubs, is the most graceful of them all, with small shiny leaves, yellow flowers, and fuzzy balls of fruit.

Unless the rains of early spring and midsummer are unusually deficient, they bring forth a crop of short-lived herbs that carpets the desert with flower-spangled green.

 Kodachrome by Jack Breed

Living Monoliths, Monarchs of the Arizona Desert, Mark a Lonely Road Near Tucson

No Arizona press agent's brain storm, the saguaro cactus—trademark of the deep Southwest—lives a normal plant life in an abnormal form. It flowers, bears fruit, and produces seeds. A grotesque forest of these mammoth, misshapen plants is preserved in Saguaro National Monument, part of southern Arizona's colorful, bizarre desertland. Because the wood shows no rings, it is difficult to determine the exact age of a specimen, but some of the largest may have been growing 200 years.



Kodachrome by Esther Henderson

Fenced in by the Arid Tucson Mountains, Lazy Herefords Browse in Poppy-filled Meadowlands

This stocky, meaty breed replaced the original rangy longhorns. In the early days, open range prevailed, but this is a privately owned valley west of Tucson. Though less than one percent of Arizona is cultivated, 85 percent provides natural grazing land.

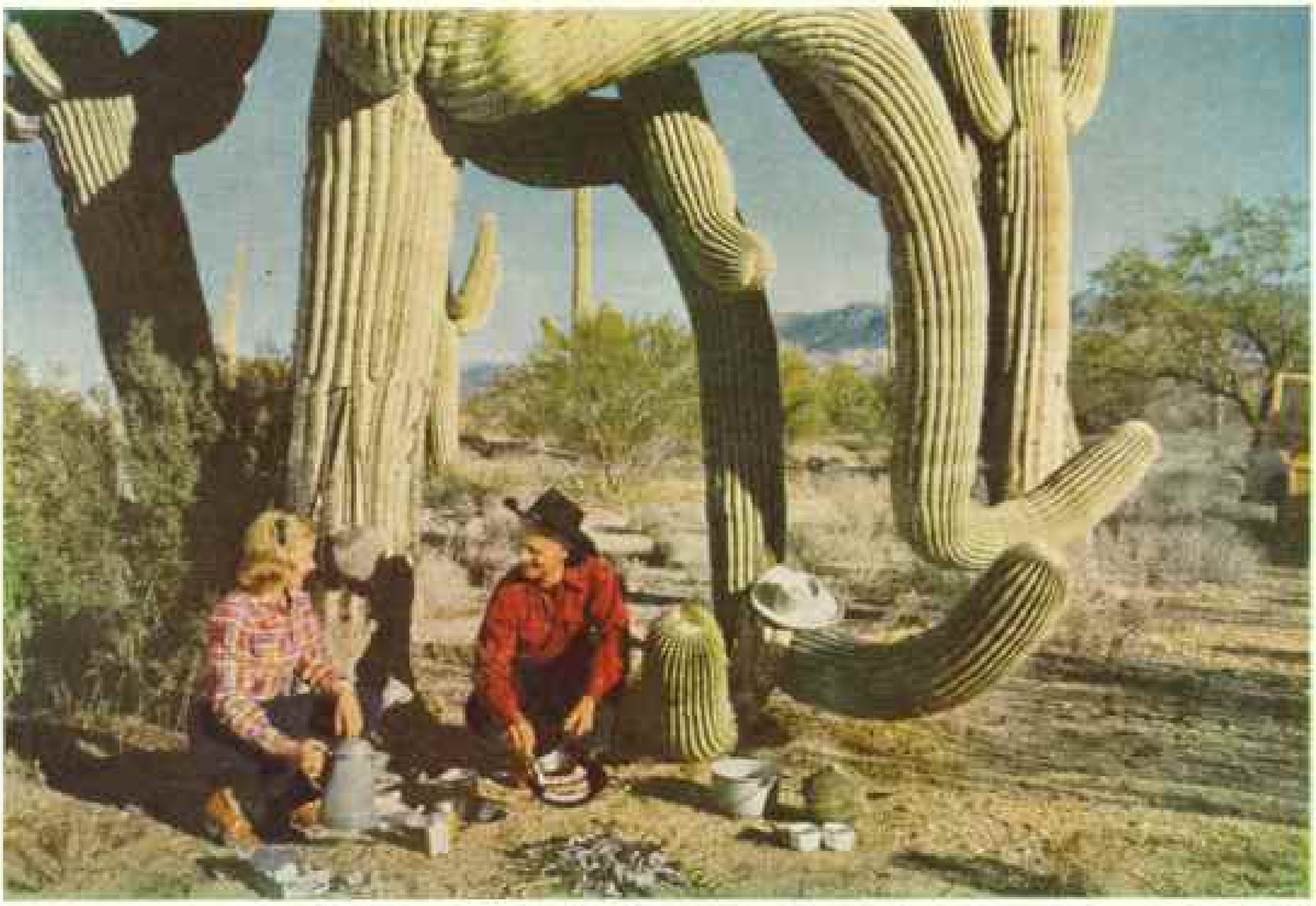
Kodachrome by Esther Henderson

Picacho Peak Witnessed the Only Civil War Battle in Arizona; More Explosive Was the Eruption Which Deformed It

In 1862, 12 Union men attacked 16 Confederates here with the loss of three killed and three captured. The inevitable saguaro dominates the vegetable world, as the extinct volcano overshadows the plain. Among the poppies appears the cholla, a cactus shrub with a frosty, underwater look.

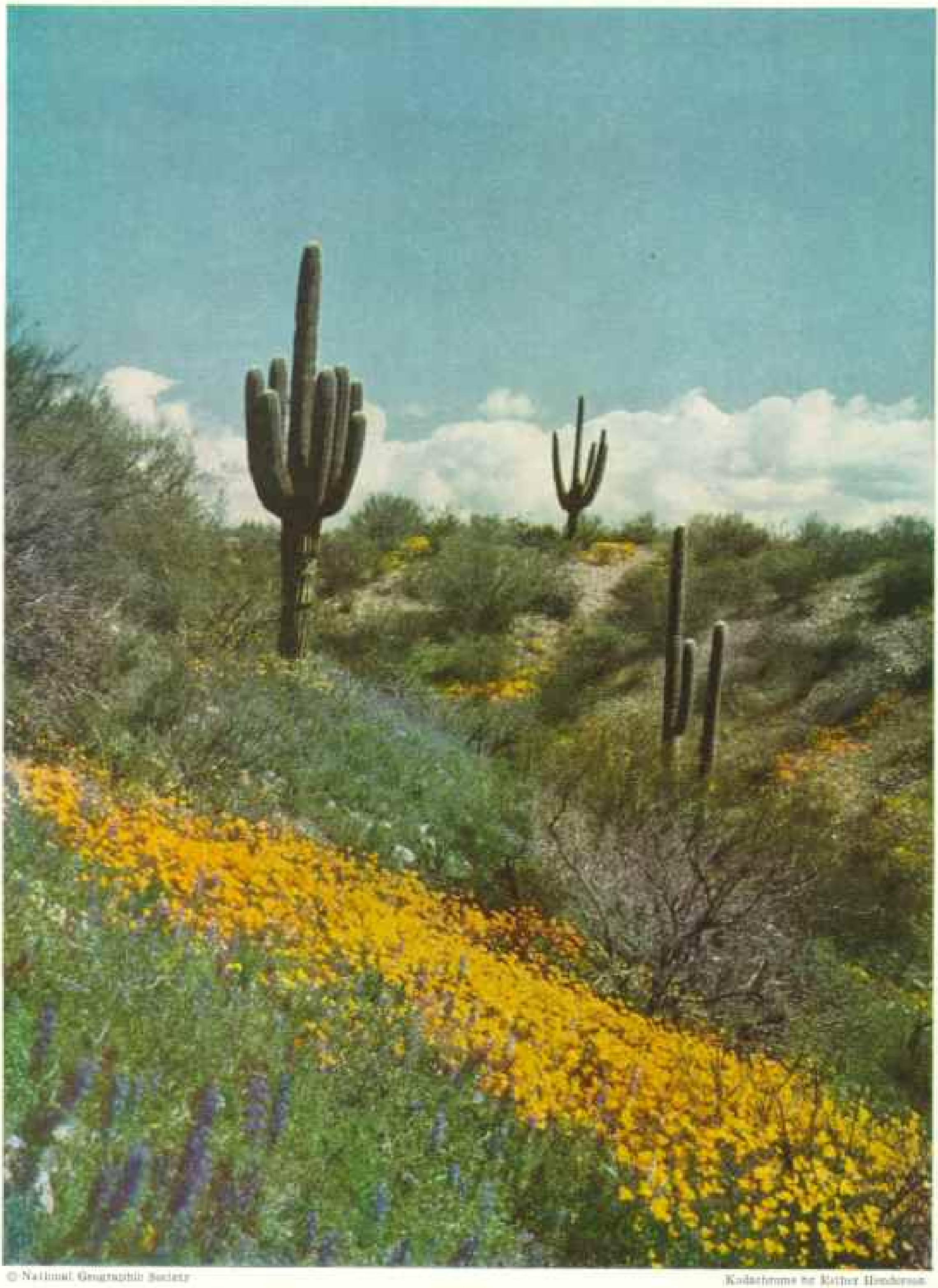
Wild Poppies Blow and Blue Skies Smile Where Pioneer Blood Once Spilled

When raiding Apaches presented a common enemy, early-day inhabitants of Mammoth (background) fought them; between raids they brawled among themselves.



Kodachromes by Luther Henderson

This Elephantlike Plant Heads the Circus Parade of Desert Freaks



Kodachrome by Esther Henderson

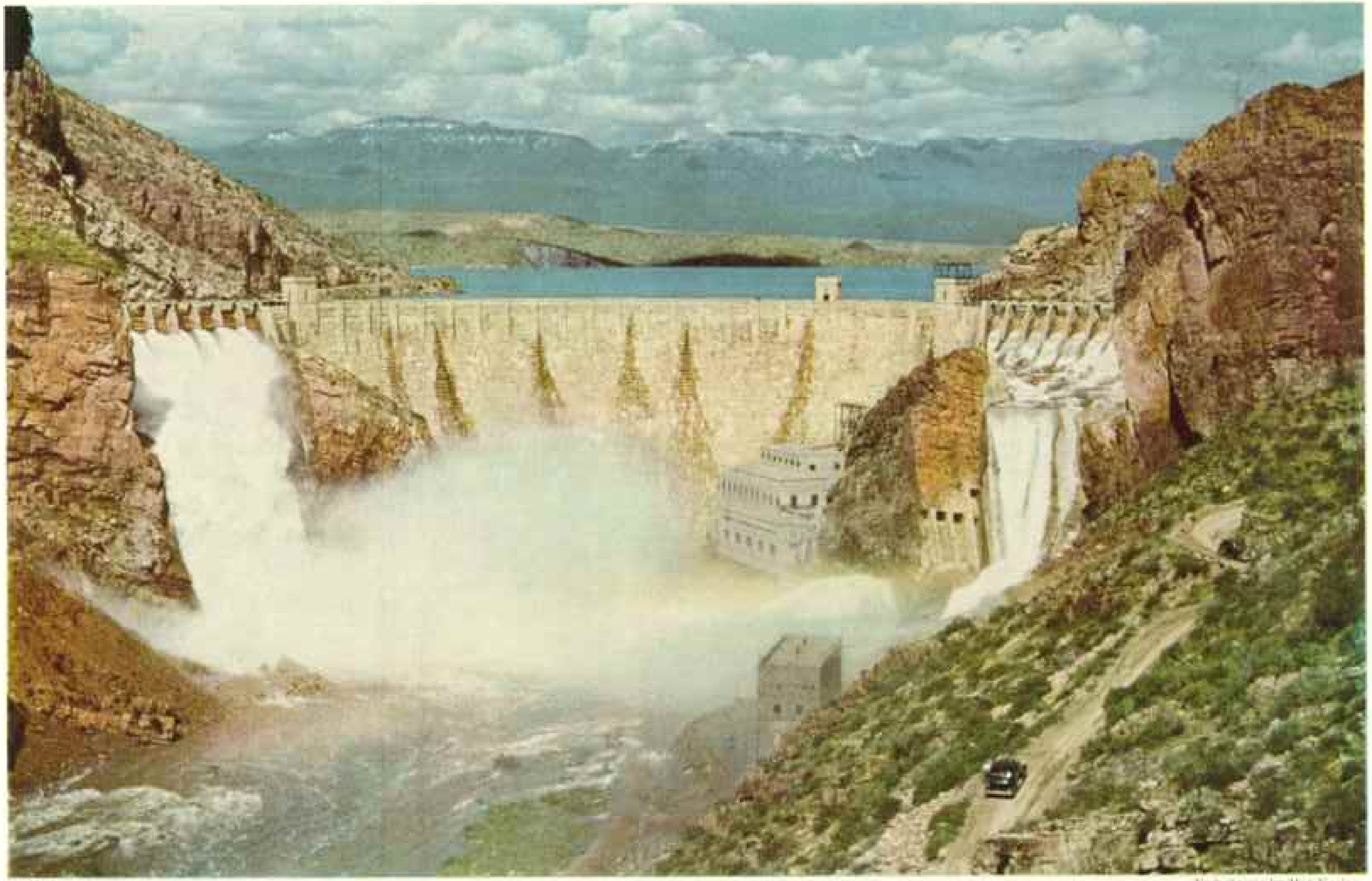
The Midas Touch of April Spangles the Drab Desert with Golden Flowers

Blue lupines and yellow poppies sparkle among the duller greens and browns. The columnar saguaro "sapling," at farthest right, has yet to grow arms; still, it may well be over the half-century mark. In one camel-like gulp, larger plants take in a ton of water during heavy rains, swelling like sponges.

Kodachrome by Jack Breed

Arizonans Say the Largest of These Saguaros Started Growing When Santa Anna Was Storming the Alamo

Probably three feet high in 1865, they put out their first branches about 1905. They are approximately half as large as the largest specimens ever measured. The hole in the cactus trunk at the right is the work of the Gila woodpecker. His water-cooled nest houses cactus wrens and elf owls when he moves out.



Kodachrome by Max Kepler

Mountain Water Stored Behind Roosevelt Dam Irrigates the Valley Around Phoenix and Gives Arizona's Capital Light and Power

Impounding the waters of Salt River and Tonto Creek, this barrier, named in 1911 for President Theodore Roosevelt, was part of the country's first large reclamation project. Phoenix, center of the rich area rescued from the desert, lies 75 highway miles away. Wild tobacco grows in this canyon.

Kodachrome by Max Kogby

The Versatile, Many-fingered Saguaro Provides Arizona with a State Flower

Each monstrous, fluted, spiny arm may produce 100 dainty chalices, blooming a few at a time over a period of nearly a month. Old, large cacti have as many as 30 arms. The fruit beneath the petals has a sweet, watermelonlike meat which the Papago Indians gather with long poles made of dead saguaro ribs.

Winning the War of Supply

By F. Barrows Colton

"NEVER before in history," said General Somervell to me, "has any nation fought so vast a war so far from home." That is the key to an amazing story that now can be fully told.

It is a tremendous epic of geography—this story of how the United States was able to send armies, fleets, and air squadrons to the farthermost places of the earth to fight, and keep them supplied with all the tools of war; across the seven seas, through countries devastated by fighting, and into strange lands where no American in uniform had ever set foot before.

While the war was still on, you seldom heard much about supply. The men who did the job worked quietly, unglamorously, often secretly.

But without the vast machinery of supply, all the courage and sacrifice of our gallant fighting men would have been in vain.

You remember Kipling's lines about the old British wars in India:

> When the cartridges ran out,
> You could hear the front-files shout,
> "Hi! Ammunition-mules an' Gunga Din!"

In this war, too, that shout went up, from fronts around the world, for ammunition, food, and countless other things.

To answer the call, or, better still, to anticipate it, our Army and Navy set up a network of supply routes that stretched around the whole globe, by land, sea, and air, over which we sent our fighters a constant flow of different supply items—1,000,000 for the Army, 700,000 for the Navy—on a scale never even conceived before.

Supply Line 7,500 Miles Long

Once, in the unexplored mountains of Luzon, an American combat team encircling a Japanese outpost got so far from its base that Filipino bearers had to hike a week and a half over rough jungle trails, carrying ammunition, rations, and even safe drinking water on their backs to the troops.

Those sweating bearers formed the last link in an unbroken chain of supply stretching back across 7,500 miles to a fast freight roaring through the night across the Rocky Mountains, hurrying to catch a convoy loading in San Francisco Bay.

Links in the chain between were hundreds of cargo ships, shuttling between mainland ports and forward bases; lonely island steppingstones where bored and homesick service troops labored 12 hours a day, seven days a week, to unload incoming ships and load outgoing ones; colossal supply dumps where you could walk for miles among huge piles of boxes, bales, and packing cases, and long rows of cannon, trucks, and tanks, with everything arranged almost as neatly and as easy to find as in a department store.

Picture the ways this vast chain kept moving night and day. Boxes of machine-gun ammunition would roll off the assembly line of an arsenal, into a boxcar, and join a train that sped across Midwest prairies and through mountain gorges while tracks were cleared ahead and crack passenger trains waited on sidings for it to pass.

For a solid month they would ride across the Pacific in the packed hold of a Liberty ship, go ashore in a wallowing "duck" through the surf off a tropical island, and be stacked in the jungle under camouflaging palm fronds. At last, a sweating ammunition carrier would lug them stealthily through the night, past Jap snipers to the waiting guns. Then, perhaps just in time, the slugs would spit death at a *banzai* charge.

It will help you visualize the tremendous job of supply if you remember that the average troop or cargo ship could make only from 5 to 10 round trips a year across the Atlantic to our bases in Britain. And on the far wider Pacific a ship could make even fewer round trips a year; so it took many more ships to supply the same number of men in the Japanese war than in Europe. A supply ship for the China-Burma-India Theater could make only two round trips a year.

Hawaii, 2,400 miles from San Francisco, still was farther away from the shooting in the Pacific war than New York or Washington ever were from the battles on the Western Front.

Supply for the U. S. Army was ably handled by the Army Service Forces, under direction of Gen. Brehon B. Somervell. Navy supply, equally efficient but less centralized, was divided among several different bureaus.

Pipelines Would Span Atlantic Four Times

To keep supplies moving for our faraway campaigns, American soldiers built and ran railroads on five continents and laid pipelines totaling 11,000 miles in length. Army Engineers and Navy Seabees literally "changed the face of Nature" on Pacific islands, built complete, new, modern seaports where only wilderness had existed before (page 729).

Army

Eager to See the Statue of Liberty, Troops Crowd *Queen Mary's* Every Porthole

Soldiers of the home-coming 35th Division even tear holes in their own "Hello America" banner, the better to see New York Harbor. This liner and others helped carry 7,300,000 American fighting men overseas in less than four years between Pearl Harbor and Japan's surrender. Now they are returning them home even faster (page 708).

We used elephants to break jungle trails to get gravel for airports; diverted part of a flooded river to keep it from washing out a vital bridge; repaired a railroad tunnel 11½ miles long in Italy's Apennines.

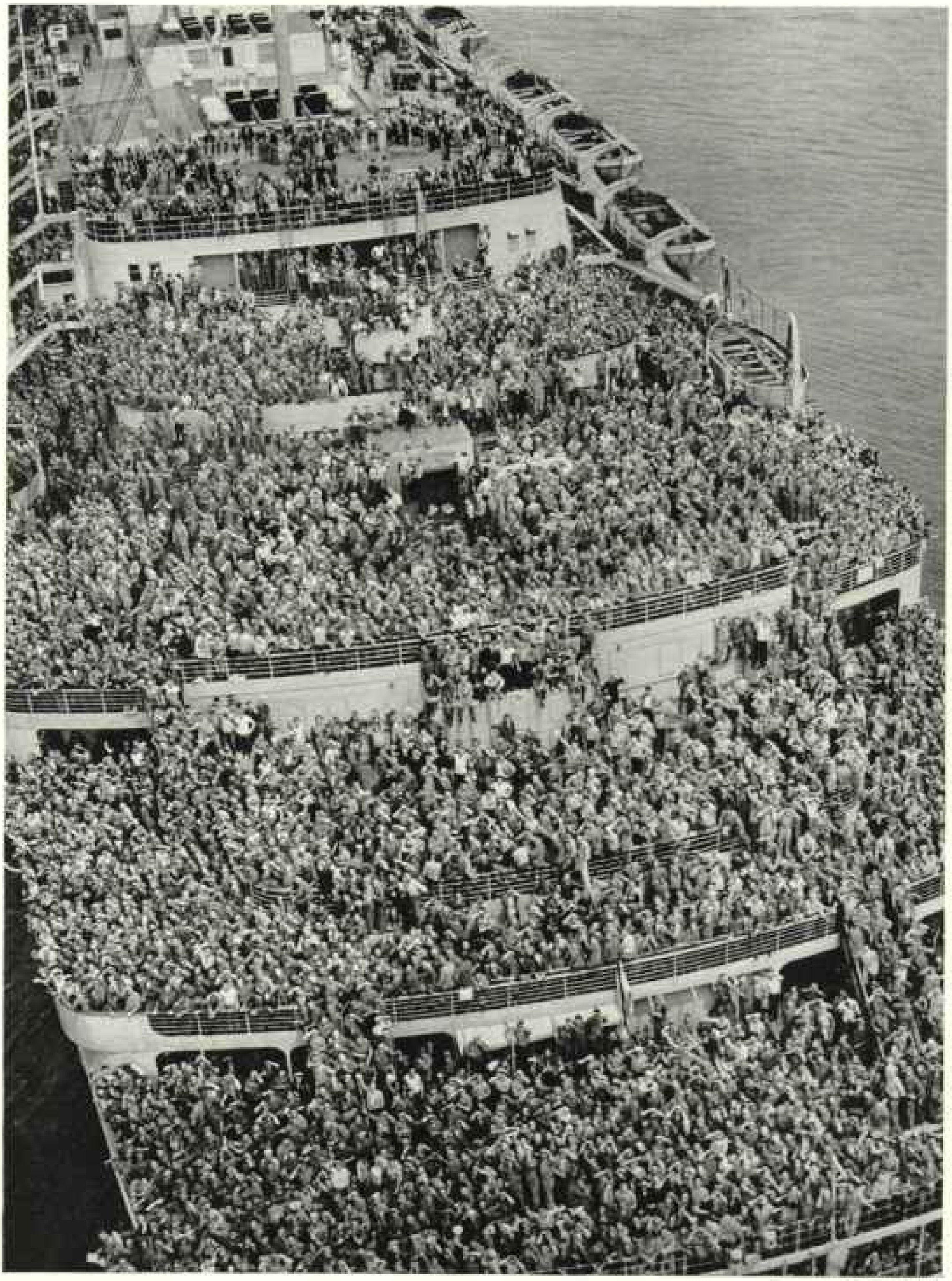
Supply was a lot more than so many thousand cans of hash, so many million pairs of pants, so many billion rounds of cartridges.*

Supply meant racing truckloads of highly inflammable gasoline through the streets of burning towns; figuring out a railroad route to ship huge, unwieldy battleship parts that were too large to go through the superstructure of bridges (page 719); marking boxes with different colors so that natives who couldn't read English could stack them in the right piles; keeping mules from getting seasick; estimating a year ahead how many bridges would be destroyed in the Battle of France, so that the Army could have portable ones on hand to replace them.

Supply meant guiding truck convoys over English roads from which all direction signs had been removed in case of invasion; running a train down a strange track at night without headlights when you didn't know whether or not the next bridge was bombed out; using square telephone poles instead of round ones so that more could be packed into a ship's hold; building ice plants in India to store frozen meat for the forces in Burma and China; rounding up enough barbers to give haircuts to soldiers just back from Europe so that they would look neat for their furloughs home.

Supply included a lot of things you might not think of—100 miles of culvert pipe for drainage of the Stilwell Road; water filters to protect our troops from the vicious Philippine

* See "QM, the Fighting Storekeeper," by Frederick Simpich, in the NATIONAL GEOGRAPHIC MAGAZINE, November, 1942.



U. S. Coast Guard Official

15,000 Cheering Yanks, a Full Army Division, Come Home on the *Queen Elizabeth*

This is the approximate number of troops she and her sister ship, the *Queen Mary*, carried on each trip to and from Europe. At that rate they could transport a good-sized army across the Atlantic in half a dozen voyages. They are so fast they traveled without convoy escort. No enemy submarine could catch them.

blood fluke; 800,000 different kinds of spare parts for rifles, cannon, trucks, tanks, radios, and jeeps. Just one Army supply company in Italy issued more than one million spare parts in two years.

"Coke" Bottling Plants and Shoe Polish

To far-off war fronts we sent Coca-Cola bottling plants, mule feed bags, sawdust, soup bowls, handcuffs, embalming needles, shoe polish, light bulbs, safes, meat grinders.

Once we flew some beetles from Fiji to Honduras to attack a root weevil that was damaging the hemp crop and threatening our rope supply.

We studied the geology of remote islands to determine in advance where to drill wells for safe drinking water and where to find gravel for constructing airstrips.

We developed fast tankers and repair and supply ships to follow our battle fleets to refuel and supply them at sea (page 711). Hence our Navy could range the oceans for months without returning to base, something never done before since the days of sail.

In the winter of 1944–45 we sent to Britain all the strip-mining machinery available in the United States, to help dig coal from British deposits that lay just beneath the surface. It tided the British over the winter when they were short of miners.

Germany's great offensive, the Battle of the Bulge, was actually aimed at our huge supply depot near Liége, Belgium. The Germans well knew that to halt our invasion they must first destroy our supplies.

You can sense the importance of supply if you know that there are 130 different types of service troops in the United States Army, whose job is to back up the fighting men. Among them are such outfits as a Chemical Laboratory Company, Dump Truck Company, Forestry Battalion, Oil Field Battalion, Veterinary General Hospital, Tire Repair Company, Laundry Company, Refrigeration Company, and Fumigation and Bath Company.

Supply is the "world's greatest headache," said General Somervell.

Floods on the Seine, for instance, raised the river so high that barges loaded with vital war materials could not pass under the bridges; something in Iwo Jima's volcanic ash unexpectedly ate holes in the shoes of soldiers there; tropical downpours and wettings in the surf sometimes smeared the stencil markings and washed the labels off boxes and cans so that nobody could tell what was in them. As a result, some Marines on Guadalcanal had nothing but canned corn for "chow" for several days.

In India, cargo had to be transferred from broad-gauge railroads to narrow gauge, then to canal barges, then back to narrow-gauge railroads again. On Leyte 60 percent of the road-building material sank out of sight in the wet soil.

Certain biologicals, such as typhus vaccine, had to be refrigerated all the way from the factory to field hospitals, but could not be allowed to get too cold, lest expansion of the liquid break the glass containers.

After several futile efforts to get a bridge-building cable across the Rhine under heavy German fire, a red-eyed, weary Engineer officer said to his commander: "Sir, it's impossible to get a line across this river, but we'll do it somehow." You could say that about the whole job of supplying a global war. It seemed "impossible," but it got done.

Moving Mountains of Supplies

We moved not only mountains of supplies but unprecedented hordes of men to use them. The movement of American troops from Europe to the Pacific was scheduled to be "the greatest migration of human beings by sea in history." In the 30 years between 1910 and 1940 a flood of seven million immigrants poured into the United States from across the Atlantic.

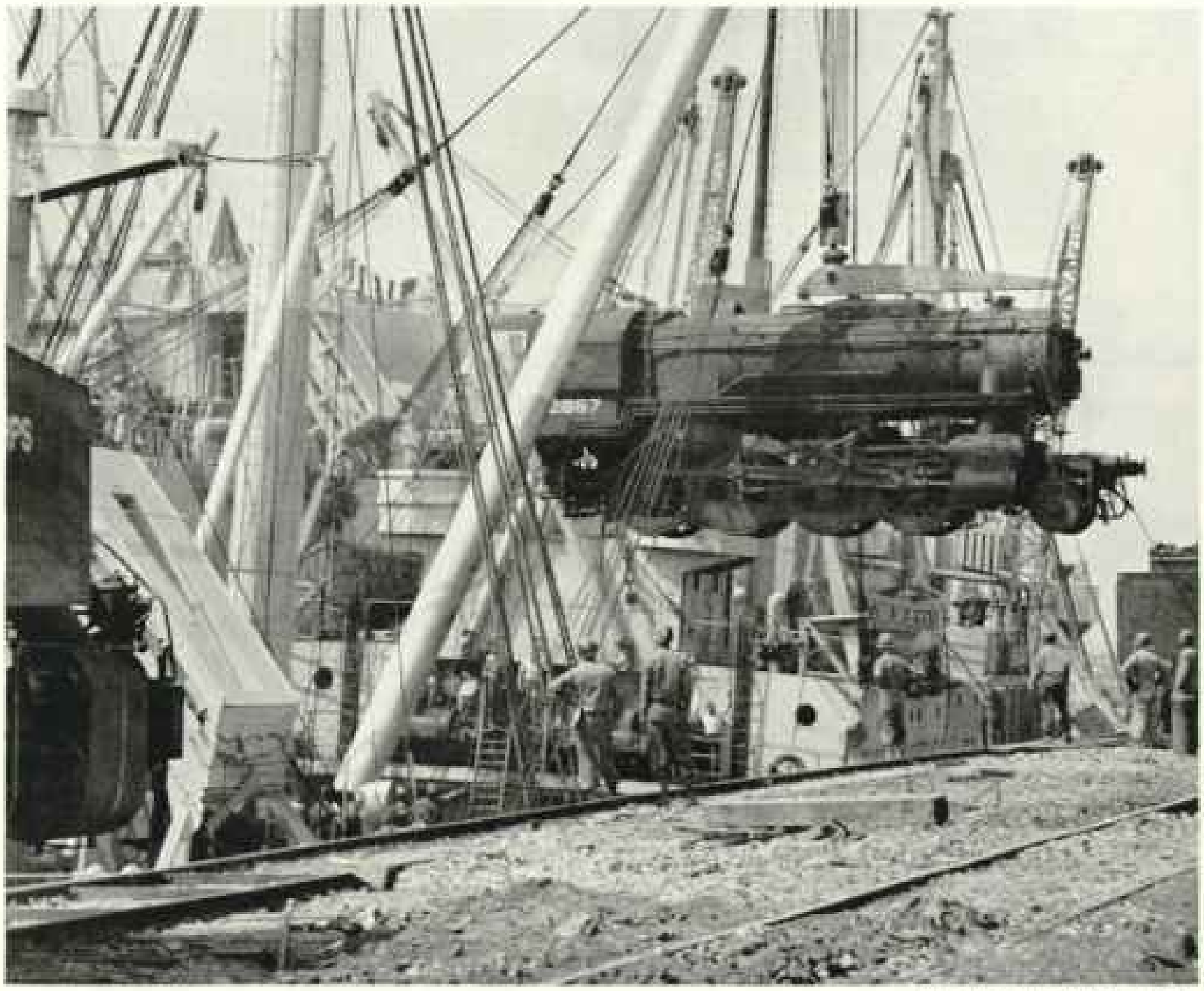
Yet in less than four years, between Pearl Harbor and V-J Day, we moved even more Americans in uniform overseas. Now we are moving them back again even faster. That is comparable to moving the entire population of Illinois, California, or Ohio, or of Sweden or Greece.

When we massed our forces in the British Isles to invade Europe, a ready-made base was there for us, with harbors, docks, cranes, stevedores, railroads, highways, warehouses, electric power, water supplies, and all the conveniences of civilization.

But to build a base in the Philippines, we had to take all these things with us, 7,000 miles across the Pacific (page 729). When we captured Manila, there were 500 sunken ships in the harbor; only one pier was worth repairing; the only electric power source was a small generator in a brewery.

So vast was our task in the Philippines that we sent some specialist service troops out there from Britain after the invasion of Normandy, to begin building bases all over again on the other side of the world, just as they had already done in Naples, Antwerp, and Cherbourg.

Before General MacArthur captured Manila, he received reports that the Japanese planned to destroy the city's water system.



U. S. Army Signal Corps, Official

American-made Locomotive Comes Ashore in France to Haul Army Supply Trains

Specially built for use on foreign railroads, 2,000 engines were shipped to England, France, Belgium, India, Burma, North Africa, Italy, and Iran for use by American troops in moving supplies. Some locomotives sent to France in 1918 were found and used again by our Army in this war (page 714).

That meant the threat of a disastrous epidemic of typhoid fever, dysentery, and other water-borne diseases for both his army and Manila's civilians. A rush call went back to America for all the water-purification equipment that could be scraped together.

All over the United States, Army officers searched out what MacArthur wanted, packed it in freight cars, and routed them to central points. Starting in the Midwest, a fast freight train rushed across the continent, picking up the loaded cars along the way. In San Francisco a special ship was waiting. All traffic was sidetracked to let that freight go through.

One day at Army Headquarters in the Pentagon I saw a file marked "Railroads of Japan," a map entitled "*Eisenbahnen im Deutschen Reich*," and National Geographic Society maps being used to show railroads of the whole world. In that same room, in other files, are detailed data on all the world's railroads.

"We know more about some foreign railroads than we do about our own," said an Army expert. "That's because the American railroads operate themselves, while overseas the Army had to run railroads in occupied nations.

"In India, for example, in the wet monsoon season, rails get so slippery that trains can't haul such heavy loads as in the dry season. On European trains the drawbars in the car couplings can stand less strain than ours. That limits the weight of trains. We had to know the pulling capacity of locomotives, steepness of the grades, capacity of bridges."

British Railroad Men Outwit Nazi Flyers

Railroad stories of this war are legion.

When the British had their backs against the wall at El 'Alamein, German planes were strafing the locomotives of the British supply trains, causing a lot of trouble.

Then the British received a shipment of American Diesel electric locomotives, sent all

U. S. Coast Guard, Official

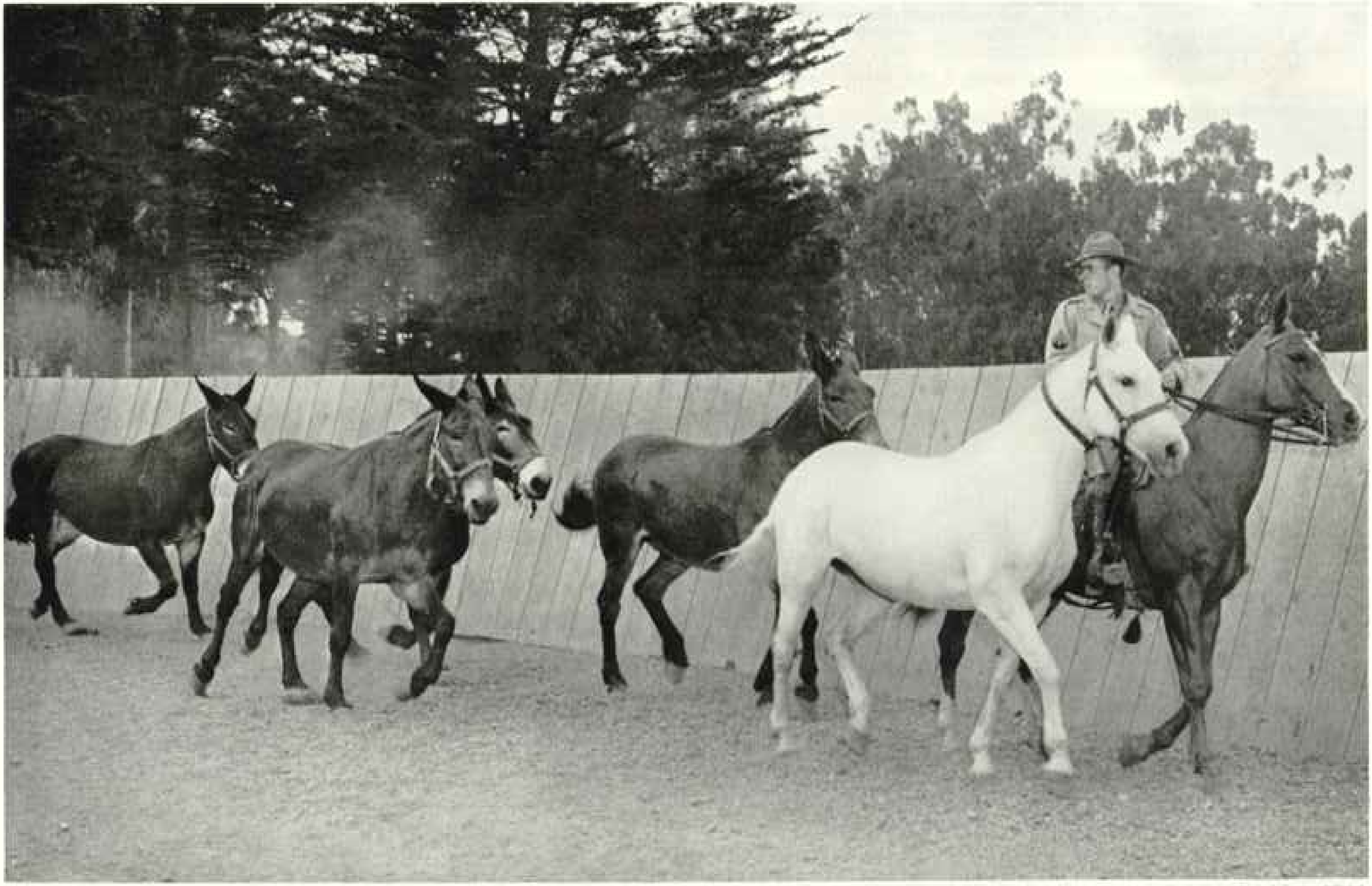
When the U. S. Army Landed in France, It Brought Its Own Trains, Specially Built for European Railroads

Small freight cars of the type used in Europe roll ashore down a tracked ramp from the beached LST 21 which ferried them across the English Channel.

U. S. Navy, Official

Waves Break High on Navy Oiler *Tallulaah* as She Pumps Fuel to Carrier *Essex* and a Destroyer in the Open Pacific

This method of refueling enabled Navy vessels to stay at sea for months at a time without returning to base, vastly extending their range of operations. The *Essex*, partly visible at left, is receiving fuel oil and gasoline through two hoses looped between her and the *Tallulaah*. The destroyer is preparing to take fuel from the other side. Fuel can be transferred even in a full gale. A million gallons of oil may be delivered in five or six hours while the ships steam about 100 feet apart.



U. S. Army Signal Corps, Official

Army Mules Can't Resist the Charms of a White Mare; So "Belle" Lures Them Aboard Ship at San Francisco

With a bell tinkling on her neck, she leads a shipment of the animals from a siding to the docks. Without the decoy they would balk at boarding a vessel. Thousands of mules were shipped overseas to Italy, Burma, and other theaters of war for use where motor vehicles could not operate (page 720).

Mounted on Elephants, Army Engineers Surveying the Stilwell Road Meet a Bulldozer Working in the Burma Jungle

Even elephants are dwarfed by such giant machines, used extensively for the first time in war by the U. S. Army (page 717).

U. S. Army Signal Corps, Official

"Ducks," the Army's Seagoing Trucks, Load Supplies at a Ship's Side and Take Them Direct to Dumps Ashore

Ships were unloaded in this way off Anzio and Normandy beaches and in many other parts of the world where no docks were available (page 734).

the way around the Cape of Good Hope, and somebody had a bright idea. The Diesels looked more like cars than locomotives, with no smokestacks or other distinguishing features. The British put them in the middle of their trains, pulling one half, pushing the other. When the German fighters swooped down to attack, flying too fast to notice the change, they shot the front boxcars full of holes, but the trains kept right on rolling!

On the French railroads in North Africa operated by the U. S. Army, heavily loaded trains had to slow down almost to a "walk" on some of the steeper grades. Natives would hop on to steal supplies. MP guards were put on, with orders to shoot only as a last resort; so there were wild chases across the tops of the lurching trains like those of the old silent movie thrillers, as the MP's sought to capture the thieves.

Those North African trains also had no air brakes. Instead, an Arab rode on every eighth or tenth car to operate a brake wheel by hand. When the engineer wanted to apply the brakes, he tooted his whistle and hoped the sleepy brakemen would pay attention. Sometimes they didn't. The African locomotives had no headlights, either; so 400 headlights were manufactured in this country and shipped over.

Knowing that in war areas railroads would be destroyed or badly damaged in the fighting, we built in the United States and sent overseas for ourselves and through Lend-Lease * 5,745 locomotives and 103,695 freight cars designed to operate on foreign tracks. That's equal to all the rolling stock of a good-sized American railroad.

Locomotives were sent into Burma by air. We built engines for the Russians, too, on Lend-Lease.† Since the Russian gauge is wider than ours, we shipped the locomotives on flatcars to the west coast, where they were loaded on ships.

In England, when even the highly efficient British railroads were choked by the added traffic of the huge American invasion force, our Army Engineers built miles upon miles of new sidetrack to help ship bombs for our planes attacking Germany.

World War I Locomotives Serve Again

When railroad troops of the Army Transportation Corps landed in France, they found some American locomotives there ahead of them. Shipped to France by the Army in the last war, these engines had been operated by the French until 1940, then used by the Germans, and finally, after a lapse of 27 years, they hauled United States Army trains again. Looking for rails to repair bombed tracks, our troops found stacks of American rails, also sent over in 1918 and still good as new!

When the Allied invasion got rolling in France, whole trains of freight cars were loaded with supplies in England, shunted on to LSTs fitted with tracks in their tank decks and holds, and ferried across the Channel.

Army Transportation Corpsmen had invented a hinged section of track that would rise and fall with the tide. The LSTs were run right up to the shore, and the supply trains rolled off over the hinged track and away to the front. Locomotives came on other craft already supplied with water and coal.

Engines Watered from Shellholes

So urgent were the supply demands of our fast-moving armies that trains were sent out with orders just to keep going toward the front until they had to stop, since nobody knew the condition of the tracks ahead. Running on rails laid hastily over filled-in bomb craters, soldier train crews could feel the tracks sag under them as the cars passed over.

Where water tanks were destroyed by retreating Germans, they carried water for the locomotive boilers from shell craters or ponds, sometimes having to break the ice first. Once they borrowed a French village fire engine to pump water from a near-by stream.

On badly bombed double-track lines, GI "gandy dancers" (railroad slang for track workers) salvaged enough rail to make one good single track. They built "shoofflies" (detours) around bomb craters too big to fill quickly. When they found boxcars too severely damaged to repair, they cut the sides off and made flatcars of them. To fix a tunnel too badly blocked to dig out, they ran in a carload of dynamite, blew the roof off, and thus made the tunnel into an open cut.

Anything to keep supplies moving!

Officers and noncoms of the Army's Railway Battalions were recruited from experienced personnel of various American railroads, but most of the rank and file were ex-clerks, salesmen, teachers, or what not, who learned railroading after they entered the Army.

Some ran trains for days and nights on end without rest to keep the supplies rolling. Some exchanged shots with German snipers from their speeding trains, like the old days in the West when Indians attacked the "iron horse" puffing across the prairies.

* See "Lend-Lease Is a Two-way Benefit," by Francis A. Flood, NATIONAL GEOGRAPHIC MAGAZINE, June, 1943.

† See "Lend-Lease and the Russian Victory," by Harvey Klemmer, NATIONAL GEOGRAPHIC MAGAZINE, October, 1945.

U. S. Navy, Official

Two Damaged Ships Are Lifted out of the Water in a Navy Floating Drydock

These ABSDs, or Advanced Base Sectional Docks, can hold the largest battleships. Steel sections are towed out to forward areas and welded together to form one large dock, located in sheltered waters of an advanced base. Walls contain machine shops, foundries, and air-conditioned living quarters for crews. Ships not too badly damaged can be fully repaired in these docks and returned to active duty without making the long voyage to the United States. Water is let in to sink the dock, the damaged ship is moved into place, and the water is then pumped out, lifting both dock and ship. In this dock are a cargo vessel and an LST. Barges contain additional repair facilities.

U. S. Army Signal Corps, Official

Effigy of Hitler with Noose Around His Neck Decorates Bridge Across the Rhine

Engineers of the American Third Army built this structure and named it after their commander. Sign indicates the bridge is two-way for vehicles up to 40 tons and one-way for 70-ton loads. Though the Germans destroyed the Rhine bridges, Allied engineers replaced them with light floating bridges in a few hours and with steel bridges capable of carrying loaded freight trains within a week to 10 days (page 727).

When MacArthur's little army retreated before the Japanese invasion of the Philippines in 1941, they wrecked the Manila-Lingayen Gulf railroad so effectively that the Japs never got it running well again in the four years of their occupation. But when the Americans came back they repaired it fully in two months!

Yankee Methods Leave Their Imprint in the Far East

Pushing supplies through in all parts of the world, Americans left their imprint everywhere.

Railroads of India never had had a "tracer" system for finding lost shipments. United States Army units operating there installed one.

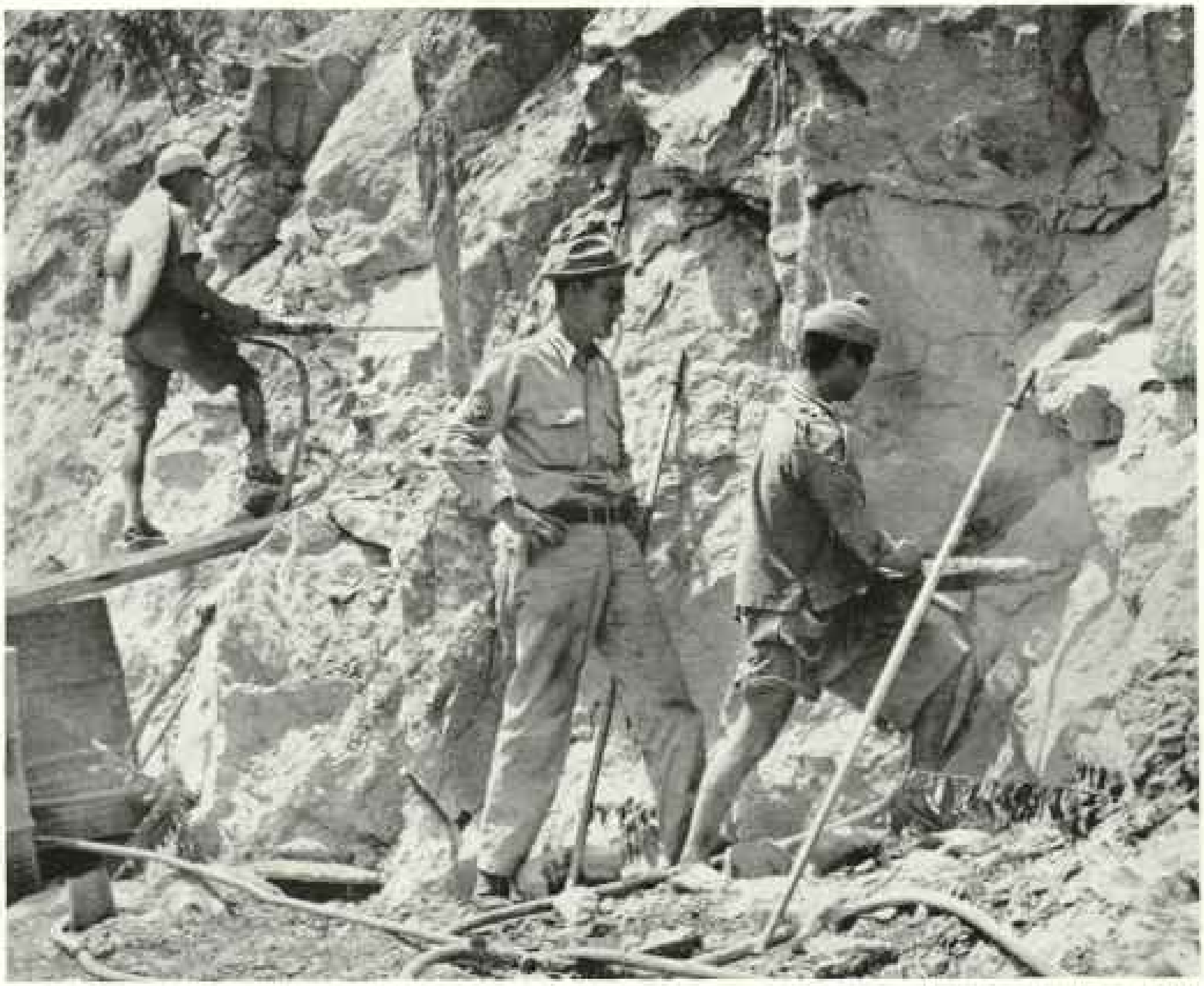
Only rail link between India and the Burma front was the old partly narrow-gauge Bengal and Assam Railway, which before the war carried chiefly tea and jute. American railroaders moving supplies to the British armies fighting in Burma improved the efficiency of the line so much that some American operating methods will be retained after the war.

To get enough lumber for the buildings they needed in China, Army Engineers revolutionized the Chinese lumber industry. Chinese lumber used to be cut with handsaws. Boards and timbers were never longer than could be carried conveniently on a two-wheeled, pony-drawn cart. But the Engineers brought in portable sawmills and trucks, even built roads for the trucks.

The ancient Chinese method of making sun-baked roofing tiles was too slow to meet the Army's needs; so the Engineers started China's first roofing-paper industry, using tung oil and local paper.

Until the Ledo section of Stilwell Road *

* See, in the National Geographic Magazine, "Stilwell Road—Land Route to China," by Nelson Grant Tayman, June, 1945.



U. S. Army Signal Corps, Official

Modern Air Drills Give a Mighty Lift to Chinese Muscle Power

Natives constructing the Stilwell Road learn to use up-to-date equipment for cutting rock, under the supervision of an American sergeant. Some Chinese had to be specially fed to give them strength and weight enough to operate heavy road-building machines.

was built, China and India had been separated since earliest times by a strip of wilderness so remote and impenetrable that even bandits were said to have got through only with difficulty. On the Stilwell Road in 1945, the United States Army operated one of the world's largest filling stations.

On the Burma section, some Chinese highway engineers came in to learn to operate American jackhammers, or pneumatic drills, the jumpy, ear-splitting gadgets you've seen being used to dig up city pavements.

The Chinese were too light in weight and undermuscled from years of malnutrition to operate the heavy, vibrating tools. That didn't bother the American Engineer officer in charge. He had been a football coach at the University of Tennessee; so he set up a regular "training table" and fed his "squad" of Chinese until they gained enough weight and strength to "make the team." Some of the men gained as much as 20 pounds.

In Europe, Asia, and many far corners of the earth, familiar American road signs sprang up, such as "Soft Shoulders," "Keep to Right," "One Way," and "Speed Limit 25 Miles per Hour."

We widened streets and installed traffic circles. But in Britain tough GI truckers had to learn to keep to the left!

"Americans Don't Fight in Jungle"

On one Pacific island a captured Japanese officer was being quizzed on how he rated troops of various Allied nations as jungle fighters. When asked about the Americans, he said: "Americans don't fight in jungle. They knock it down first!"

That wasn't so much exaggerated. On Bougainville,* where Jap troops after a year

*See, in the National Geographic Magazine, "Jungle War: Bougainville and New Caledonia," 17 illustrations in color from paintings by Lt. William F. Draper, April, 1944, and "Fiji Patrol on Bougainville," by David D. Duncan, January, 1945.

U. S. Coast Guard, Official

Barbed Wire, Oil Drums, and Shells Are among the Supplies Jamming This LST

A Marine Corps Quartermaster outfit brings in material for the invasion of New Britain. In foreground are litters for the wounded, rough furniture, and rolls of wire. Vehicles include water-tank trailers, jeeps, a special jeep for laying telephone wire, trucks, and a bulldozer. Water cans, boxes of first-aid supplies, and rations are visible.

and a half of occupation were still living in huts like the natives, the Americans in four months rooted out the jungle with bulldozers, leveled hills, built roads, constructed buildings with floors, screens, and furniture.

The United States Army was the first in history to be extensively equipped with heavy construction and earth-moving machinery, partly because of its peacetime experience in Mississippi flood control.

"Gasoline sometimes is more important than food," Gen. George S. Patton, Jr., has said. Tanks of one armored division once were stalled four days because they ran out of gas. To help keep that from happening, we used collapsible gasoline storage tanks of impregnated fabric, easily carried in a small space and set up on frameworks.

Advance patrols hid them in forests along the routes of the advancing armies, where they were later found, erected, and filled from pipelines or tank trucks as "filling stations" for the fast-rolling armored divisions.

Pipelines for gasoline and oil were laid on the surface of the ground. They were put down sometimes as fast as 50 miles a day.

Once, so the story goes, some American soldiers saw an officer surveying his pipeline route out in front of them in no man's land. They warned him that the ground where he was had not yet been taken. "I can't help that," he said, as he squinted through his transit. "There's a crew laying pipe right behind me and I can't stop for Germans!"

Most sensational pipe-laying job of the war was "Operation Pluto," in which 750 miles of 3-inch pipe were laid under the English Channel (pages 721-6). Through it gas and oil were pumped direct from Britain to the front-line armies.

You wonder if the British, after doing that, may not dig that Channel tunnel that's been talked about ever since Napoleon thought of it as a way of invading England!

An 1,800-mile Pipeline

You heard a lot about the "Big Inch" and "Little Big Inch" pipelines laid across country from Texas when tankers bringing oil to the east coast were being sunk wholesale by submarines. But the 1,800-mile pipeline from Calcutta to Kunming, China, much of it through uncharted jungle, is longer still.

To keep the Army pipelines clean, salt water was periodically pumped through. Black marketeers, tapping our lines in Italy to steal oil to sell at fancy prices, sometimes got this salt water instead. It looked and smelled like gasoline, but what their customers said, nobody knows!

We even built pipelines of hollow bamboo in China, to carry water when regular metal pipe couldn't be had.

Though we tried to plan far ahead, unforeseen things kept happening.

Last-minute Rush Orders

Our forces in the Pacific sent in an urgent order for a new kind of jungle-proofed uniform cloth. The cloth was rushed by fleets of commercial trucks from mills in the South to processing plants in Philadelphia and New Jersey. Each truck carried a special flag, and State police along the route were instructed to suspend the wartime speeding ban and let trucks with the flags roll wide open.

When the Allied armies neared the Rhine sooner than planned, the assault boats for crossing the river were not ready.

Plywood to build them was flown from the Pacific Northwest to eastern boat shops, and the finished boats then were flown to Europe (page 734).

For our landings in Sicily, the last 50,000 pounds of grease for waterproofing tanks and vehicles going ashore through the surf had to be flown from Pittsburgh to New York to catch a convoy sailing for North Africa.

All this was directed by the unjustly belittled "chair-borne troops" in Washington—officers who had the whole American transportation system at their fingertips.

Their job was to keep supplies rolling from factories to ports without delay. Just after Pearl Harbor, when we were rushing all available antiaircraft guns, ammunition, and other things to the west coast to meet a possible Jap attack, Army officers rode the supply trains, reporting four times a day to Washington so that a check could be kept on the progress of these vital supplies.

Railroad Tunnels Enlarged

One Army and Navy headache was moving big items of equipment that were too large to go through tunnels, too high to go under overpasses, or too heavy to pass over some bridges. Routing such things was the special task of a quiet-spoken, tired-looking captain who sat all day and half the night on the end of the long-distance telephone.

"Once," he said, "we had to ship some landing craft in a hurry from Camp Edwards, Massachusetts, to Camp Gordon Johnston, Florida. These craft were 50 feet long, 14 feet wide, and 15 feet 7 inches high. We brought them to New York under their own power because they were too large to move via railroads or trucks out of New England.

"At Weehawken, New Jersey, we drained

them of fuel, blocked engines and hulls, cut a foot and a half from the height, then turned them on their sides and loaded them in 52-foot gondola cars. The railroads moved them via circuitous routing: Weehawken, Elmira, Cape Charles, Norfolk, Augusta, Willacoochee, Dothan, and into Camp Gordon Johnston—so routed to miss low wires, bridges, tunnels, and train interference.

"Tunnels on some railroad routes in the West were too small for a lot of bulky objects. This caused congestion until one or two of the railroads enlarged their tunnels, which relieved the condition somewhat. Snowsheds and rock cuts were obstacles, too.

"Another headache was that most of the tunnels on eastern railroads are smaller and the bridges and underpasses lower than those in the West, because the eastern roads were built earlier when everything was on a smaller scale. Things that will go through western bottlenecks sometimes get stuck in eastern ones.

"In one trainload of ammunition was a boxcar from a western road that was a little oversize. When it went through a small eastern tunnel, part of its roof and the ladders on the sides were ripped off, but by some miracle the ammunition didn't explode. When the train stopped, the engineer took one look at that car and fainted dead away!

"One time, to get big warship turret rings past station shelter roofs and through underpasses, we put wrecking cars with big cranes behind them to hold them up at an angle out of the way. The 45-ton Pershing heavy tanks, on flatcars, had only a half-inch clearance going through some bridges. Sometimes we scraped the paint off things squeezing them through narrow places, but it didn't do any harm."

From Pearl Harbor to V-J Day, the Army alone used enough freight cars to stretch 17 times across the United States, a supply train long enough to reach almost twice around the earth. Before the surrender of Germany, 3,000 carloads of Army and Lend-Lease materials were arriving in Atlantic seaboard ports every 24 hours and being promptly shipped overseas.

Tribute from Rommel

Frau Rommel, widow of Germany's "Desert Fox," quoted her husband as having said: "The Allies' material superiority makes our fighting seem like that of primitive men."

We used for war purposes the Nation's entire tractor production and almost all its lumber. GI lumberjacks cut timber in European forests, too. In some of the trees they felled, they found old shell fragments from World War I.

Telephone lines were built the whole length of the Alaska Highway and from Calcutta far into China. We sent vast quantities of telephone poles overseas and drove 320,000 piles in the smashed harbor of Cherbourg alone, plus many hundreds of thousands more in other ports, to make them usable for unloading supplies. In Pacific harbors wharf piles lasted only a few months because they were rapidly destroyed by the voracious teredo, or shipworm, that lives in the sea. Piles had to be specially treated or replaced.

We fought whole campaigns just to secure bases from which to launch new campaigns for still other bases farther on toward Tokyo. Old bases had to be left behind in turn. At one New Guinea airbase the jungle came back so fast that where we had laid down 12 landing strips only one remained visible six months after the base was abandoned. That seems a waste, yet it was a necessary means to the all-important end of forcing Japan's surrender.

Mules Sent by Shipload

To save the work of unpacking invasion supplies in Britain, then packing them on ships again for Normandy, we loaded 54 ships in the United States with invasion supplies, anchored them in British waters until D Day, then took them to France.

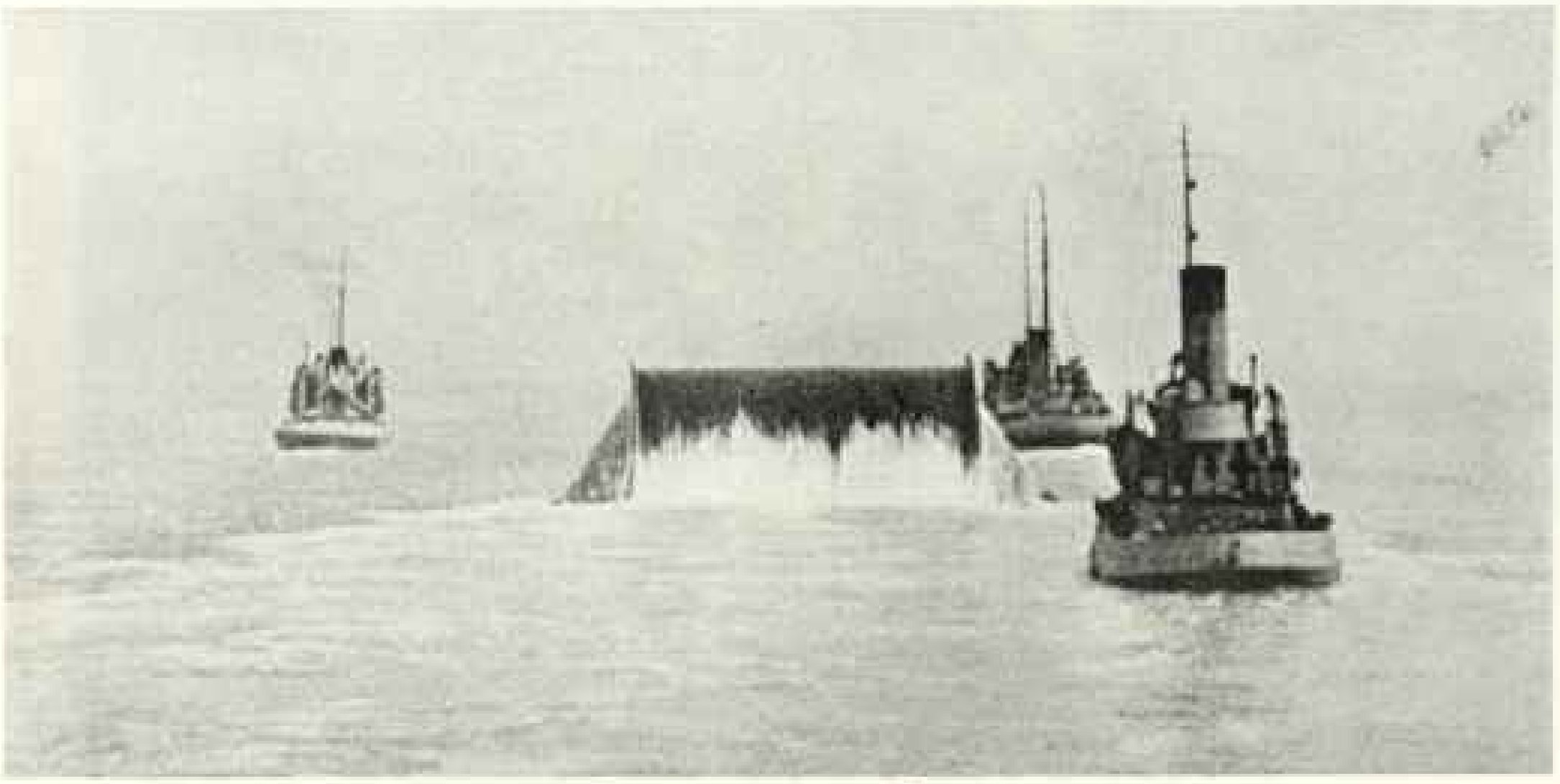
Because we lacked accurate charts of the New Guinea coast where we planned to make a landing, the general in command of the operation himself flew over the spot in a scout plane, lying on his stomach on the floor to look down and locate a place where the water was deep enough for a supply ship to come in and unload near shore.

When we found we needed mules to carry supplies in the roadless mountains of Italy and Burma, 17 freighters were converted into mule ships. Stalls were built in the holds athwartship, since mules get seasick less easily in that position than if facing fore and aft.

On long voyages in the Tropics the mules perspired so much that they had to be fed four times the usual amount of salt to keep them healthy. A shipload of mules is not exactly fragrant, and an entry in one mule-ship log on an 80-day voyage to India read, "Attendants irritable, mules calm!"

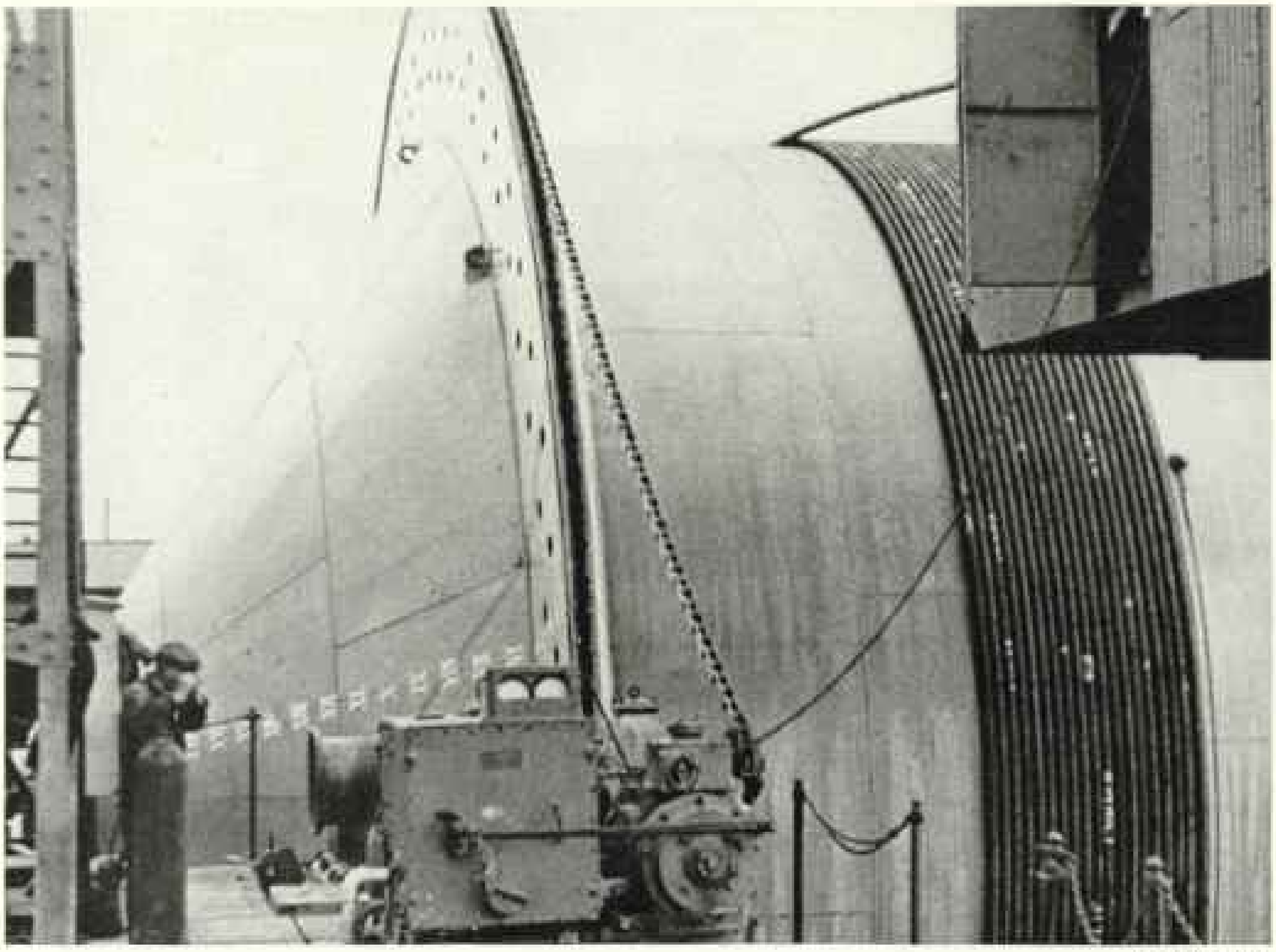
Because mules balk at going aboard ship, there is an old mare named Belle with a bell around her neck at the San Francisco Port of Embarkation whose specific job is to lure the "hardtails" up the gangplank. Mules will follow a bell mare anywhere (page 712).

Oil for Victory Piped under the Sea



Tugs Tow a Giant Drum, Unwinding Pipe as It Goes, Across the English Channel

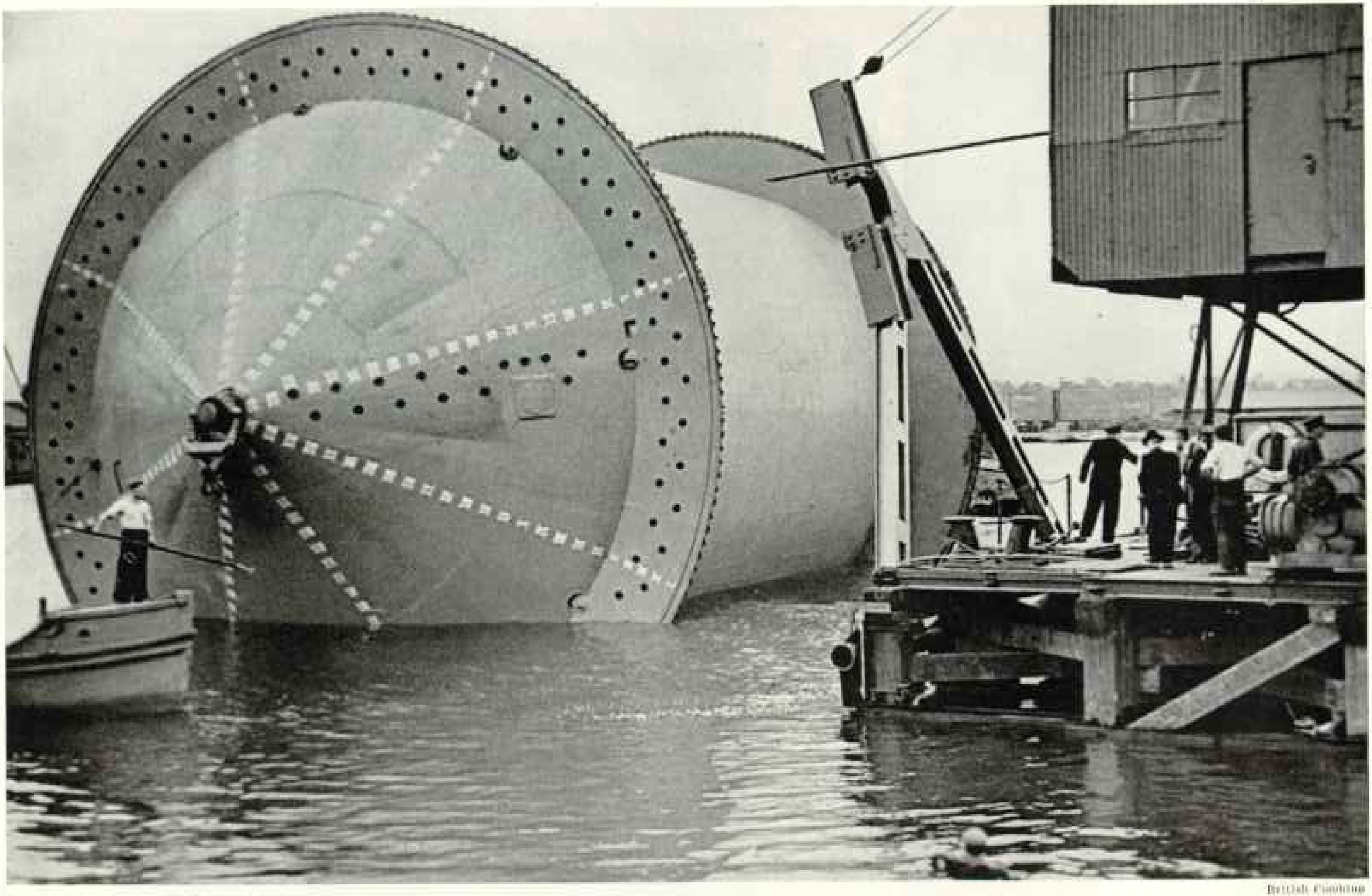
Twenty undersea pipelines were laid between England and France from such floating drums and from special ships. Through them up to a million gallons of gasoline per day were pumped direct to the Allied Expeditionary Forces after the invasion of the Continent. For secrecy the project was known as Operation Pluto, which stood for "pipeline under the ocean."



British official

Like Thread on a Spool, Pipe Is Wound on a Drum

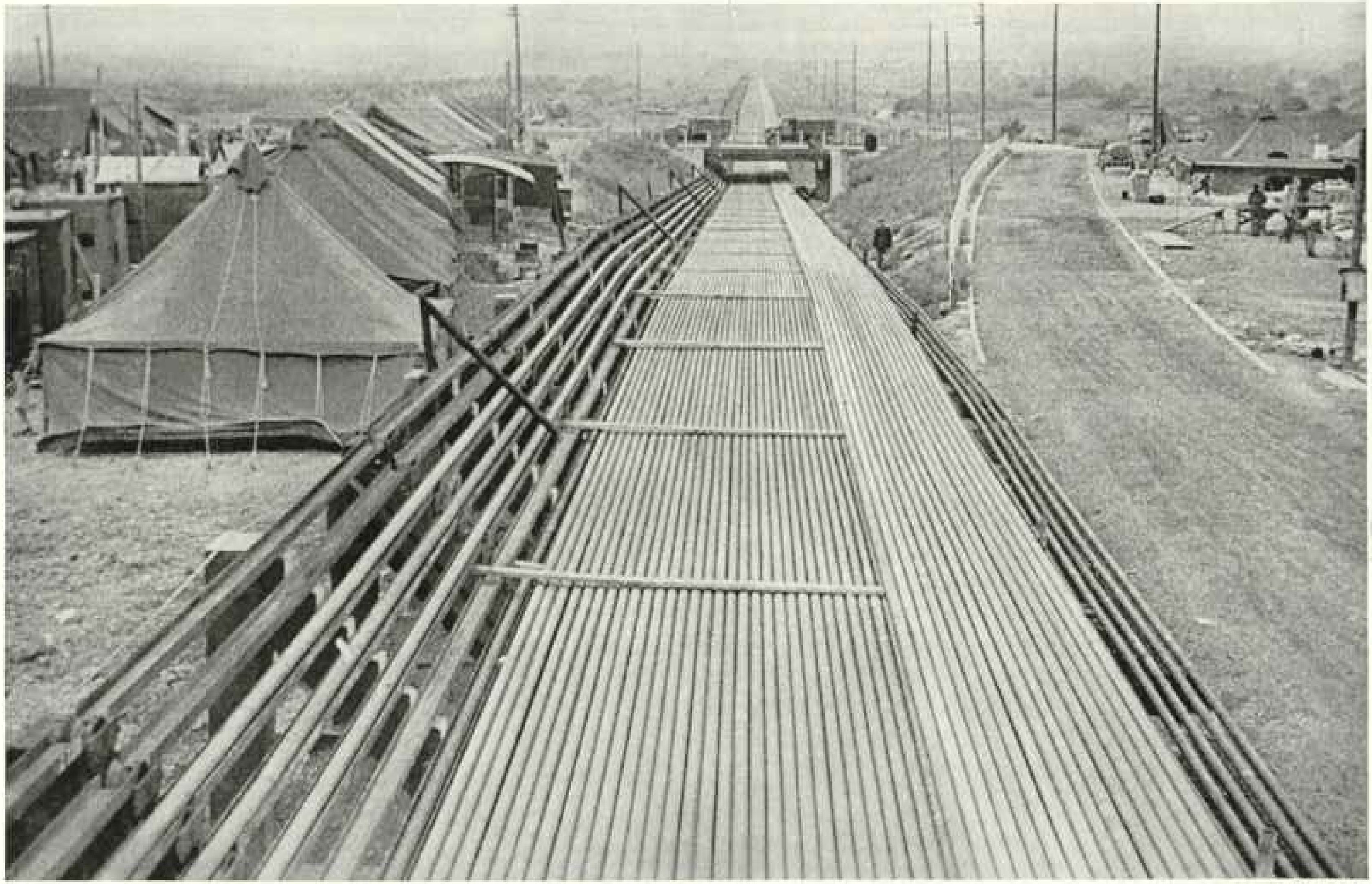
Six floating drums, known as H.M.S. Conundrums, or "Conums," were used in laying steel pipe across the Channel. Each could carry 70 miles of 3-inch pipe when fully loaded. Conceived originally in 1942, the gigantic project was carried out by British civilian engineers and manufacturers, with the cooperation of the British Army and Navy.



British Combine

One of the Huge Floating "Conundrums" Is Moved into Position for Steel Pipe To Be Wound onto It

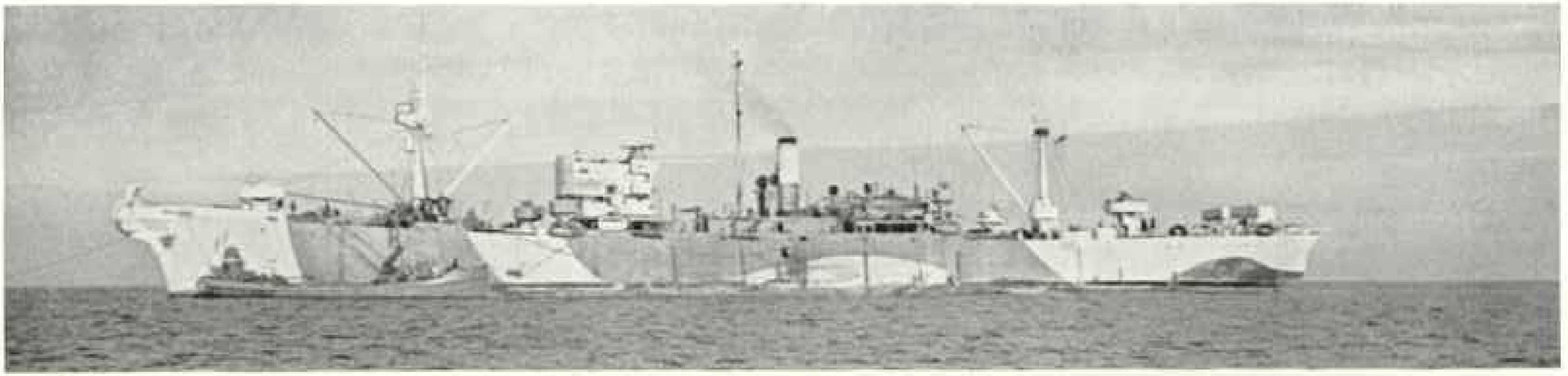
An idea of its size is given by the figure of the sailor at the left. The "conuns" were 50 feet in diameter and 90 feet long overall. Numerals painted on the end are draught marks like those used on a ship to show how far down it is riding in the water.



British Official

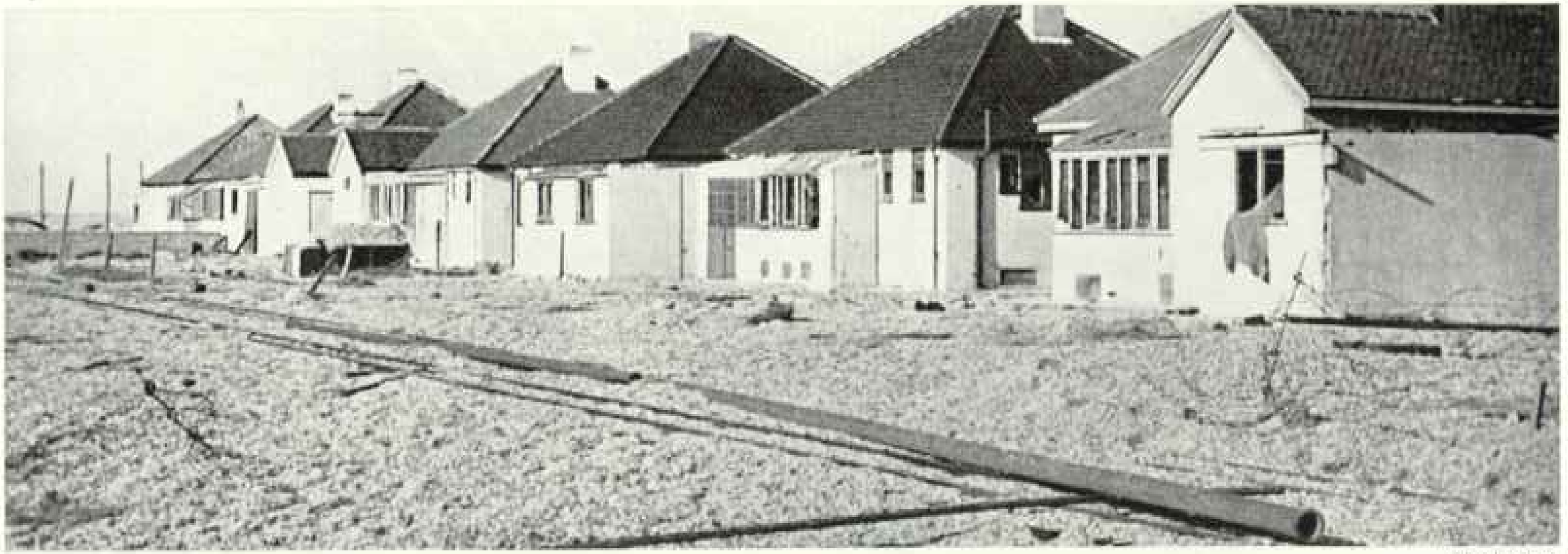
Pipe for the Lines under the Channel Was Stored in Three-quarter-mile Lengths Before Being Wound on Drums

Short pieces of steel pipe were welded together to form a single continuous line that was flexible enough to be wound on huge "conundrums" (opposite page) and unwound on the ocean floor without damage. Another type of pipe, made like hollow submarine cable, was laid from ships (pages 724, 726).



Liberty Ship *Latimer* Helped Lay Pipe Between Isle of Wight and Cherbourg to Supply Allied Armies

Four pipelines were laid in 10 hours on this route, a distance of 66 miles, after mines had been swept from the Cherbourg area.



British Official

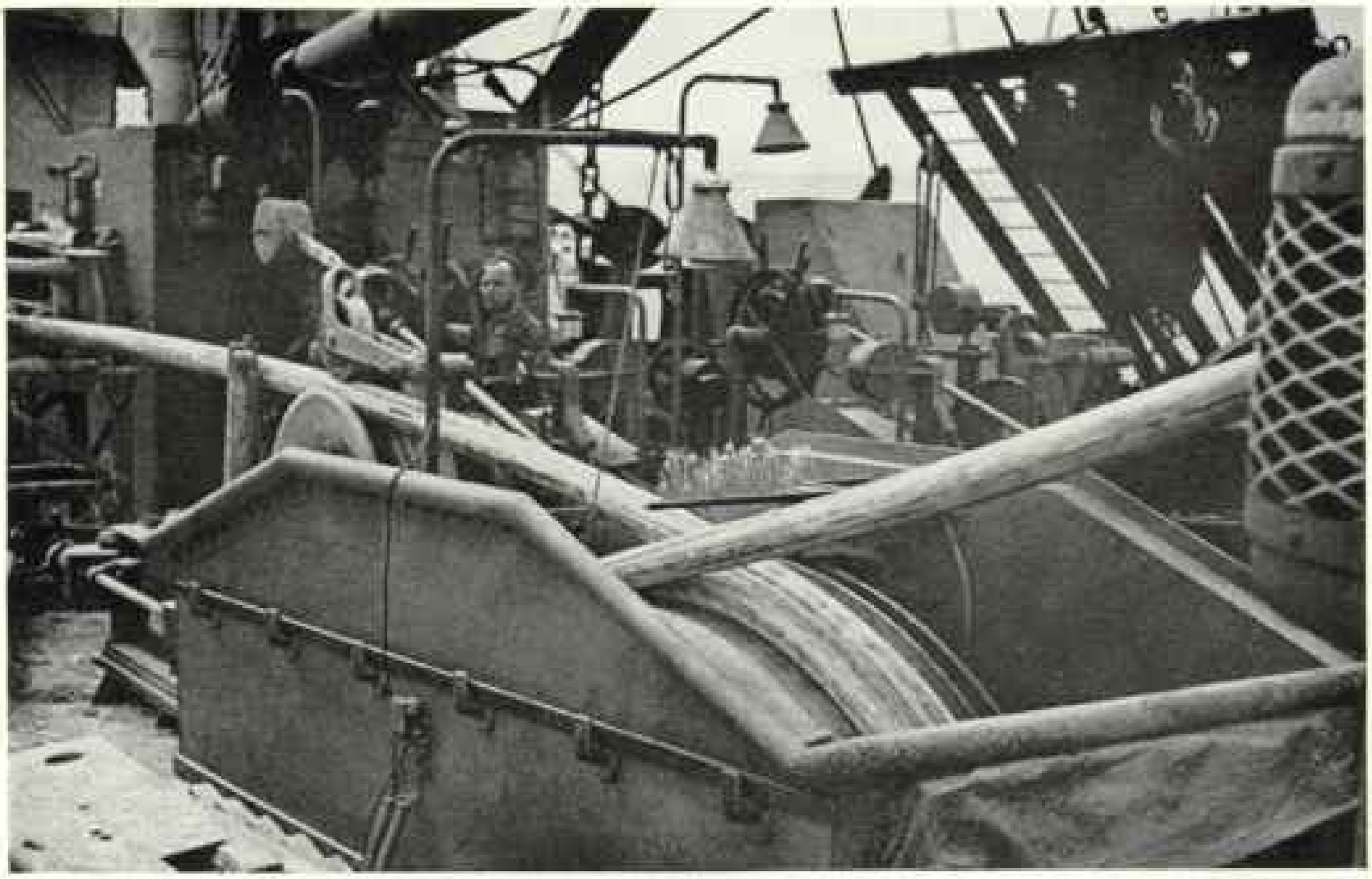
To German Airmen, These Were Wrecked Summer Homes. Actually They Concealed Pumps for Forcing Oil Through Channel Pipelines

Pumping stations also were hidden in a row of bombed-out houses, an old fort, and an amusement park. Sixteen pipelines were laid in five hours across the 30-mile stretch of water between Dungeness and Boulogne sur Mer, France.

British Combine

A Pipeline to Supply the Invasion of France Enters the Channel Through Never-used British Defenses

In nine months Pluto pumped 120,000,000 gallons of gasoline through the lines from Britain direct to the fighting fronts. American Army Engineers also laid pipelines across the French countryside. They carried 3,800,000 gallons of fuel a day, at the peak of operations, from tankers at the coast to U. S. forward areas.



British Combine

Cable-type Pipe Passes Around a Drum Which Controls the Speed of Laying

The pipe coiled in ships' holds was paid out as the vessels steamed across the Channel. It was filled with water while being laid to keep it from collapsing. American factories made much of the pipe.

British Official

This Pipe Was Made Like Hollow Submarine Cable and Coiled in Ships' Holds

Sailor supervises stowing of the pipe in the Liberty ship *Latimer*, from which it was later paid out and laid on the Channel bottom (page 724). This 3-inch pipe was made by essentially the same process as undersea electric power cable—of lead with a protective cover of fabric, steel tape, and wire.

U. S. Coast Guard Official

Supplies Landed on Tropical Islands Had to Withstand Surf and Jungle Damp

A jeep and amphibious tractor go ashore from an LST on Cape Gloucester, New Britain. Vehicles landed in this way were waterproofed to protect their engines and moving parts (page 735). Marines carry litters for casualties expected in the jungle fighting ahead.

If you studied Latin in high school, you probably still remember laboring through that long description of the bridge that Julius Caesar built across the Rhine when his Roman legions invaded Germany in 55 B. C.

Rhine Bridged in 10 Hours

Caesar's bridge, built of wood and strong enough for foot soldiers and cavalry of those times, was put up in 10 days. Two thousand years later our engineers in less than seven days built a 2,300-foot steel bridge across the Rhine, heavy enough to carry freight trains! We put three floating bridges across in less than 10 *hours!* (page 716).

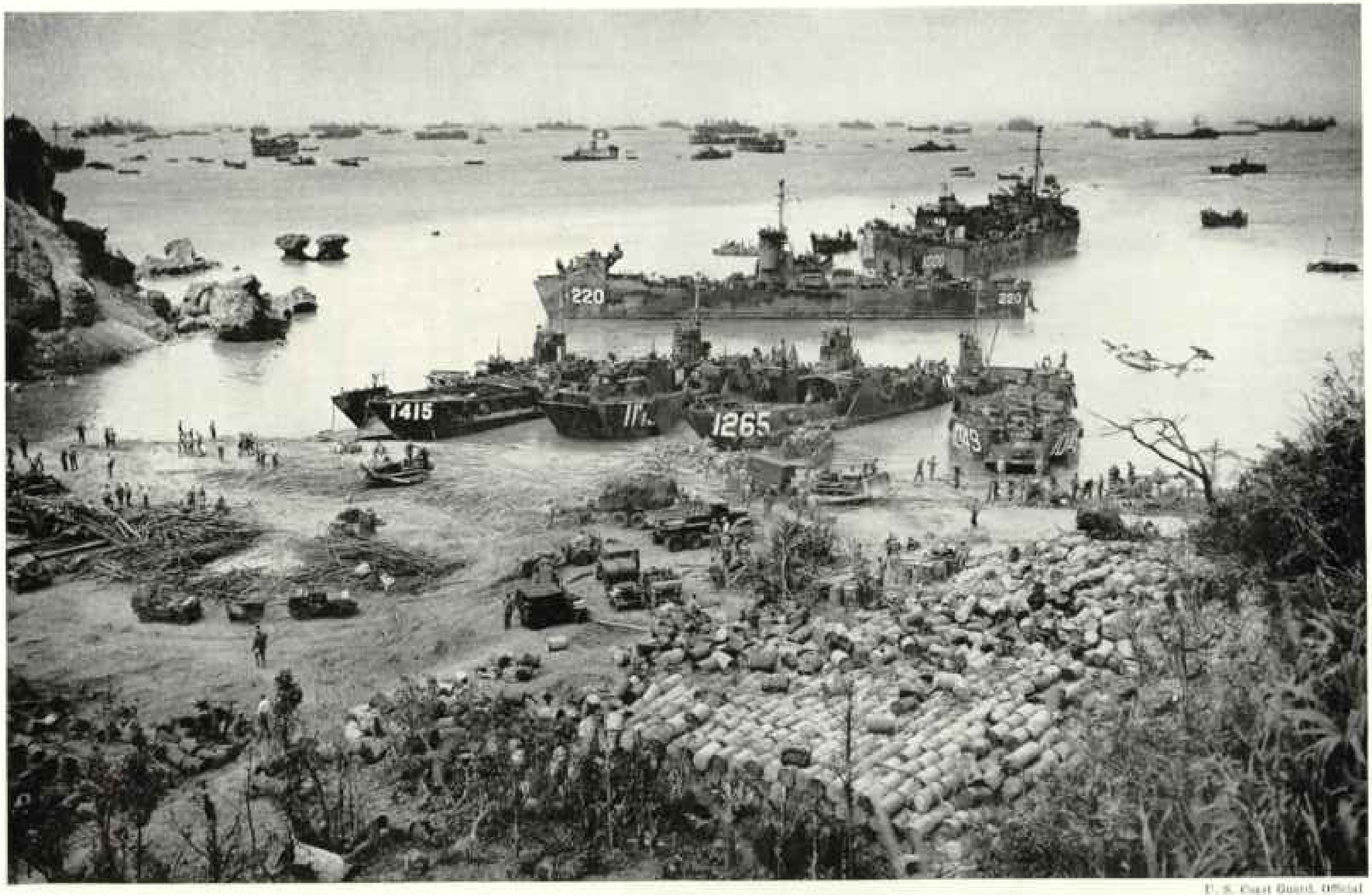
Well aware of the importance of the Rhine in their defense scheme, the Germans went so far as to comb the libraries of occupied countries soon after they invaded France and remove all data on the Rhine that might be useful to our engineers.

But fate made their effort useless. A German officer, captured in North Africa, happened to be carrying with him a German Army monograph on the use of the Rhine as a defense. It supplied important information that we needed.

In the fall of 1944, before the damaged French railroads were repaired, we supplied our advancing First Army over the famous "Red Ball" truck line.

Following bomb-pocked French highways from the coast to forward supply dumps, it was a 400-mile one-way highway with trucks following one route up to the front and returning another way. To guide the drivers, red balls and arrows were posted along the route. "Red ball" is an American railroad term signifying shipments of great urgency (page 730).

Red Ball trucks ran 22 hours out of every 24, leaving only two hours a day for repairs and maintenance work. At intervals along the way were gasoline stations and places for



U. S. Coast Guard official

Gasoline Drums Are Piled High on Shore While Supply and Landing Craft Fill the Sea to Back Up the Invasion of Okinawa

Bulldozers smooth out the sand to make roadways for vehicles to be unloaded from the LCTs nosed in to the beach. Logs and brush from piles at left are laid down to make corduroy roads. Vehicles drive in at left to refuel from 55-gallon gasoline drums, many of which are already empty.

U. S. Army Signal Corps, Official

Mountains of Supplies Intended for the Invasion of Japan Are Stacked in the Open at Lingayen on Luzon

Boxes, crates, and oil drums are placed in orderly piles with roads between for supply trucks. Ships in the background unload still more war materials. Weapons, spare parts and other metal objects, as well as food, intended for use in the Pacific, had to be specially packed to prevent spoilage and corrosion in the damp climate.

U. S. Railroad Troops Post a Special Train Announcement

In humorous vein they chalk their own "train information" on the bulletin board of a French railroad station. American soldiers repaired tracks and operated trains on French railroads to move supplies to the front lines (page 714).

U. S. Army Signal Corps, Official

Trucks Roared Day and Night down the Red Ball Highway

Signs like this urged the soldier drivers to greater efforts in rushing supplies to the front along this one-way road in France, from which all other traffic was barred. Thousands of vehicles moved along it in an unceasing stream.

U. S. Army Signal Corps, Official

Building a Pier on a Ship Capsized in Naples Harbor, Army Engineers Turn an Obstacle into an Asset

Germans who overturned the vessel as a hindrance to unloading of supplies did not count on American ingenuity. The ship's superstructure, digging into the harbor bottom, steadies the hull. All five hatches of a Liberty ship alongside the "pier" can be unloaded at once, expediting movement of her cargo.

U. S. Army Signal Corps, Official

American-built Trucks Rush Chinese Troops and Supplies to the Salween Front over the Burma Section of the Stilwell Road

U. S. Army Signal Corps, Official

Into Thousands of "Jerricans" Goes Gasoline Pumped Through Pipelines Laid Across the French Countryside

The five-gallon cans used for supplying U. S. Army vehicles are filled from tank trucks which brought the fuel forward. "Jerricans" were so named because the design was taken from a similar can used by the Germans.

Pinecastle Boat & Construction Co.

Even a Street in Pinecastle, Florida, Was Used to Build Rhine River Assault Craft

When the Allies neared the Rhine sooner than expected, a hurry call went out for plywood craft for use in the river crossing. To complete the boats in time, materials were sent by air from the Pacific Northwest to eastern factories, and finished boats were flown across the Atlantic (page 719).

drivers to eat, sleep, and even vote, since the American Presidential campaign was going on then. Emergency repair crews patrolled the road, ready to help a truck in trouble. Drivers at times averaged 36 hours on the road.

"Ducks" Brought Supplies Ashore

Equally vital in the chain of supply were the "ducks," amphibious trucks that carried supplies from ships anchored offshore onto the beaches in invasions all around the world. In the Normandy landing some ducks brought supplies from ships as far as 10 miles out in the English Channel, rolled up the beaches and on to the front without stopping.* Think of the back-breaking labor that saved! On Angaur Island in the Pacific they rushed artillery shells from supply ships direct to gun batteries on shore that were firing on the enemy (page 713).

"Real unsung heroes of the war were our labor troops, a large proportion of them Negroes," one officer told me. "In many ways their lot was tougher than that of the combat soldiers. The fighting man faces danger, it's true, but he usually has periods of inactivity between fighting, and he has the excitement of combat, the stimulus of knowing he is advancing and winning victories.

"The labor troops had none of this. They worked steadily 12 or even more hours a day, often seven days a week, sometimes even all day and all night in emergencies. Their work was always the same old routine, hoisting crates and boxes out of ships' holds, lowering them into boats alongside, taking them ashore, and stacking them up. The flow of boxes and crates seemed endless; the work was fatiguing and uninteresting; they never saw the results of their efforts. Some of them were stuck on tiny tropical islands for months, even years, without relief.

* See, in the National Geographic Magazine, "Normandy's Made-in-England Harbors," May, 1945.

U. S. Navy, official

Cows to Supply Fresh Milk for Our Forces on Guam Go Ashore from an LCT

Cattle are being herded from the landing craft down its ramp to a big truck waiting in the background. Hogs, chickens, and turkeys also were sent to Pacific bases to provide fresh meat, fowl, and eggs for the wounded and to ease the burden of sending food from the mainland.

"Some men had been on island bases so long they couldn't walk on the pavements when they got to Manila, because it hurt their feet!"

Something new in warfare were our Engineer Port Reconstruction and Repair Groups, whose specialty was taking over a seaport destroyed by our own bombing and enemy demolition and making it usable again. They cleared mines; raised sunken ships or cut them in half and dragged them to one side to clear ship channels; repaired wharves, cranes, and warehouses; cleared dockside streets of rubble and wreckage so traffic could move freely.

Transportation Corps Port Battalions unloaded ammunition ships under attack by enemy planes, and some of them earned Presidential Unit Citations. One Port Battalion worked 102 straight days and nights without time off.

Le Havre, France, familiar to countless American tourists, was repaired in 60 days after its harbor facilities had been totally destroyed, and handled more cargo after the repairs than it ever did in peacetime. Leghorn (Livorno), Italy, was so badly damaged that, instead of repairing it, we built a new port near by!

Just packing the supplies we sent overseas was both a colossal task and a fine art.

When redeployment of the armies from Europe to the Pacific was begun, vast quantities of packing material, such as lumber, nails, wire, metal tape, stenciling equipment, grease, waterproof wrapping paper, tools, and baling machines, had to be sent to France and Britain, for such things simply weren't available over there in the quantities needed.

"Sometimes moisture condenses so heavily in a ship in the Tropics that you would almost think it was raining," a colonel told me. Gun, truck, and tank parts, airplane engines, and many other things were packed with bags of

U. S. Army Air Forces, Official

Airplane Engines, Like Cigarettes, Wear Transparent Wrappings to Keep Out Moisture

These engines, arriving at Accra, Gold Coast Colony, in British West Africa, are encased in plastic-film envelopes to protect them from corroding and becoming useless in the damp climate of the Tropics. The card with the T-shaped marking on the engine at left is a chemical indicator which shows by a change in color when moisture inside has increased to the danger point.

silica gel inside to absorb moisture and keep them from rusting. Resembling granulated quartz, silica gel is so porous that one cubic inch has about 75,000 square feet of absorbing surface. Little windows were placed in package wrappings so that the silica gel could be inspected.

When a chemical indicator impregnated in it turned pink, indicating that the silica gel had absorbed all the moisture it could, a new supply was inserted.

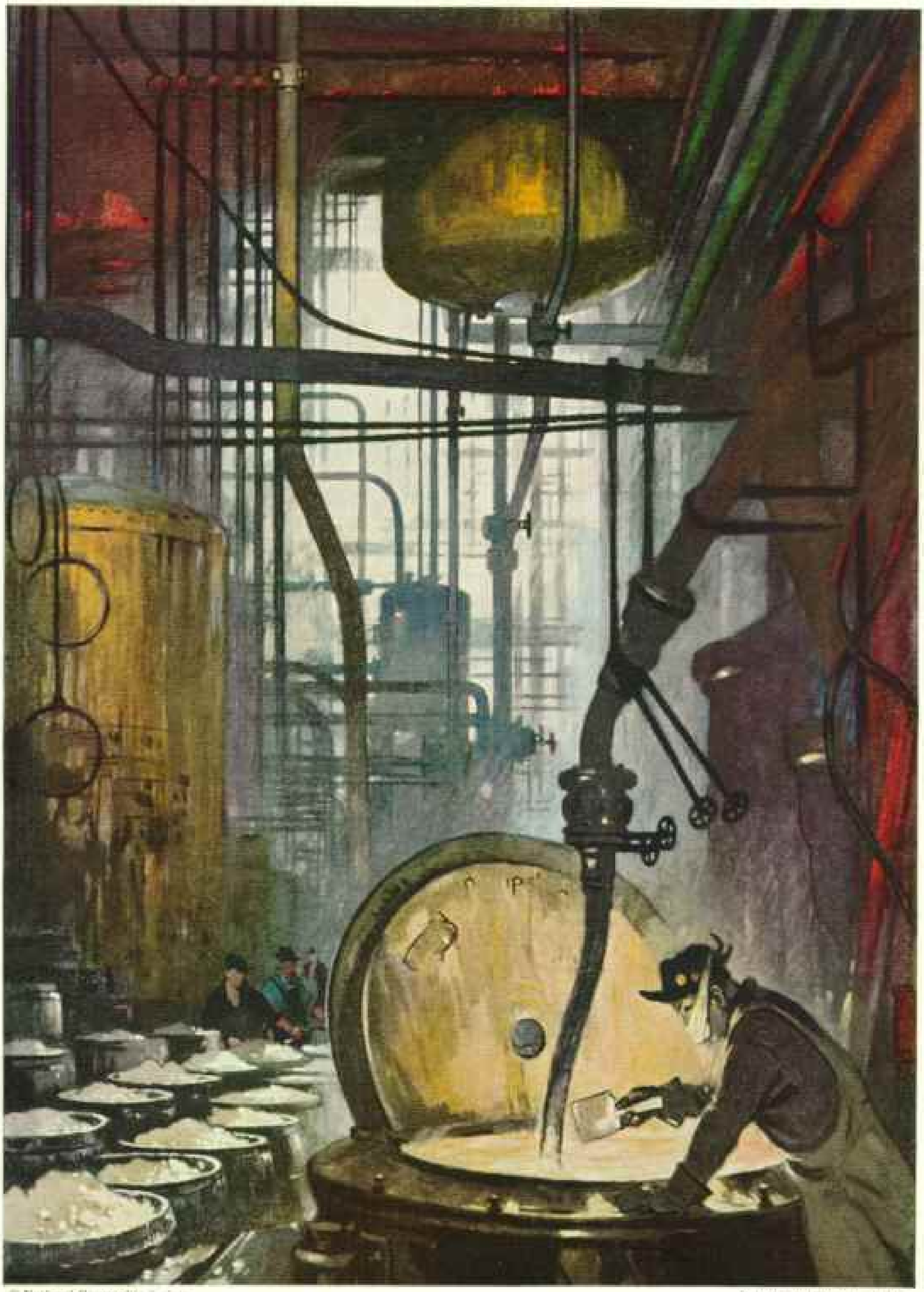
We learned to make gasoline cans so completely watertight that when a cargo of them was salvaged from a ship sunk for six months in the English Channel, not one can had leaked. Millions of cases of canned goods for the South Pacific had to be coated with a special pigment to keep them from rusting through and spoiling the contents. Even the acid in fingerprint moisture can ruin highly polished metal precision parts and had to be removed before packing.

Operations on opposite sides of the earth had to be coordinated almost to the minute. When we took the island of Saipan, we started hauling coral rock night and day to build the 9,000-foot runways needed for our B-29's. Dump trucks raced at 50 miles an hour over a special road between the coral quarries and the new airfield. Posted along it were signs reading: "No vehicles allowed on this road unless carrying coral."

Each day the Engineer officer in charge radioed in secret code to Washington how many feet of runway had been finished. Meanwhile, in the United States, new B-29's were flying practice missions to train their crews for operating from Saipan. When the field was nearly completed, the big planes started the flight across the Pacific. They reached Saipan just as the last few yards of runway were finished.

We built, just in the European Theater of Operations, enough concrete airfield runways, roads, and "hard-stands" to make a 20-foot highway from New York to Moscow. In the first summer after Pearl Harbor, we built 400 new airfields in the United States alone.

Supply has its funny side, too. Once, unloading a Liberty ship in Naples, stevedores found three cases of house windows from a Montgomery Ward store in Baltimore, addressed to a Mrs. Jennings of Erie, Pennsylvania! How they got there, nobody knows.

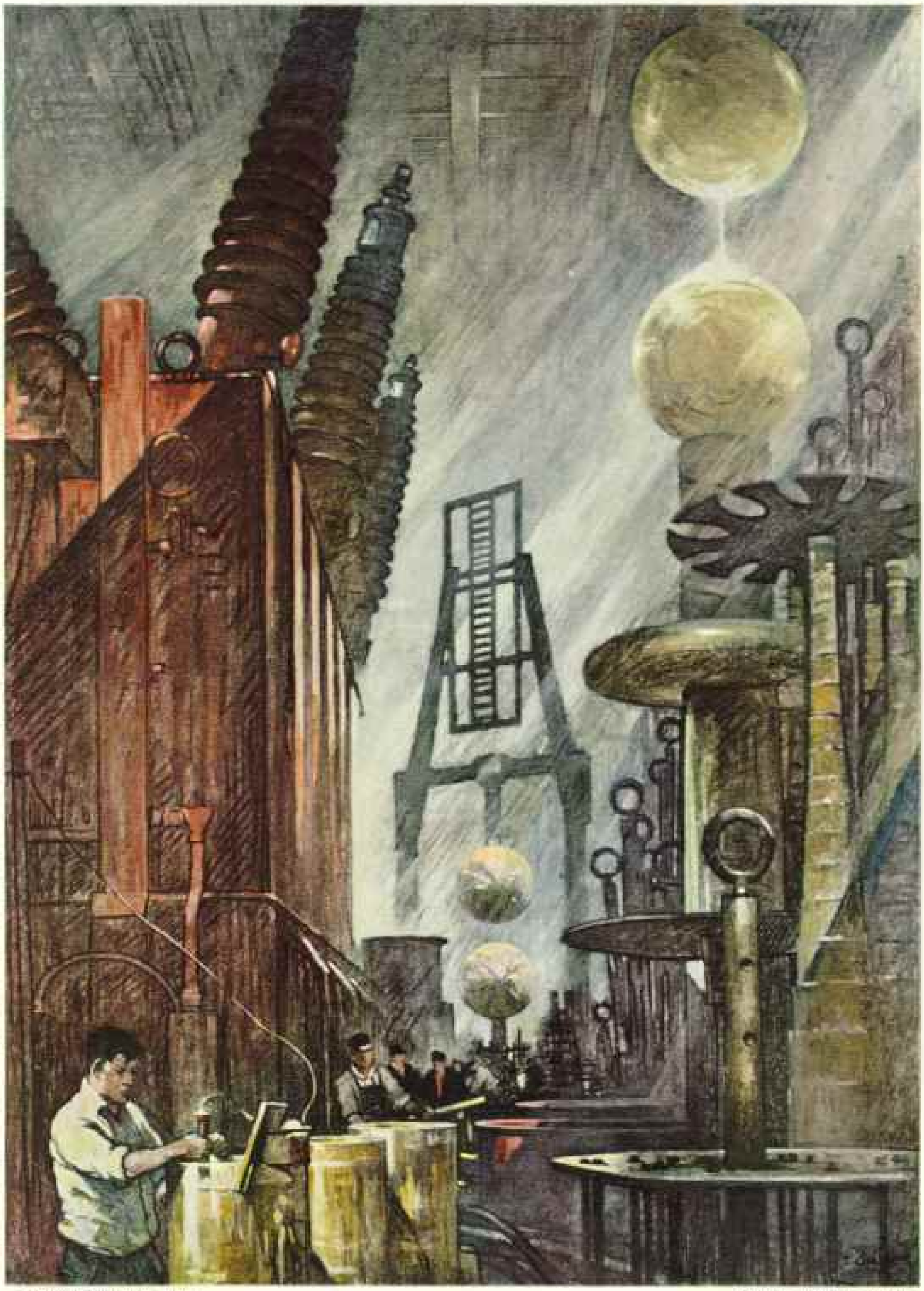


Painting by Thornton Oakley

Whirling Baskets Separate Sulfa Crystals from the Mother Liquor

 Painting by Thornton Oakley

Within This Towering Atom Smasher Atomic Energy Is Freed



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Man-made Lightning Tests Huge Power Transformers

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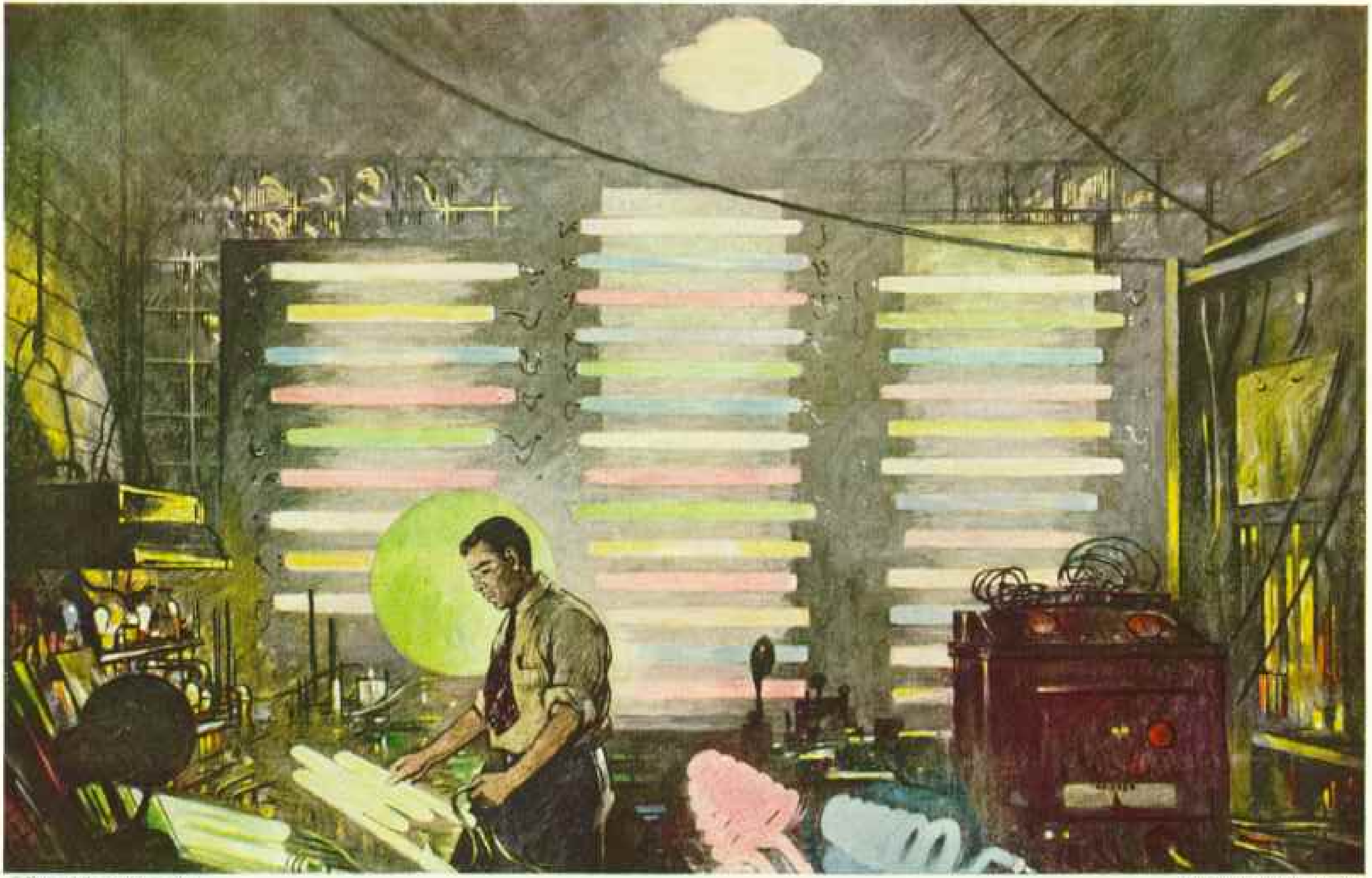
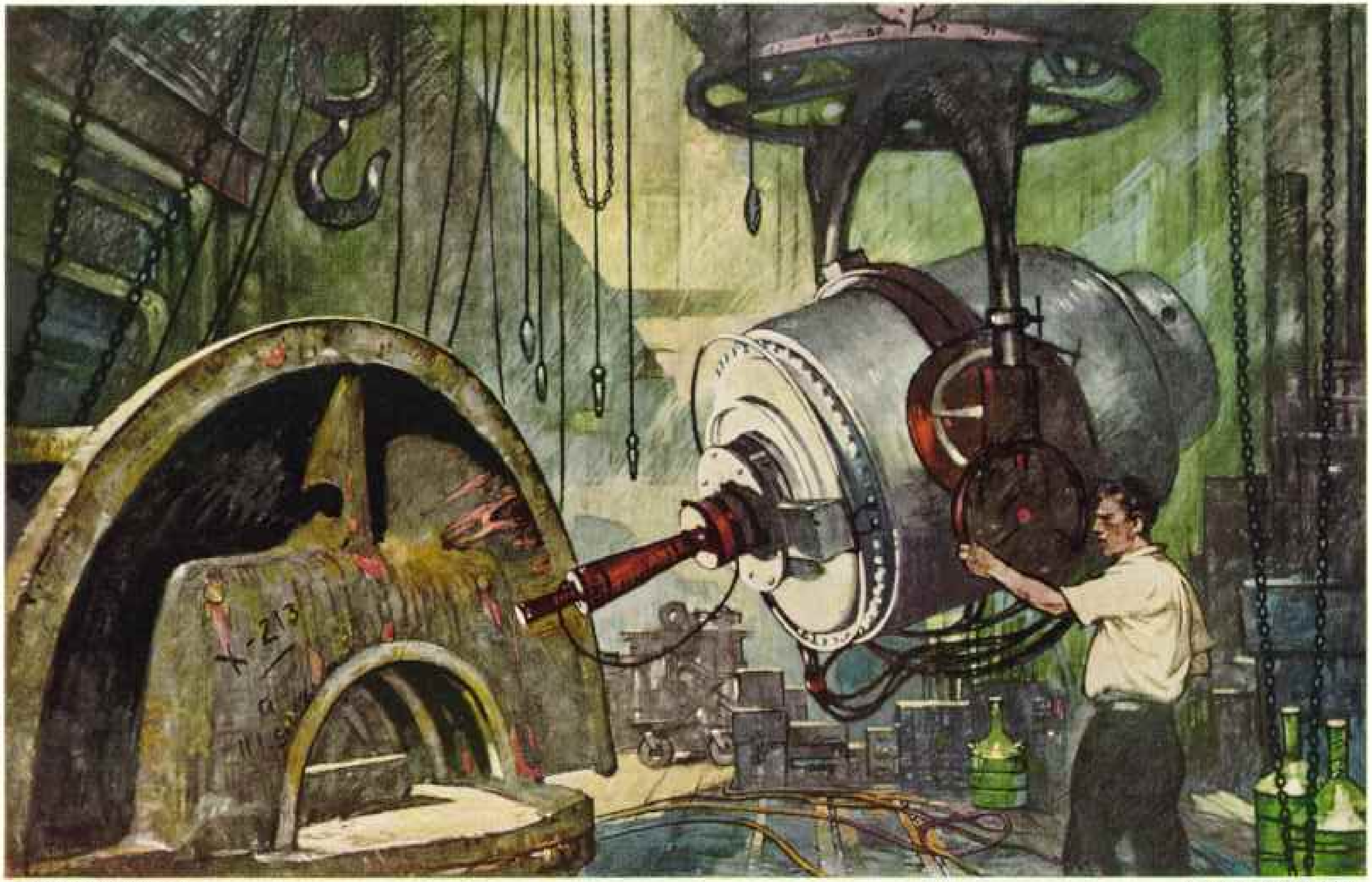
Television Studios Are Realms of Cameramen and Actors, of Mystery and Light



Painting by Thomas Oakley

Newest Fluorescent Lamps Are Made to Glow by Invisible Ultraviolet Rays

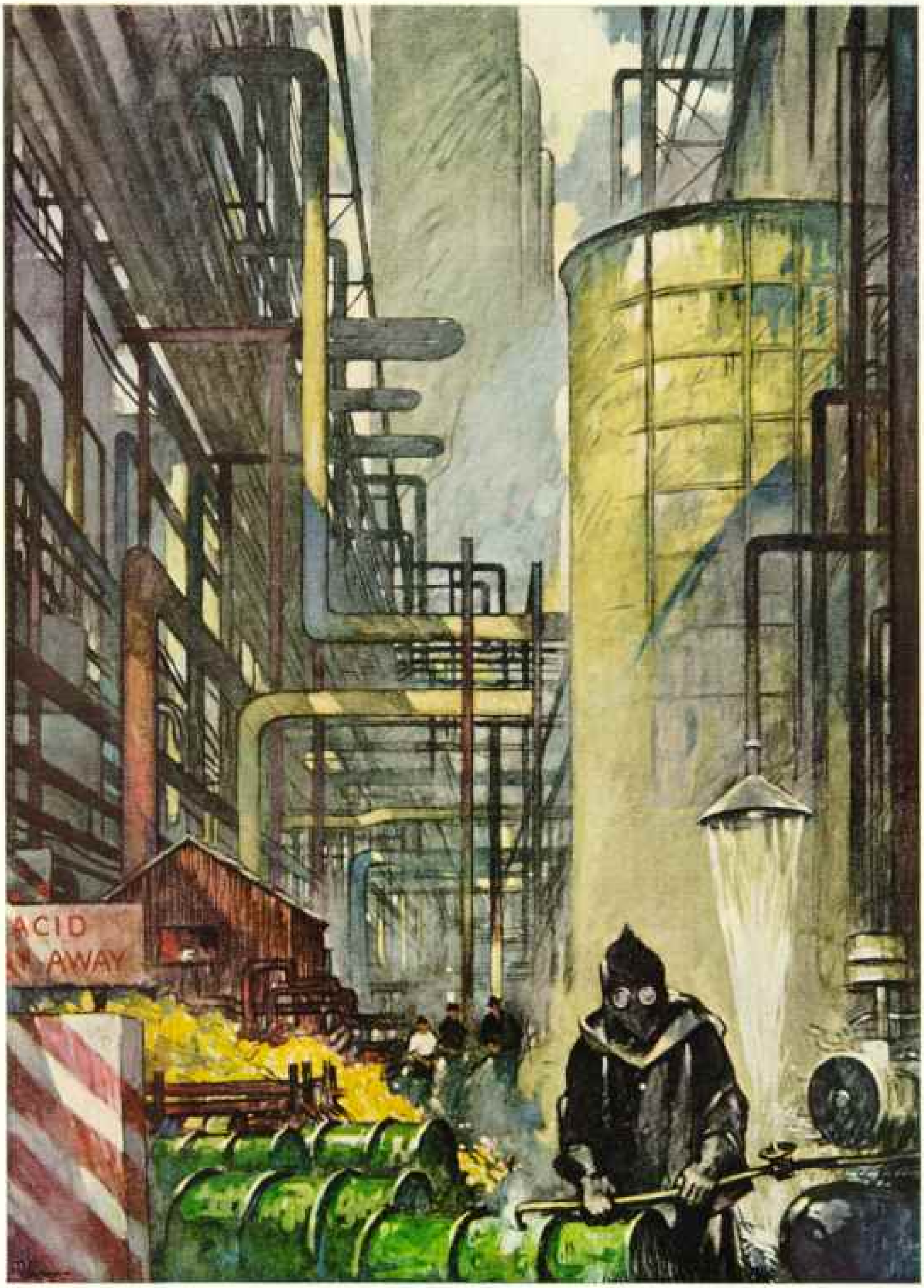


Painting by Thomas Gilroy

1,000,000-volt X-ray Machine Projects Radiations Through Solid Steel to Detect Hidden Flaws

Painting by Thurston Hopkins

Through an Infrared-ray Tunnel Pass Freshly Painted Tanks. In Mere Minutes They Emerge Dry



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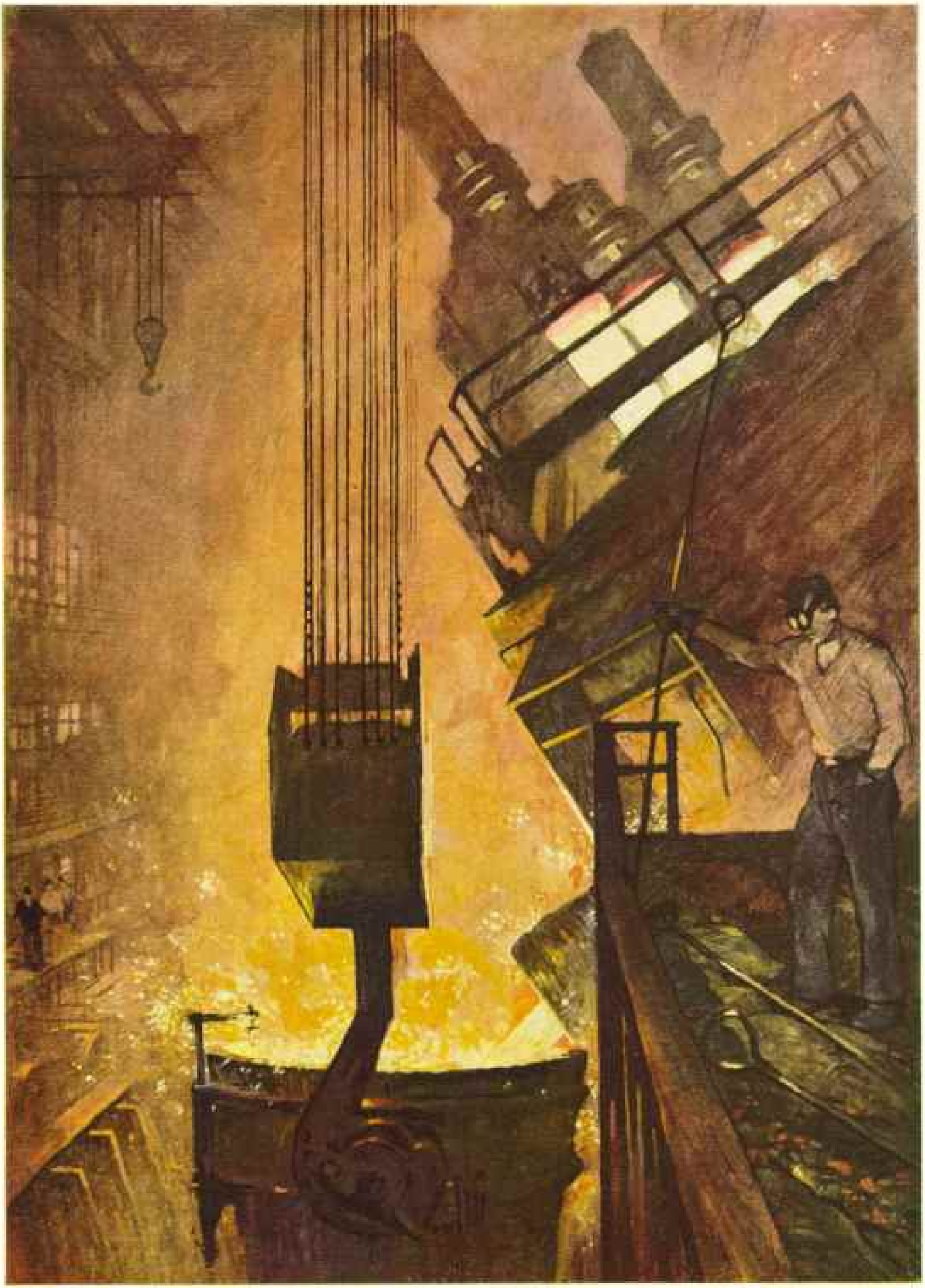
Acid Handlers Play Their Part in the Fantastic World of Industrial Chemistry



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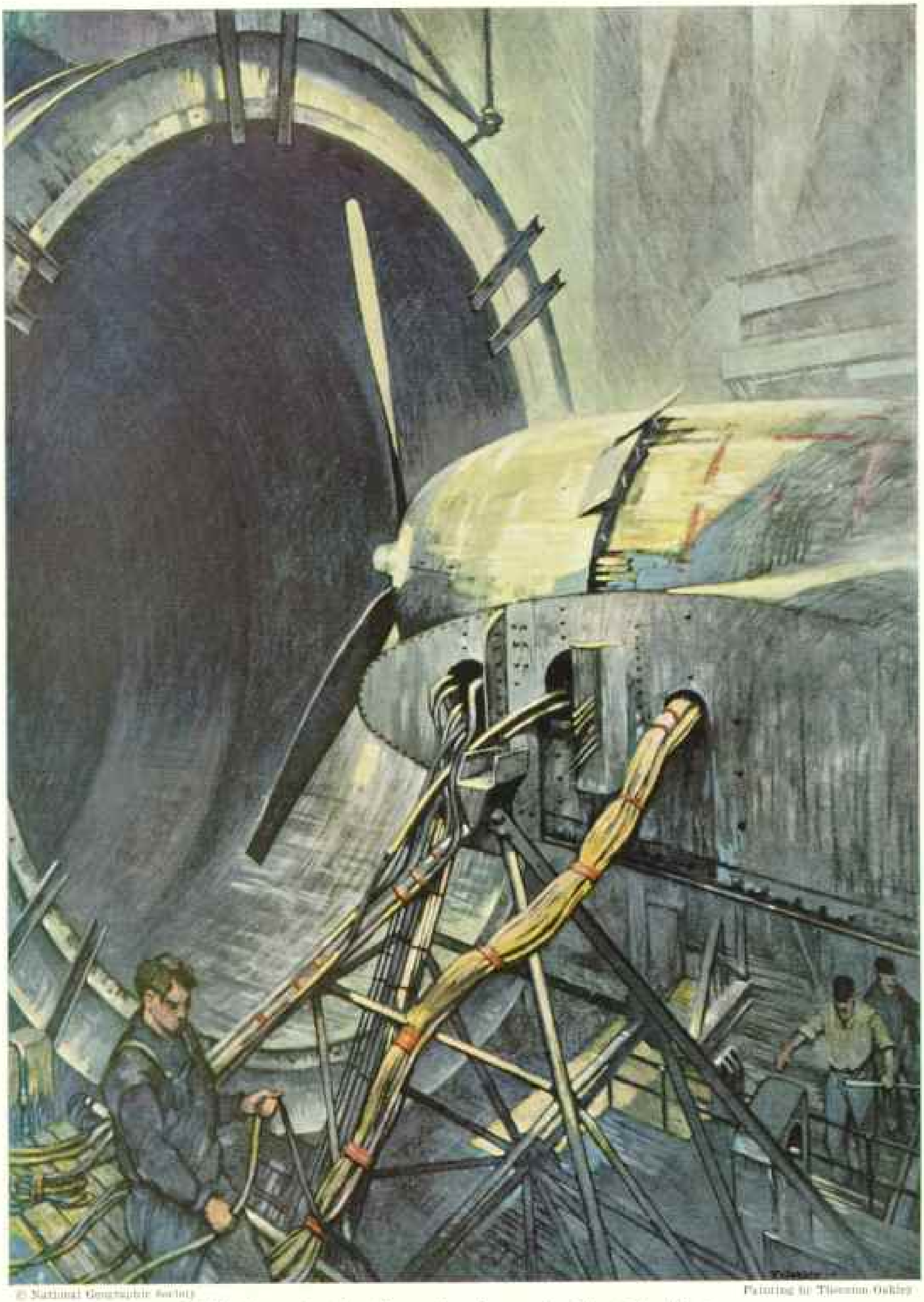
Fine Steel Pours Forth from a Monstrous Electric Furnace



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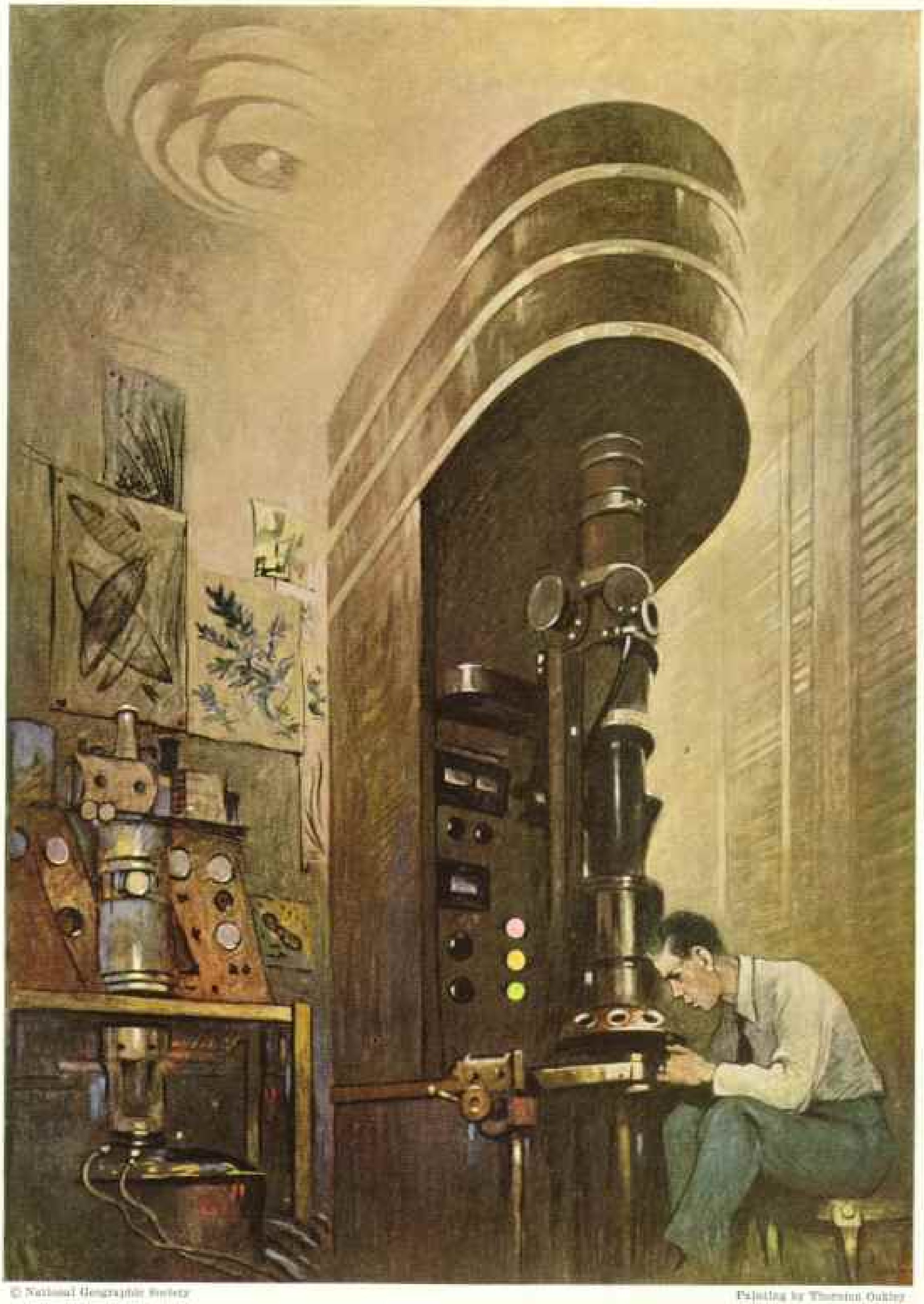
Wind Tunnels Hurl Superhurricanes for Testing Airplanes



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Electron Microscope Opens Secrets Even of the Molecule

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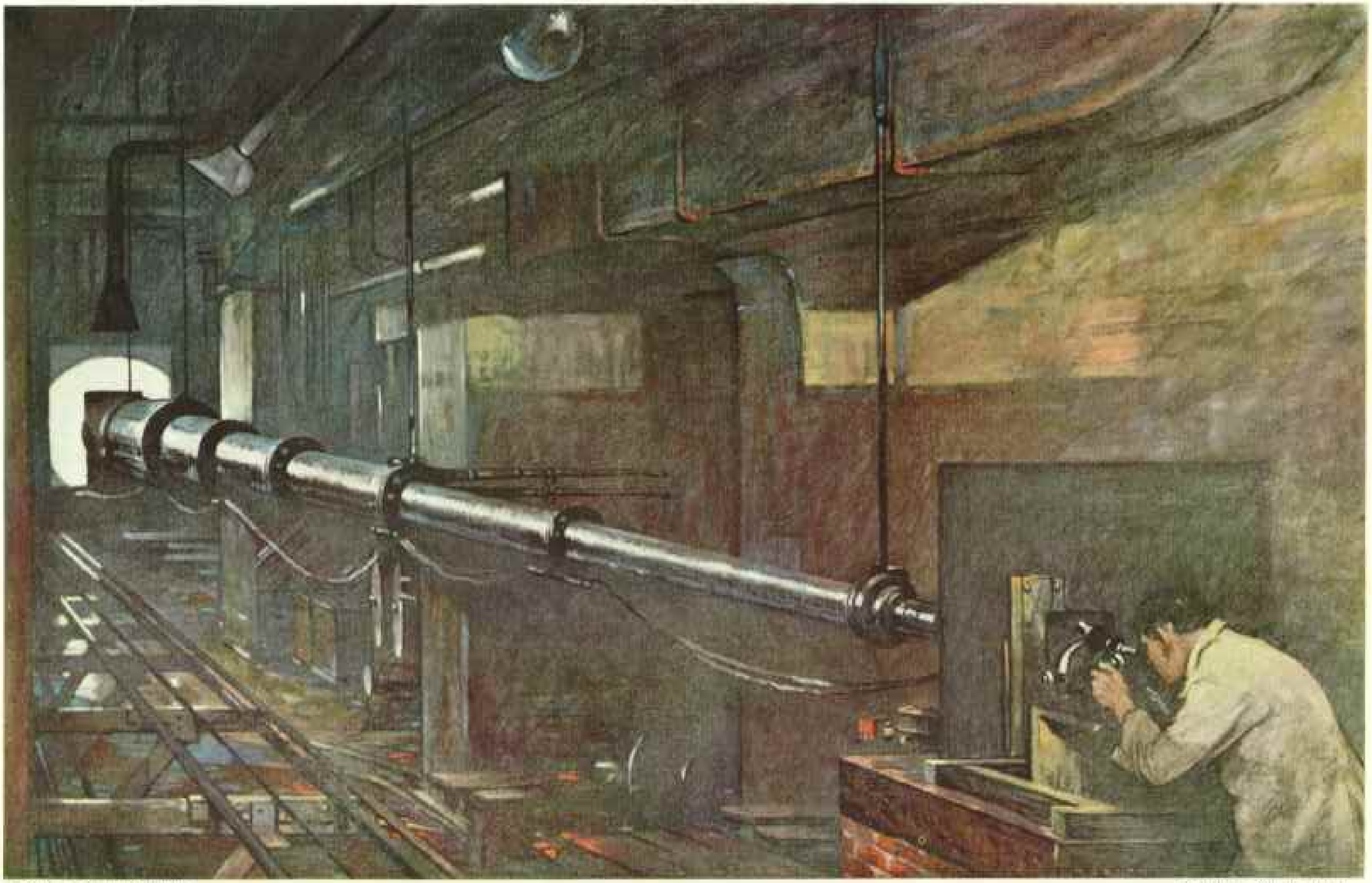
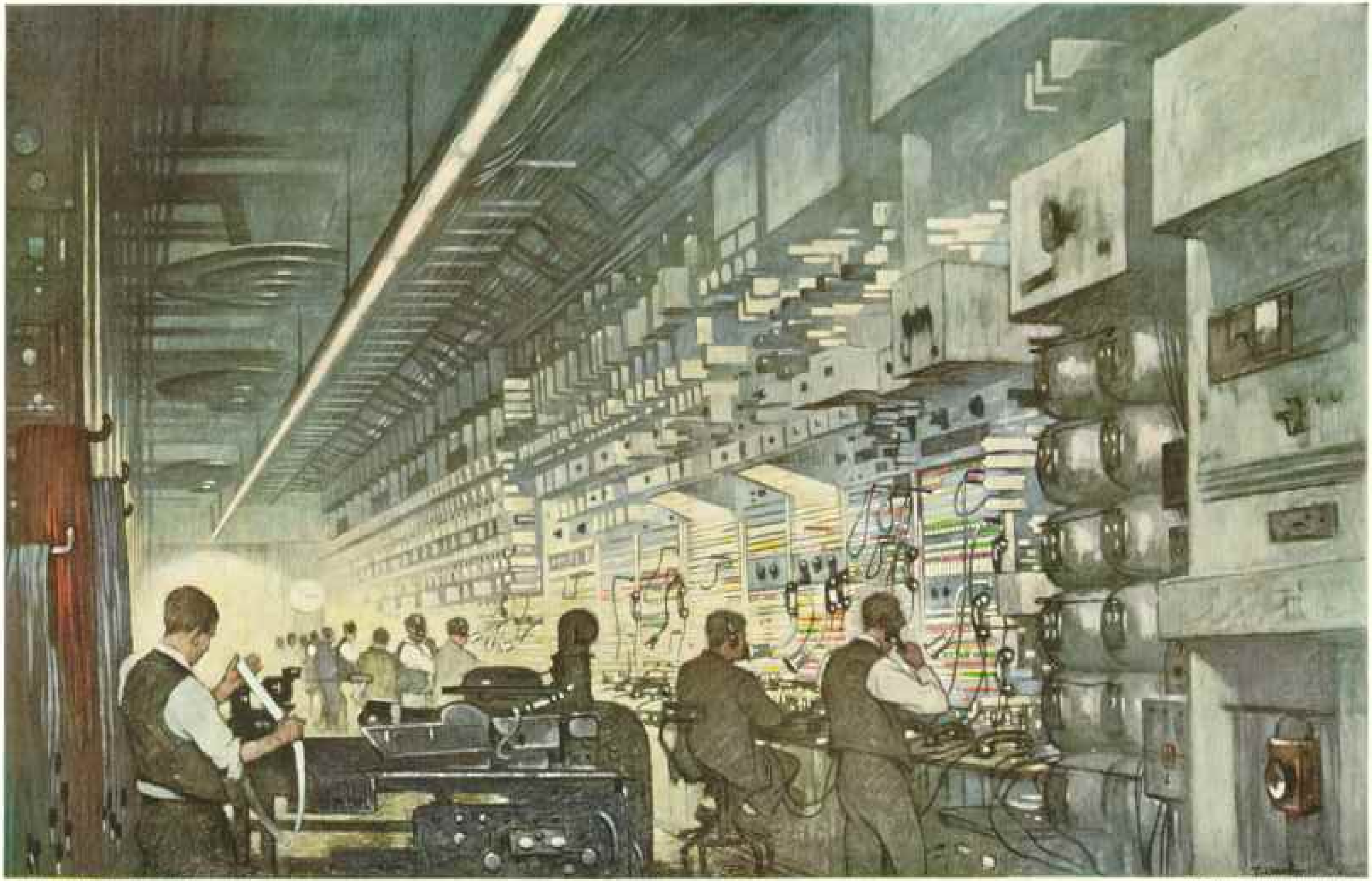
Machine for Testing Speed and Pull Demonstrates Powers of New Giant Locomotives



Painting by Thornton Oakley

Resolving Power Camera Tests Ability of Photographic Film to Register Very Fine Detail



Painting by Thomas Oakley

Through Instruments of the Radiotelephone Control Room Come Voices from the Ends of the Earth

Painting by Thornton Oakley

Experiments with Sound to Improve Broadcasting Are Conducted among Noise-absorbing Hangings

Painting by Thornton Oakley

In Colossal Stills Vitamin A Is Separated from Shark-liver Oil, Then Tested on White Rats

Face of Japan

By W. Robert Moore

EARLY on the morning of September 2, 1945 (Tokyo time), when the Japanese delegates stiffly signed the formal surrender documents aboard the U. S. S. *Missouri* on behalf of the Emperor and the Imperial General Staff, they penned the official end to nearly four fateful years of war.

But they did more. They also wrote an end to a chapter of Japanese history covering almost a century of rapid economic and territorial expansion.

The terms of the Potsdam Declaration, to which Japan had agreed, specified that the country was to be limited to the four main home islands—Honshu, Hokkaido, Kyushu, and Shikoku—and such other small islands as may be designated. All territory gained by aggression thus was to be shorn from Japanese control. Japan, too, is to be stripped of the power to make war again.

When cease-fire orders were given, high-explosive, fire, and atomic bombs already had reduced much of the industrial empire centered about Tokyo, Nagoya, Osaka, Kobe, Nagasaki, and other closely compressed cities and towns. In truth, large portions of most of the main industrial districts were bombed, fire-blackened, and blown to dust or heaps of rubble (pages 757, 763, 765).

Japan Overreached, Fell Back 92 Years!

Today Japan can look about and see how little her ill-patterned expansion policy has availed her. She stands again with virtually the same territory she had when Commodore Matthew Calbraith Perry sailed his peaceful armada into Yedo Bay (Tokyo Wan) in 1853 to open the doors of the isolationist kingdom.

With this issue of their National Geographic Magazine, the 1,250,000 member-families receive a new 10-color map supplement of these main Japanese Islands and Korea, where tens of thousands of American soldiers have begun the long, patient task of occupation. Included, also, is a portion of Manchuria, into which the Russian armies plunged with spectacular gains during the final days of the war.*

* Members may obtain additional copies of the new "Map of Japan and Korea" (and of all other maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices, in United States and Possessions, 50¢ each, on paper; $1 on linen; Index, 25¢. Outside United States and Possessions, 75¢ on paper; $1.25 on linen (postal regulations generally prohibit mailing linen maps outside Western Hemisphere); Index, 50¢. All remittances payable in U. S. funds. Postage prepaid.

Because new boundaries are still indefinite and will have to be settled at the peace table, with certain exceptions, such as Kwantung, prewar frontiers are shown on the map. Notes explain the breakdown of the Japanese Empire.

In Korea, Japanese names are still used, as they are better known. All U. S. Navy charts carry Japanese names, as do press dispatches. As many Korean names as can be shown on the map are placed in parentheses.

Presented on the new chart is a series of ten large-scale insets showing the long chain of outlying islands, from the Kurils in the north to bulky Formosa (Taiwan) in the south, which composed the Empire of Japan before the war.

Tankan Bay, in the Kurils, from which the Japs sailed to attack Pearl Harbor is delineated. The Okinawa inset carries one new name of interest, Buckner Bay, the name given to Nakagusuku Wan by Secretary of the Navy James V. Forrestal. It has been called the "Scapa Flow of the Pacific."

An inset of the Tokyo area shows Kurihama, where Perry landed in 1853, and Atsugi, where General of the Army Douglas MacArthur landed 92 years later. Included also is a great-circle strip map to show Japan's location in the western Pacific. The great circle runs through Manila, Tokyo, and Attu.

Drawn by The Society's cartographers after months of painstaking research, this new chart, 37 by 26½ inches in size, is based on an Albers conical equal-area projection and is scaled 1 to 3,000,000, or 47.35 miles to the inch.

Knobby Mountains and Twisting Rivers

The map reveals clearly the outstanding physical features of the islands—long, irregular, bay-indented coastlines; the famed Inland Sea (Seto Naikai); landscapes knobbed by mountains and volcanoes and seamed by short, twisting rivers.

On it, too, are etched the red and black nerve lines of vital communication systems, repeatedly disrupted in the last year of the war, over which American men now are traveling.

These new maps will serve our occupation forces as do other National Geographic Society maps now in use in the occupied areas of Europe. On this chart members at home will be able to locate places where relatives and friends are on guard.

When our airborne troops dropped down on

U. S. Army Air Forces, Official

An American Gulliver Puts His Finger on a Lilliput Jap Naval Base

To aid them in planning their target runs, B-29 pilots studied scale models of the Japanese Islands. This portion shows Yokosuka naval base. The lieutenant points to a ship in dock which had been observed on a previous reconnaissance flight. Compare this model with the air view of Yokosuka (opposite page).

Atsugi airfield, in the Tokyo area, and naval forces began landing at the Yokosuka naval base to begin the task of occupation, the Japanese became aware of a new and strange experience. It was their boast that no foreign soldiers had ever "defiled" their soil during the entire span of history since the mythological Jimmu Tenno supposedly ascended the throne on February 11, 660 B.C.

Japan Disgorges Lands Devoured Long Ago

Only once before our successful march along the road to Tokyo had Japan been threatened by direct attack. Back in 1281, following a smaller expedition the preceding decade, Kublai Khan launched an immense flotilla against that country when the Japanese beheaded his envoys. But, like the Spanish Armada sent against England, it was wrecked by a severe storm. *Kamikaze*, "divine wind," the Japanese called the hurricane which saved them then.

Kamikaze they called the air squadrons which they hurled in suicide dives against our naval craft in a futile attempt to stave off final defeat.

Through wars, however, Japan won large portions of the Empire that now has been torn from her grasp. At the conclusion of her conflict with China in 1894-95, she gained the large island of Formosa and the near-by Pescadores, an area nearly as large as Kyushu. By agreement at the Cairo Conference in 1943, those islands are to be returned to China.

In her war against Russia, 1904-5, Japan acquired half of the island of Sakhalin, which she renamed Karafuto, and was ceded the lease by which the Russian government had held right to the operation of Port Arthur.

Today Russia has regained these areas and has also occupied the Kurils, to which she gave up claims by agreement with Japan in 1875.

Leased territory of Kwantung has been returned to Chinese administration, Dairen be-

U. S. Army Air Forces, Official

The Prying Eye of a B-29 Camera Unveils the Secrets of Yokosuka Naval Base

Installations and ships taking refuge here were heavily bombed. Yank Marines and naval personnel landed here on August 30 to prepare for official surrender and occupation of Japan. Yokosuka guards the constricted entrance to Tokyo Bay.

coming a free port and Port Arthur a Chinese-Russian naval base.

To reach the Russian battlefields in 1904, Japanese officers disembarked many of their troops at Korean ports for their overland drive. Then, in 1910, climaxing years of increasing domination over the Hermit Kingdom, Japan formally annexed Korea as an integral part of the Empire—an increase in territory nearly the size of the main island, Honshu,*

Korea Promised Freedom

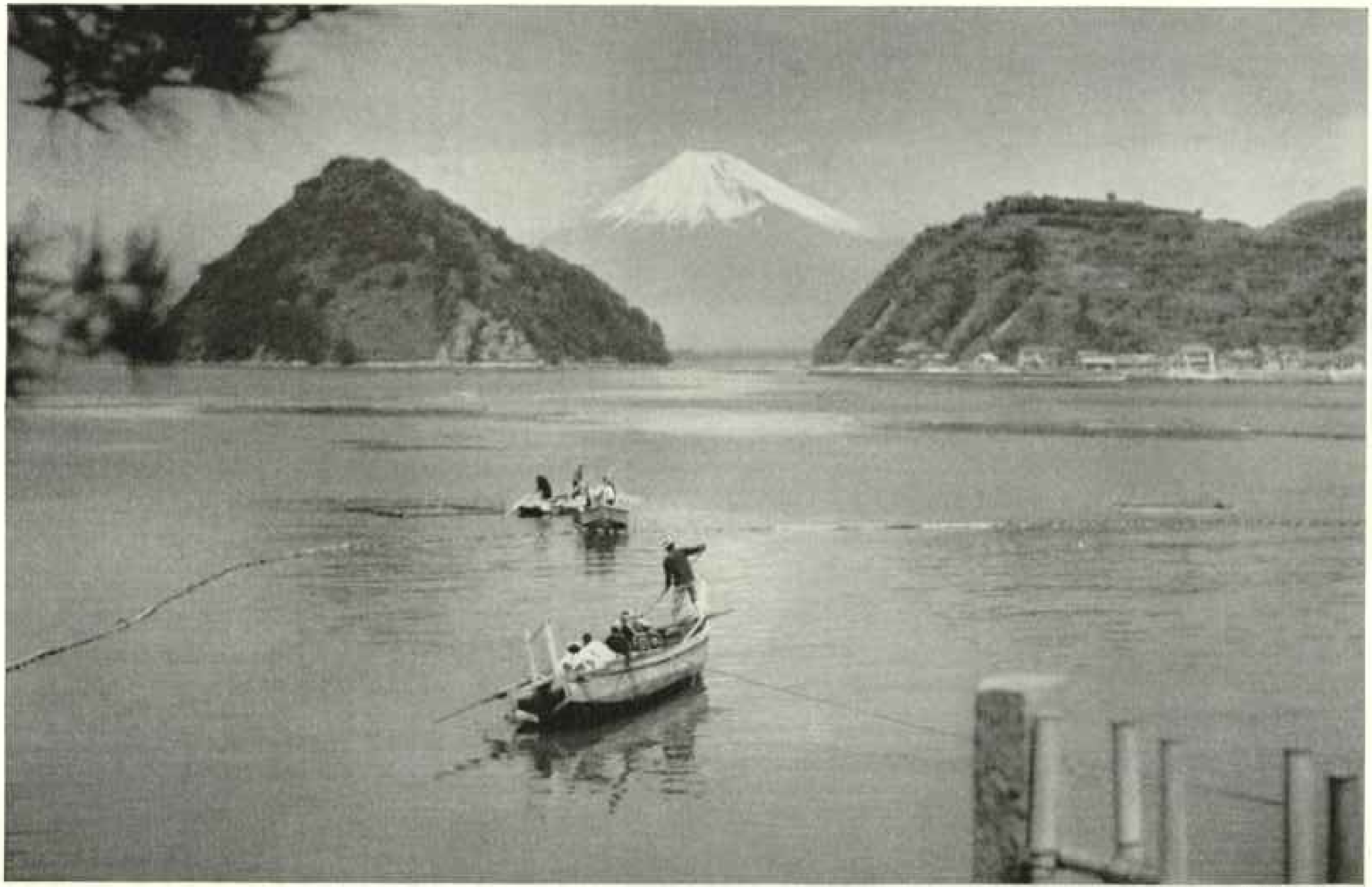
By the Cairo Declaration, the United States, Great Britain, and China promised that in due course Korea shall become free and independent. At present, however, American forces are occupying the southern half of the country, while Russian troops control the northern portion above the 38° parallel.

Early in World War I, Japan fattened her resources when she obtained from China an agreement to exclusive mining rights in eastern Mongolia and the transfer of all mining and railway privileges in Shantung previously held by the Germans.

At that time, too, she moved almost unhindered into the Marianas, Marshall, and Caroline Islands to take over all German possessions of Micronesia north of the Equator. These she held by what might aptly be termed a "barbwire" mandate, since few persons other than her own nationals were allowed to set foot on them until our relentless amphibious forces battered down the doors.

Japan's recent expansion started with the conquest of Manchuria in 1931, the beginning of her occupation of one-fourth of China. In the flush of her early successes preparatory to and following the attack on Pearl Harbor, Japan overran French Indochina, Burma, Malaya, the Netherlands Indies, the Philippines,

* See "Jap Rule in the Hermit Nation," by Willard Price, NATIONAL GEOGRAPHIC MAGAZINE, Oct., 1945.



Bernacchi Kellerman

Fishermen Set Their Nets in Waters That Often Mirror the Snow-mantled Cone of Mount Fuji

Deeply indented Suruga Bay (Wan) is their fishing ground for sardines. Early in October, mountain-climbing veterans of the 27th Division planted Old Glory atop Fuji, framed here between the headland at Mito and the conical island of Awa Shima. This 12,388-foot peak wears its heavy snow cap only part of the year.

U. S. Army Air Forces Official

Skeleton Chimneys, Leaking Boats, and Blocks of Ashes Remind Osaka That B-29's and Carrier Planes Passed over Its Waterfront

Industrial Osaka, home of 3,250,000, was Japan's second city. In four major raids, Superforts dropped nearly 11,000 tons of bombs, destroying half the city. Carrier planes pin-pointed targets. After peace, American war prisoners were quartered in the New Osaka Hotel; Osakans lived in shacks, grew vegetables in the ruins.

Andrew Lopez from Acme

Baby Rides Pickaback while Mother Presents Her Ration Book

Japanese civilians come with carts, pots, and bags to receive their allowance of beans, substitute for scarce rice. American occupation forces found Japan reduced almost to starvation diet. This winter she must get additional supplies from the Asiatic mainland.

and many other islands in the Pacific.

This, however, is history now. Her soldiers who occupied these fronts and lived have been ordered to lay down their arms. One day they must return home. Manchuria, which the Japs called Manchukuo, is again under Chinese administration.

Compared with these vast territories which Nippon grasped but could not hold, the Japanese home islands are small.

If the accompanying map were superimposed at the same latitude on a chart of equal scale of our Atlantic coast, it would extend from central Maine to Daytona Beach, Florida. The four main islands, however, would form only a narrow band, averaging between 100 and 200 miles in width.

U. S. Coastline Only a Third of Japan's

One of the most striking geographical features of these Japanese Islands is their irregularity and the unusual length of their coastlines. Particularly on the Pacific side, their shores are broken by deeply indented bays and long, fingerlike peninsulas.

Overall, Japan proper has a general coastline approximately three times that of continental United States. In relation to the land surface, there is one mile of shore for each eight or nine square miles of land. In the British Isles, to which Japan is sometimes compared, the ratio is about one to thirteen.

Not all these protected bays, however, are useful as harbors. Many of the best anchorages are in localities that are blocked from the interior by mountains. Some bays which probe rich open districts are too heavily silted and shallow to be of much value.

In peacetime years, Japan had more than 40 ports open to foreign trade. Yet, more than three-fourths of all her international commerce was handled through the three main gateways—Yokohama, Kobe, and Osaka.

Useful and picturesque is the vast protected

Newman from Wide World

"How Will You Have Them—Three Minutes or Hard-boiled?"

The kimono-clad Japanese girl lowers the basket filled with eggs into the hot springs at Beppu. One of the most famous of the thermal regions in Japan, Beppu Spa on the east shore of Kyushu attracts thousands of health seekers. It has alkaline, sulphur, iron, and carbonated baths (page 761).

water space of the Inland Sea. More than 250 miles long and 40 miles wide, this sinuous Japanese Mediterranean nestles among Kyushu, Shikoku, and the lower portion of Honshu.

It opens into Pacific and Korean waters only through easily guarded straits. The one-time huge shipping and industrial centers of Kobe and Osaka, now badly battered, are at one end; Moji and Shimonoseki are at the other. Between were busy, though smaller, ports and industrial centers and the large naval station of Kure, where remnants of the Jap fleet got the death blow. Beside the Inland Sea, too, was Hiroshima, disintegrated by the first atomic bomb (pages 763, 764).

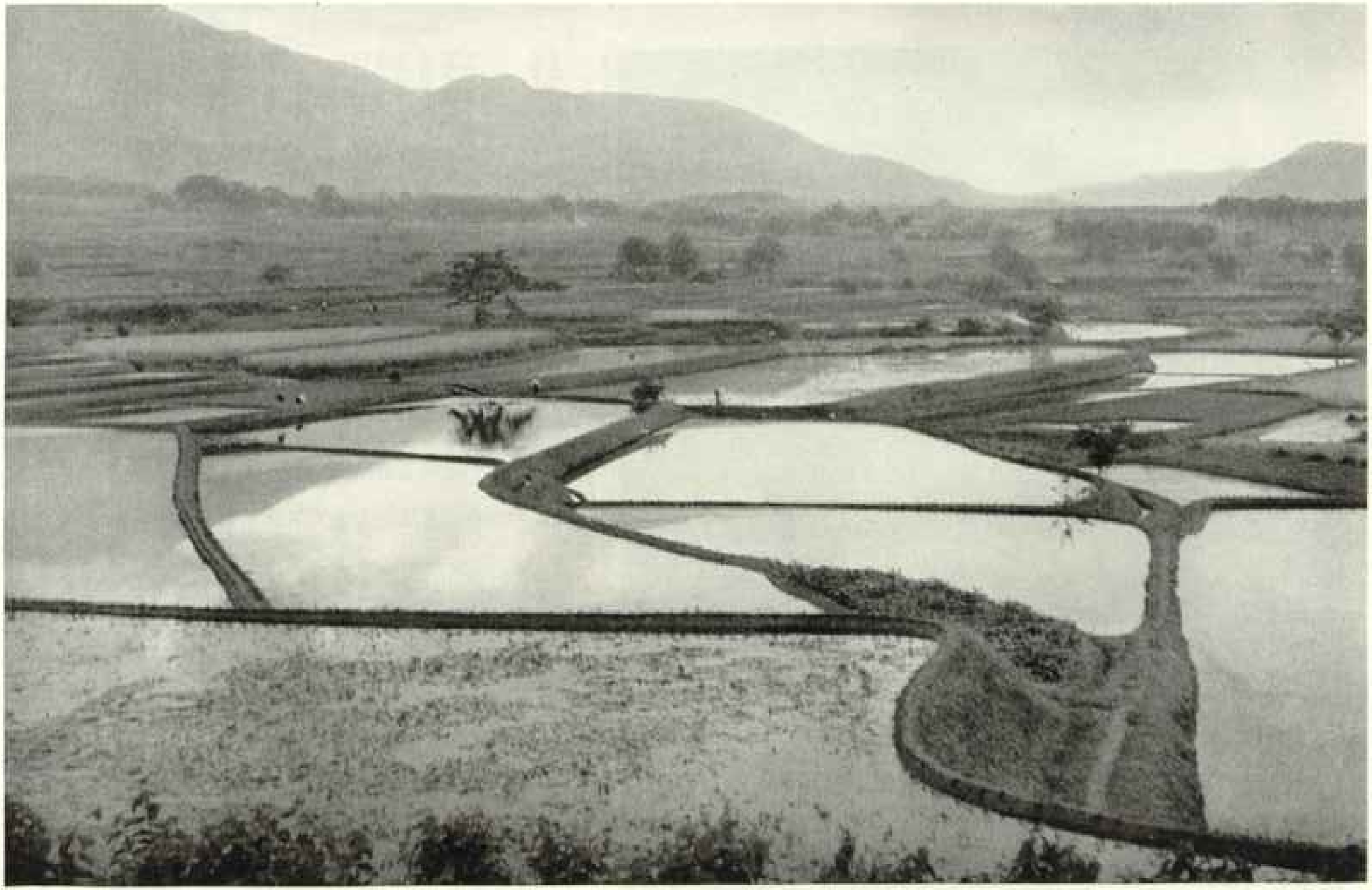
Famed for its scenic beauty, this island-studded reach of water is geologically a series of five flooded valleys linked by narrower channels. The entire Japanese archipelago is formed by the summits of a mountain chain thrust above the sea off the Asiatic mainland.

To the north, narrow straits break direct communication with the continent. Toward Korea the waters are so shallow that a comparatively slight upheaval would permit an army to walk across dry-shod. Much of the East China Sea is no more than 125 to 150 feet deep.

Sea Bottom to Mountaintop, Eight Miles

On the Pacific side, however, is a profound ocean trench, the Tuscarora Deep, where soundings of 20,000 to 30,000 feet have been made. And here, midway between Tokyo Bay (Wan) and hard-won Iwo Jima, is the 34,626-foot Ramapo Deep, second in depth only to the world's deepest known spot on the ocean floor, off Mindanao.

What a tremendous seam has been created here in Mother Earth's rocky crust! Between these depths and the tops of the Japanese mountains there is a difference in elevation of considerably more than eight miles.



Germaine Kellerman

On Such Carefully Terraced and Diked Fields Japanese Farmers Grow Their Chief Crop, Rice

More than half of Japan's cultivated land is planted to this single cereal, yet not enough is produced for the country's needs (page 764). At left center are thick beds of seedlings which will be transplanted by hand into the flooded fields. Farmers have nearly finished transplanting the center plot.

Actually, the seam is not a single break, but several earth fractures. In the north are two arcs, one through Karafuto and another along the extensive sweep of the Kuriles from Kamchatka, which converge on Hokkaido. To the south, from Honshu and Kyushu, extend the arcs of the Ryukyus and the Bonins.

Immense subterranean pressures are exerted along these seams, and earth adjustments are constantly taking place. Here is the solar plexus for earthquake and volcanic activity.

On an average some 1,500 earth tremors annually, or about four every day, shake the islands. Most of them are slight and cause little damage, but others rock the land with savage violence.

Americans located there now need not be surprised if they are awakened at night when floors begin shuddering and building timbers start creaking. During months I was in Japan this was a frequent experience. Many of the wooden structures are built to withstand medium shocks, and some of the newer reenforced-concrete buildings are claimed to be "earthquake proof."

In the last 350 years Japan has suffered more than a score of major earthquakes. That of 1923 leveled Yokohama and much of the Tokyo district. The quake, fire, and tidal waves killed or wounded nearly 100,000.

In the course of World War II Japan had two or three heavy quakes, but we learned little of their destructiveness. Seismologists reported the tremors of December, 1944, to be among the heaviest ever recorded.

Guardedly, Tokyo at first stated that the quake had caused "slight damage."

"The inhabitants of central Japan enjoyed sitting on Mother Earth's cradle," glibly remarked one of her radio commentators. Later, however, Tokyo admitted that tidal waves had caused considerable damage to factories and homes along the coast between Tokyo and Osaka.

Many of these earth shifts originate in the ocean trench off the islands, and, while the tremors themselves may not be severe enough on land to topple buildings, huge tidal waves often are set up. Great walls of rushing water, which sweep into the bays and crash over the coasts, batter shipping and flood extensive areas.

Sleeping Volcanoes Are Treacherous

Along the extended land seams, or arcs, and within the main Japanese islands rise more than 500 volcanoes. Many are old burned-out cones that have remained dormant throughout historical times, but others still puff and fume and blow out ashes and evil-smelling vapors. Some, long thought dead, have suddenly exploded with terrific blasts and caused widespread damage. One such is Bantai in northern Honshu. After ages of quiescence it blew its top in 1888 and destroyed virtually everything in the vicinity. Several valley towns were completely entombed.

Crater Smoke Guides Ships

Many visitors to prewar Japan saw the antics of fiery Mounts Asama and Aso, which vie with each other as the largest active volcanoes in the country. Smoke from the crater of Mt. Mihara on O Shima has long been a familiar guide to navigators sailing into Yokohama.

When B-29 bomber crews flew on missions against Tokyo and surrounding industrial districts, they had as a landmark Japan's crowning volcanic peak, famed Fuji. This dormant cone, sacred to the Japanese, towers in sheer beauty to 12,388 feet, the loftiest mountain in the main islands (page 756).

So supreme to the Japanese is this "Peerless One" that when they found in Formosa a peak that outtopped it, they named the Formosan crest "New High Mountain" (Niitaka).

In addition to these volcanoes, slumbering or awake, hundreds of thermal districts dot the islands. In places the fiery nether regions seem to have been laid bare.

Some have spouting geysers, boiling mud pots, sulphurous fumaroles, and bubbling pools of fantastically colored brews; others gush hot chemical-laden waters that are highly prized as thermal baths.

At Beppu, Kusatsu, Noboribetsu, and other spas, I have seen crowds of Japanese baking in scorching mud and volcanic debris or bathing in scalding waters which my skin could not endure (page 759).

Not all Japan's mountains are cinder cones. Right beside these new geologic outbursts rise colossal bastions and rugged peaks of solid granite.

Through the ages the earth here has undergone many writhing contortions. Although mountains form a rocky backbone, or axis, through the main islands, the ranges are broken by rifts and conflicting formations.

In general, however, they may be regarded as three large mountain systems. The first, or northernmost, of these is the Karafuto system, which extends from Sakhalin down through Hokkaido and reappears again on Honshu.

The second, or southern, swerves up through Kyushu, Shikoku, and continues on Honshu. Actually, this is but the extension and reappearance of the Kunlun Mountains of China.

These two systems come together in central

Andrew Lopez from Acme

The English These Students Learn Can Be Put to Good Use Now

The instructor explains the use of "as" and "so" to two of his shaven-polled students. Pupils in this Tokyo high school were required to take two years of English and urged to study it further. Many Japanese have learned to use the language fluently from study in their own schools.

Honshu. Where they met and mingled, mighty upheavals once took place to create a third massive mountain pile—the Japanese Alps.

Eons ago, the conflicting stresses first produced a colossal rift, or fissure, between the two chains. Known as the Fossa Magna, this giant landbreak extends all the way across the widest part of the island.

Volcanoes Mended the Broken Range

Subsequent volcanic action, however, burst forth to heap this yawning land trench with numerous lofty cones, the culminating one of which is Mount Fuji.

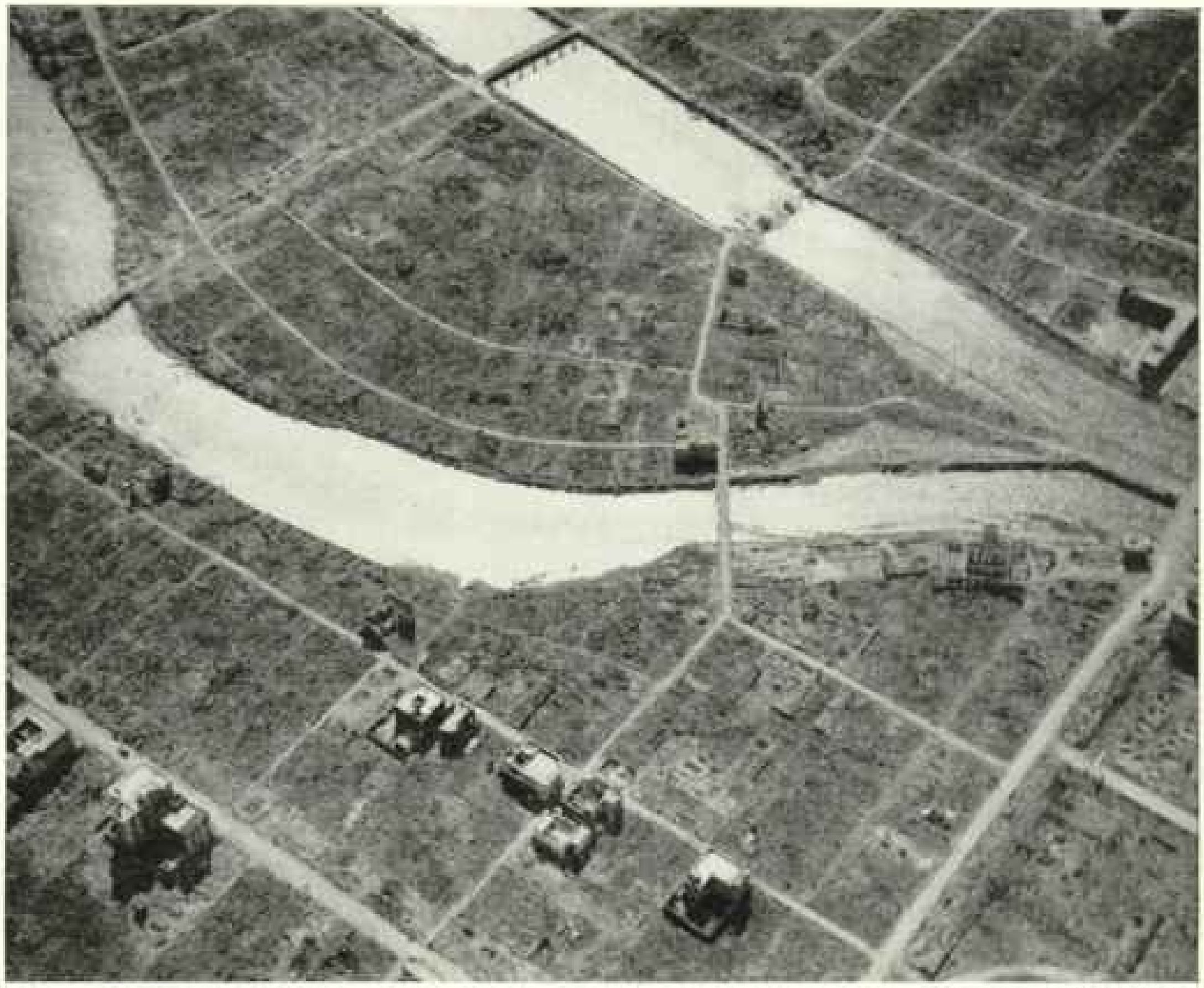
So here, today, towers a chaos of rugged, spectacular peaks, cleft by deep, awe-inspiring ravines. Scores of the crests rear to heights of about 10,000 feet, and the whole region is one of wild natural grandeur.

Because of the mountainous nature of the islands, rivers are short and swift on both sides of the slopes. Only two are more than 200 miles long. Some are born in numerous lakes cradled in the hills; some leap bold cliffs to form striking waterfalls and gleaming cascades. Most are filled with rapids in their upper reaches.

Among the waterfalls Kegon, near Nikko, is perhaps the most famous. Shortly after flowing out of hill-girt Chuzenji Lake (Ko), the River Daiya tilts over the edge of a sheer precipice and plunges in unbroken descent into a rocky gorge more than 330 feet below.

By far the largest, but not the most attractive, of Japan's lakes is Lake Biwa. Nearly 150 miles in circumference, it lies in the narrowest part of central Honshu. With its River Yodo, which empties into Osaka Bay (Wan), it seems almost to sever the island in two.

Few of the rivers are navigable, even as they near the coast. Turbulent as they debouch from the mountains, they spread out on lowlands, and many actually ride above the plains between natural and man-made dikes.



U. S. Army Air Forces, Official

In All but Vanished Hiroshima, the First Atomic Bomb Opened Safes, Even Bank Vaults

Following an "all clear" last August 6, a single bomb floated down by parachute from a B-29. As it burst in the sky, there was a flash as from an exploding sun; trees swayed as in a hurricane. Sixty-eight thousand buildings were destroyed or damaged. Twenty steel and concrete structures were forlorn survivors among pulverized rubble. Glass caved in a dozen miles away. Flames leaped the Ota River firebreaks (center); most bridges remained. One Japanese report gave the death toll as 126,000.

Rising frequently in flood, many of them have deposited wide gravel fans near their mouths, so that considerable areas are rendered untillable.

But the streams are useful to irrigate the checkerboard rice fields and other farms. Many, too, produce hydroelectric power, though in some rivers limited volumes of water permit the operation of only small units.

Of some 1,400 hydroelectric plants scattered over the islands, more than 1,000 have a capacity of less than 3,000 kilowatts. Several large plants, however, were built along the main rivers in central Honshu to provide power for the industrial districts centered about Tokyo, Nagoya, and Osaka.

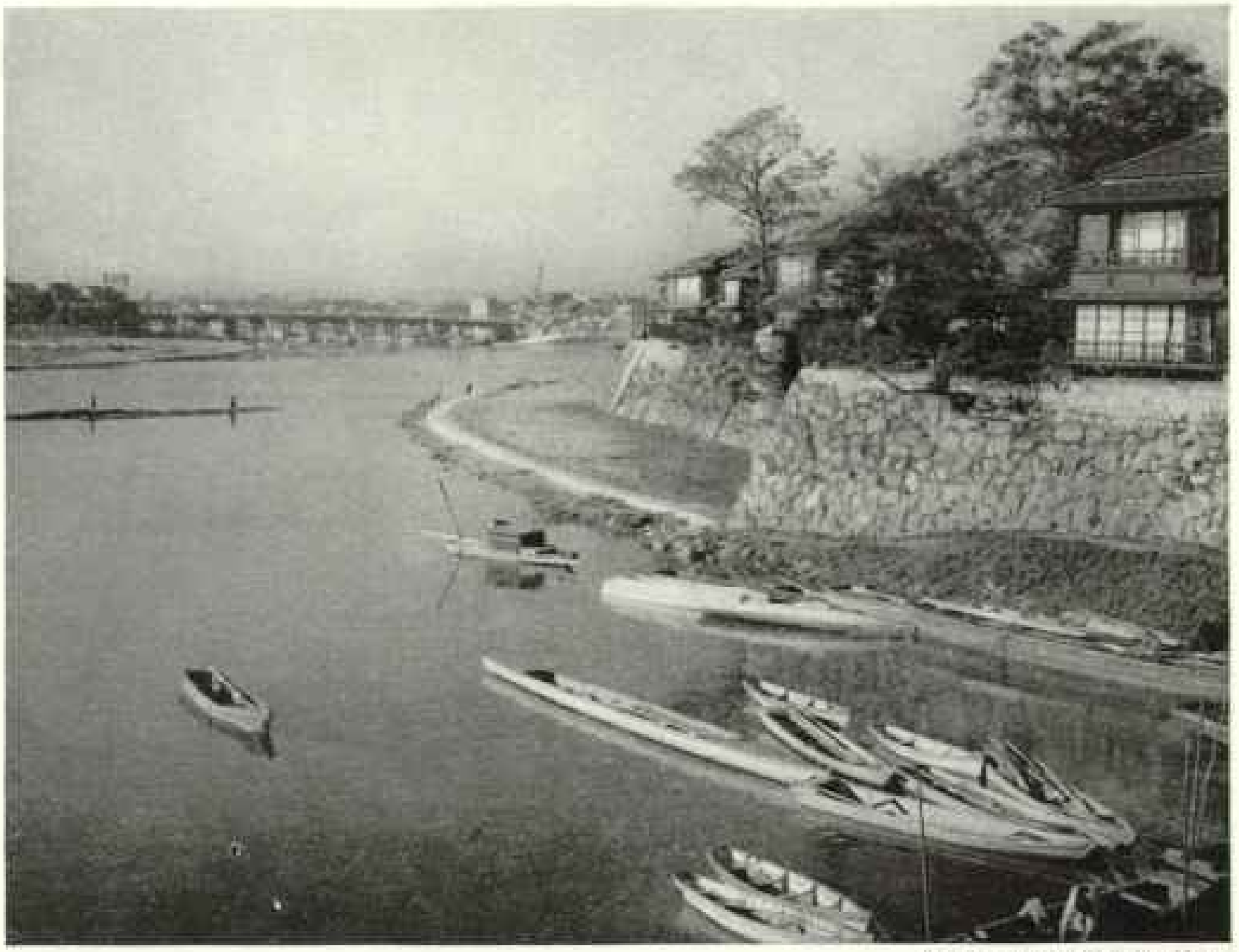
Industry consumed tremendous quantities of both hydroelectricity and steam-generated electricity; nevertheless, before the war Japan had sufficient electric power to be one of the leading countries in percentage of homes wired for lighting.

Because rugged mountains spread over most of Japan, arable land is at a premium. Most of the upland plateaus are restricted by hills, and even coastal plains are nowhere large except in the Kwanto district about Tokyo. Taken together, the arable areas comprise only about 16 percent of the country's total surface.

Trees Cover More than Half of Japan

Trees, however, have found footing on slopes that cannot be tilled, and one of the most vivid impressions of the country is its profusion of greenery.

In Japan proper somewhat more than one-half of the land is covered by forests. Another 8 or 9 percent is classed as "wild land," but some of this is gradually being forested. On



Staff Photographer W. Robert Moore

This Was a Part of Hiroshima B. A. A. (Before Atomic Age)

Wooden homes with paper windows perch on the stone walls above a branch of the Ota River near Hiroshima Castle. In the distance is one of its numerous steel bridges and some of its concrete buildings—part of which withstood the atomic assault. This view was made north of the area shown on page 763.

many hills, so steep that rains have caused landslides, the Japanese patiently build narrow terraces and plant more trees.

Japan's forests provide her with an abundance of timber, charcoal, wood fuel, wood pulp, and other necessaries. Especially her bamboo growths have a multitude of uses; the tender bamboo shoots are an important source of food.

Despite the limited arable lands in the country and the emergence of Japan as an industrial nation, about one-half of her people are tillers of the soil.

Working largely with spades, hoes, and other simple tools, and sometimes using a horse or ox to haul a crude plow, these rural folk cultivate the land to its utmost. No spot, however small, which will support a few spears of grain or a handful of vegetables is ignored.

So small are the majority of farms throughout the home islands that the Japanese peasant might almost be classed as a gardener rather than a farmer.

For centuries farmers of the country have specialized in rice. More than half of all the total cultivated area is devoted to this single crop. Plains and narrow valleys are covered with an elaborate patchwork pattern of terraced and diked rice fields (page 760).

Unwearying in their patience and toil, the farm folk—men, women, and children—work in the fields plowing, transplanting, irrigating, and harvesting this honorable grain. Some hill terraces are so tiny that they look as if they might be tended by children at play.

Wherever drainage and climate permit, fields are made to yield two crops a year. In many places, as soon as rice has been harvested, the fields are "ridged" (spaded into a series of parallel ridges and troughs) and the ridges sown to crops of wheat, barley, beans, or rape.

In some districts, too, even between the fall rice harvest and sowing of winter cereals, the fields are planted with additional quick-maturing crops, such as giant radishes *(daikon)* and eggplants.

Army Air Forces

A Desert of Ashes Studded with Fire-gutted Concrete Structures—This Is Osaka

Four major fire raids destroyed nearly half of this Japanese Pittsburgh of 3,250,000 persons. Cutting diagonally through the burned business section is the canalized Nishi-yokobori-gawa (river). Paralleling it on left is a street along which runs an electric line to Namba Railway Station. Beneath it is a subway, which Americans found in operation. Dark splotches (upper left) are unburned sections.

In Hokkaido, oats are an important spring-sown crop.

Although tea is a universal drink throughout the country, and part of the output was exported to the United States and Canada, tea gardens in Japan occupy a minor portion of the arable lands. Even so, as late as 1938 Japan's tea production was exceeded only by India, Ceylon, and the Netherlands Indies.

Small gardens are scattered over the three southern islands, but most of the crop is grown in the hill districts of Shizuoka Prefecture, midway between Yokohama and Nagoya. Unlike the tea gardens of tropical India and Ceylon, where pickings are frequent, the bushes in Japan remain dormant much of the year and permit only three or four harvests.

Silkworm, "Honorable Little Gentleman"

Many times more important to the Japanese farmer, and indeed to Japan's peacetime trade, was the cultivation of the mulberry, for this is the sole food of the "honorable little gentleman" *(O ko sama)*, the silkworm.

Particularly in central Japan—in the Fossa Magna basins, on the Kwanto or Tokyo Plain, and in the region around Ise Bay (Kai)—immense stands of mulberry trees are grown to provide fresh leaves to satisfy the voracious appetites of these silk-spinning worms.

Almost continuously, from the middle of April to the end of October, upwards of one and a half million farmers normally are busily engaged in rearing the worms. Leaf-covered branches or plucked leaves are kept on trays arranged in tiers in the rooms of farm homes, where the worms feed, mature, and spin their cocoons, and then are replaced by new hatchings.

Most farmers cart the cocoons to small centrally located factories, or filatures, where the cocoons are boiled and the delicate filaments removed and wound on reels.

An ancient home trade, silk culture grew into one of Japan's most important industrial

Natori from Black Star

Japanese Schoolgirls in Hokkaido Learn How to Manipulate Skis

They wear rubber boots to keep their feet dry. During the winter months heavy snows fall in Hokkaido and in the northern part of Honshu. Because of their length, the Japanese home islands have climates ranging from long, snowy winters in the north to subtropical conditions in the south (page 768).

Stanley Troutman from Acme

"And We Don't Want to Hear, 'So Sorry, Wrong Number'"

A Jap officer shows two American lieutenants of the Signal Corps how to operate the telephone switchboard at Atsugi airfield, west of Yokohama. General MacArthur landed in his plane *Bataan* at this field on August 30, 1945, three days before the signing of the surrender terms aboard the U. S. S. *Missouri*.

enterprises. At its peak, nearly 100,000,000 pounds of raw silk have been produced in a single year.

Although roughly three-fourths of the raw silk was shipped to foreign markets, chiefly to the United States, the reeling and the spinning and weaving of the portion processed locally occupied more persons than any other single branch of industry.

The world depression and the extensive use of synthetic yarns in recent years caused considerable reduction in the silk trade, but it topped the list of the country's exports until 1934, when cotton tissues superseded it. In 1939 silk once more held first place. What has happened to the "honorable little gentleman" during the war one as yet can only guess.

Though Japan expanded rapidly as an industrial nation, it is worth while to consider her basic assets in mineral resources.

Japan proper has considerable quantities of coal, but approximately half of the deposits cannot be mined economically. Excluding these, known reserves will last less than 200 years if used at the rate at which they were being consumed when the war lords launched their attack on China in 1937.

Andrew Lopez from Army

Bombed Out of Yokohama, This Jap Couple Built a Hill Shack

From wreckage of their home they salvaged a wicker chair and saved the cat. Not sullen as are some Japanese, they smile as Americans conduct a careful search and inspection of the territory. Yokohama is one of the country's chief ports; factories and shipbuilding yards extended most of the way from its harbor to Tokyo.

Japan's Coal and Iron

The main coal fields are in northern and western Kyushu and in Hokkaido, with smaller ones sprinkled in Honshu. Biggest of the Honshu mines were those at Joban Tanden, northeast of Tokyo, which stoked some of the industries of the Kwanto district.

Iron, the backbone of both industry and war, is inadequate and of badly mixed grades. In peacetime it was more economical for Japan to import the major portion of her supply, rather than to mine some of her own ores.

When the country began turning itself into an arsenal in 1936, only about 13 percent of the ores smelted there came from her own mines. Iron production in the United States for a single year just before Pearl Harbor was equivalent to Japan's estimated total reserves!

Petroleum deposits were also inadequate even for peacetime use. Local wells furnished only about one-tenth of the amount the country used before it sent its war chariots rumbling.

Three districts produced most of the local

output, Akita and Niigata Prefectures on the northwest coast of Honshu and smaller wells on Hokkaido.

For years Japan mined sufficient copper to export sizable quantities, but, as armament factories became hungrier, they consumed the entire supply and called for more from world sources.

Closely associated with many copper deposits was gold. Particularly in the years before the beginning of her aggression, Japan searched out all the gold she could find to balance her international accounts. Deposits of lead, zinc, tin, nickel, mercury, and lesser metals generally are insufficient within Japan itself to support a large industrial economy.

By the Potsdam Declaration Japan will be permitted certain of her industries to sustain her economy and will be allowed access to raw materials, but the Allied Nations are pledged that not again will factories and materials be diverted to making the sinews of war.

It has been said that what Japan has most of is weather. Because of the tremendous length of the prewar island chain, the climate ranged from subarctic conditions in the far north to tropic temperatures in the south.

The central islands lie in the temperate zone, and to some extent the weather there can be compared with that along our Atlantic coast. During the winter Hokkaido and the northern districts of Honshu are blanketed with snow, but in the south subtropic conditions prevail (page 766).

In winter, winds sweep across from Siberia and Manchuria and pick up moisture as they pass over the Sea of Japan. Striking the mountains, they drop their moisture, mainly as snow, in the west and north.

In summer, prevailing winds come from the opposite direction. Air from the Pacific brings warm, sultry days of high humidity.

Between these two marked periods, transitory air currents move in from other quarters. During late spring and early summer months, moisture-soaked air rides down the Kuril chain and from the Sea of Okhotsk regions to bring the *baiu*, or plum-season drizzling rains. In autumn, as well as in spring, air masses originating in the Yangtze basin of China sometimes move across to Japan.

Summer Often Ends in Dread Typhoons

Frequently signaling the breaking of summer is another transient feature of Japan's weather, the dread typhoon. Several of these, whipping up their fury about the islands, delayed our landings preparatory to the signing of surrender documents. Other fierce typhoons that struck Okinawa in September and mid-October killed a number of our servicemen and did extensive damage to our ships and naval installations there.

Late in August and early in September, the time of the ripening of the country's precious rice crop, these intense tropical storms, which are brewed in the Caroline and Marianas Islands area, occasionally swing northward to lash the Japanese islands with savage fury.

The typhoon season lasts from July through October, but not more than two a year strike Japan on an average.

When one strikes, the violent winds and accompanying rains batter coastal shipping, beat down crops, flood rivers, and create havoc in villages and communications. Their fury is not to be regarded lightly, even by large ships at sea.

I remember vividly one time when such a blow caught our ship just outside Kobe harbor. For 36 hours we lay buffeted by screeching gales, our engines turning to keep anchor chains from breaking. We saw bits of the superstructure blown away before the storm subsided sufficiently for us to enter port.

Officially Japan has some 600,000 miles of "roads," but many would be classed as mere lanes in most countries.

In 1931, when I made a trip the length of the islands by motor, the Japanese said I was the first to accomplish such a feat. Part of the route was over narrow dirt roads and rutted bullock-cart tracks.*

Although there has been improvement since then, our army trucks will overfill many of the narrow highways, for there are comparatively few boulevards or wide trunk highways. Limited use of automobiles by the Japanese is one of the chief reasons that road building failed to keep pace with the country's development along other lines.

In beating Japan to her knees, we found some of her geography in our favor, not hers. Her industrial centers, of necessity, had to be concentrated; her communications were vulnerable to attack.

The sea upon which she had relied as a maritime nation became almost completely denied to her by our rigid air and naval blockade. Few of her ships ever got home with the vital goods needed to supplement her inadequate homeland resources.

Thoroughly beaten in war, Japan must now shape her course in peace to attain a position of dignity among nations. During the period of occupation, while the country rebuilds, thousands of young American soldiers will see much of the geographical face of Japan.

* See "Motor Trails in Japan," by W. Robert Moore, in the National Geographic Magazine, March, 1933.

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDING
SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON 6, D. C.

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded fifty-seven 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, 1930, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society–U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

One of the world's largest icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

"I'm giving Jack this alarm clock for Christmas...

and maybe a Hamilton, too!"

"MY HUSBAND may not get his Hamilton for Christmas. But at least he'll get an alarm clock—guaranteed to wake him at six A.M.!

"I don't think he'll be too disappointed—even though he's wanted a Hamilton ever since he joined the Navy.

"Last time Jack was home he told me about the unbelievable accuracy of the Hamilton chronometers and navigating watches on his ship.

"'Darling,' he said, 'if you're thinking of giving anyone a watch for Christmas, promise me it will be a Hamilton!'

"So far I haven't got the Hamilton. My jeweler says it takes time to make fine peacetime Hamiltons after years of building only precision timepieces for war. He says that Jack may have to wait for his Hamilton.

"But I don't think he'll be too disappointed. Not when I tell him that his new alarm clock is named Jack, too!"

HAMILTON

The Watch of Railroad Accuracy

TIMELY INFORMATION FOR CHRISTMAS WATCH BUYERS: Right up to V-J Day, Hamilton was building quantities of precision war timepieces. Not until our government contracts were cancelled could we begin the painstaking job of making civilian watches again. A few are now available. And more are coming soon. But if you can't find a Hamilton this Christmas, give a Hamilton Gift Certificate instead. Your Hamilton jeweler will be glad to secure one for you. It stands for America's most beautiful watch—the coming Hamilton! Hamilton Watch Company, Dept. GD-5, Lancaster, Penna.

NOTE: Hamilton's experience building watches for railroad men and for the armed forces insures greatest possible accuracy in *every* size and grade.

FINISH THE JOB—BUY VICTORY BONDS AND HOLD THEM!

Good Home Movie News

New Filmo Cameras, Filmosound Projectors

See them now at your

Bell & Howell Dealer's

New Filmosound sound-on-film projector. Clear, brilliant pictures . . . natural sound reproduction without distortion. Quiet, cool, easy to use.

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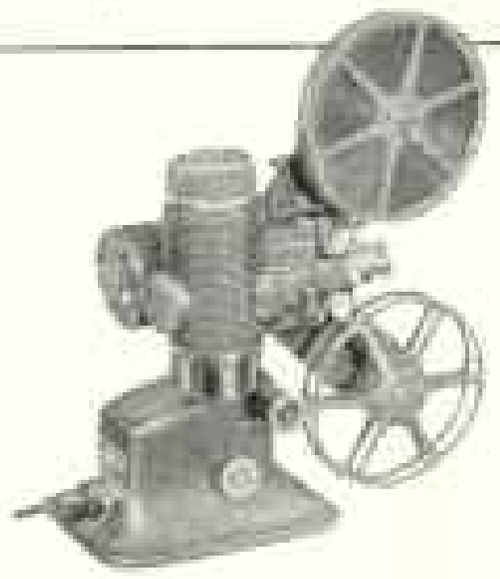
New Filmo "Sportster," the all-purpose home movie camera using economical 8mm. film. All Filmos carry a lifetime guarantee.

New Filmo-Master "400" for 8mm. film . . . up to 55 minutes of uninterrupted movies. Entirely gear-driven. Brilliant pictures.



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See this new B&H home movie equipment today—precision-built by the makers of Hollywood's preferred studio equipment.

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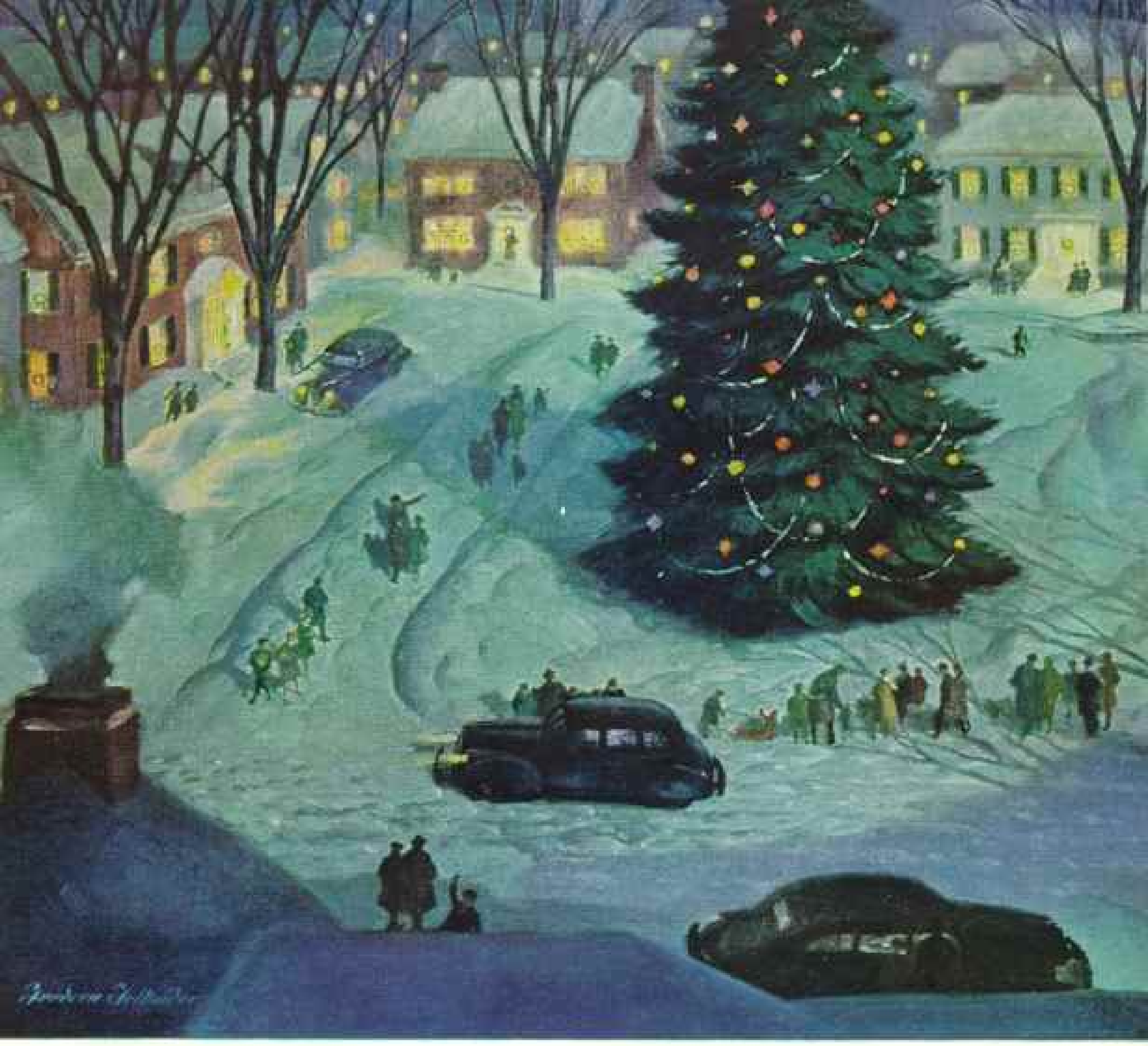


A Christmas to remember . . .

This year, the beautiful old Yuletide sentiment — "peace on earth" — means something far more real to most of us than it did at any previous Christmas . . . In this ever-memorable year of 1945, peace is a dearly won and precious acquisition we know we must treasure vigilantly . . . And so, as the lights of this inspiring Christmas twinkle at our hearthsides, as carolers sing their joyous roundelays and community trees gleam with friendliness, our nation hopefully, confidently and resolutely faces the opportunity to shape its destiny.

★ STUDEBAKER ★

Builder of cars worthy of America's homes

HE PILOTED A GIANT TRANSPORT

Relaxed and listening, he sees his fondest wish come true . . . For music has a way of reaching down inside and stirring deep thoughts. A song, a surge of orchestral harmony—and inspiration soars.

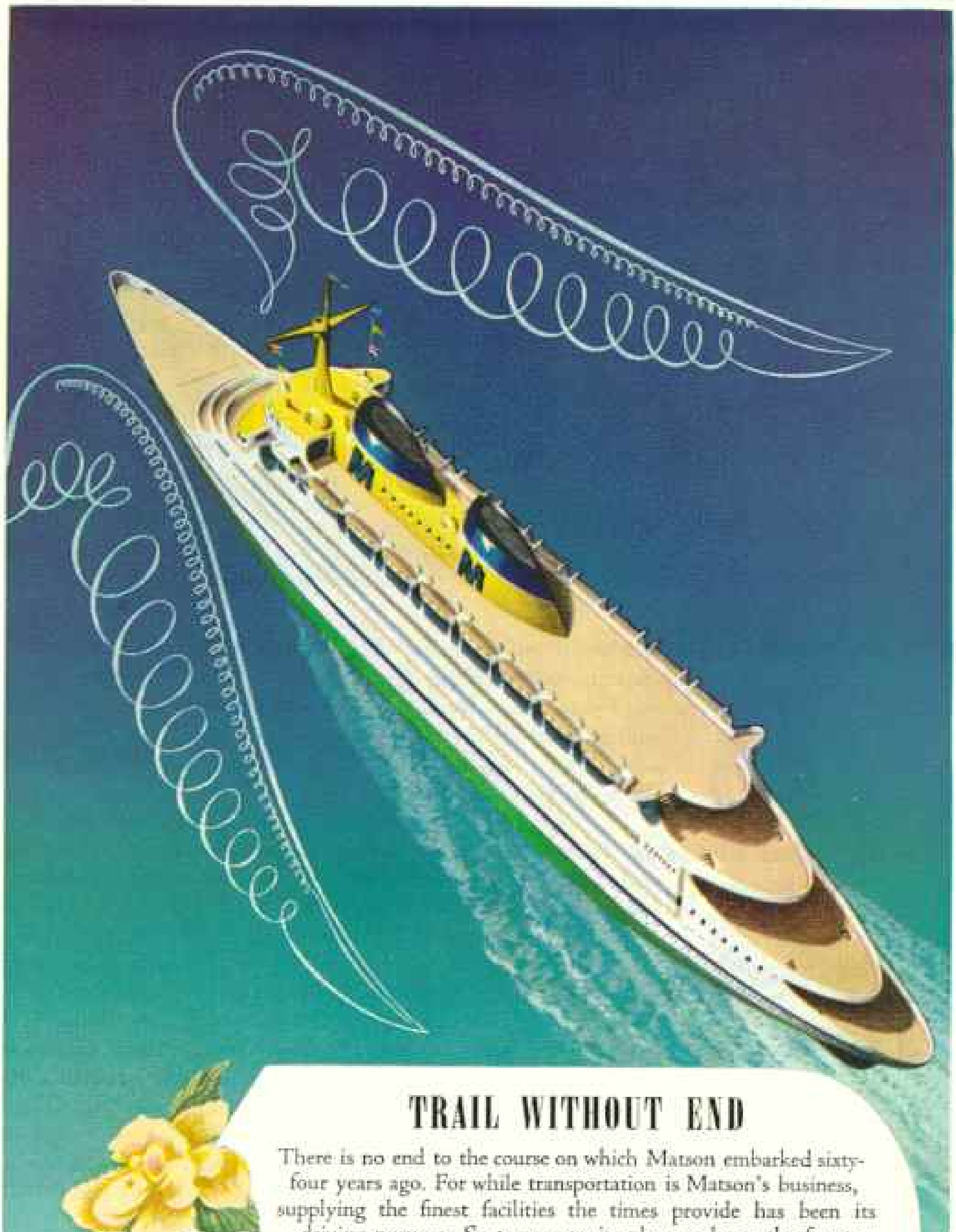
How easily the girl sees herself in the place of the performer, imagining the triumph of her ambition . . . so satisfying are the dreams and aspirations that music evokes—especially when you hear it at its best . . .

SHE HEARD THE OVATION OF A GREAT AUDIENCE

AND SOON you will be able to hear all your favorite music with utmost fidelity on the finest Stromberg-Carlsons ever made. New advances in radio reception—FM and Standard Broadcast—new developments in record reproduction, are features of the magnificent instruments now being prepared for you. Richer clarity and tone, lovelier cabinet designs—yes, you'll be very glad you waited to choose from the wide variety of Stromberg-Carlsons—priced within the reach of all.

For the main radio in your home . . . there is nothing finer than a

STROMBERG-CARLSON



TRAIL WITHOUT END

There is no end to the course on which Matson embarked sixty-four years ago. For while transportation is Matson's business, supplying the finest facilities the times provide has been its driving purpose. So tomorrow, its plans embrace the finest in travel facilities between Mainland and Islands which can be offered in the air or on the sea.

Matson KNOWS THE PACIFIC

MATSON LINES TO HAWAII AND THE SOUTH PACIFIC
SAMOA • FIJI • NEW ZEALAND • AUSTRALIA

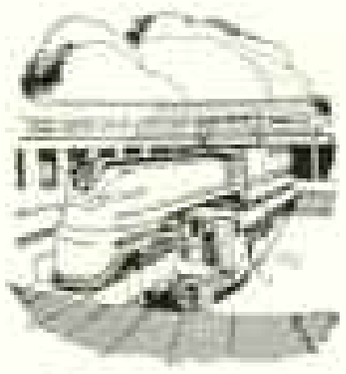
OFFICES: SAN FRANCISCO • LOS ANGELES
NEW YORK • CHICAGO

LOOKING UP THE TRACKS

To Demobilization To you returning Veterans we feel the same urgent responsibility for getting you Home as we did for getting you to the Front. There are inspiration and satisfaction in the happy ending of a job that only yesterday had nothing but the grimmest aspects. Count on us to keep the supply lines open and to serve you faithfully.

To Reconversion To Industry we say it is our purpose to gear our operations with yours, in order to smooth and shorten the route to Reconversion and Peacetime Commerce. We will provide the type of transportation required by manufacturers for the prompt delivery for needed raw material and for the economic distribution of finished goods.

To Modernization To Travelers, as soon as demobilization permits, we pledge a full and quick transition of passenger service—tuned to the times and to the traditions of The Milwaukee Road . . . To old friends, who at times relinquished their privilege to travel in their accustomed style, we convey our gratitude for their patience and understanding . . . Good days of comfort and hospitality for all Milwaukee Road patrons are ahead.



The Milwaukee Road looks forward to being unceasingly busy in performing these jobs. A long-term program of development and modernization of plant and facilities is being carried forward. Later plans, now in the making, will be progressively unfolded.

Look up the track! The signals say "All clear!" Let's go!

CHICAGO MILWAUKEE ST. PAUL AND PACIFIC

THE MILWAUKEE ROAD

FLASH!

These eight great airlines have purchased 103 majestic Lockheed Constellations to serve every major country on every continent:

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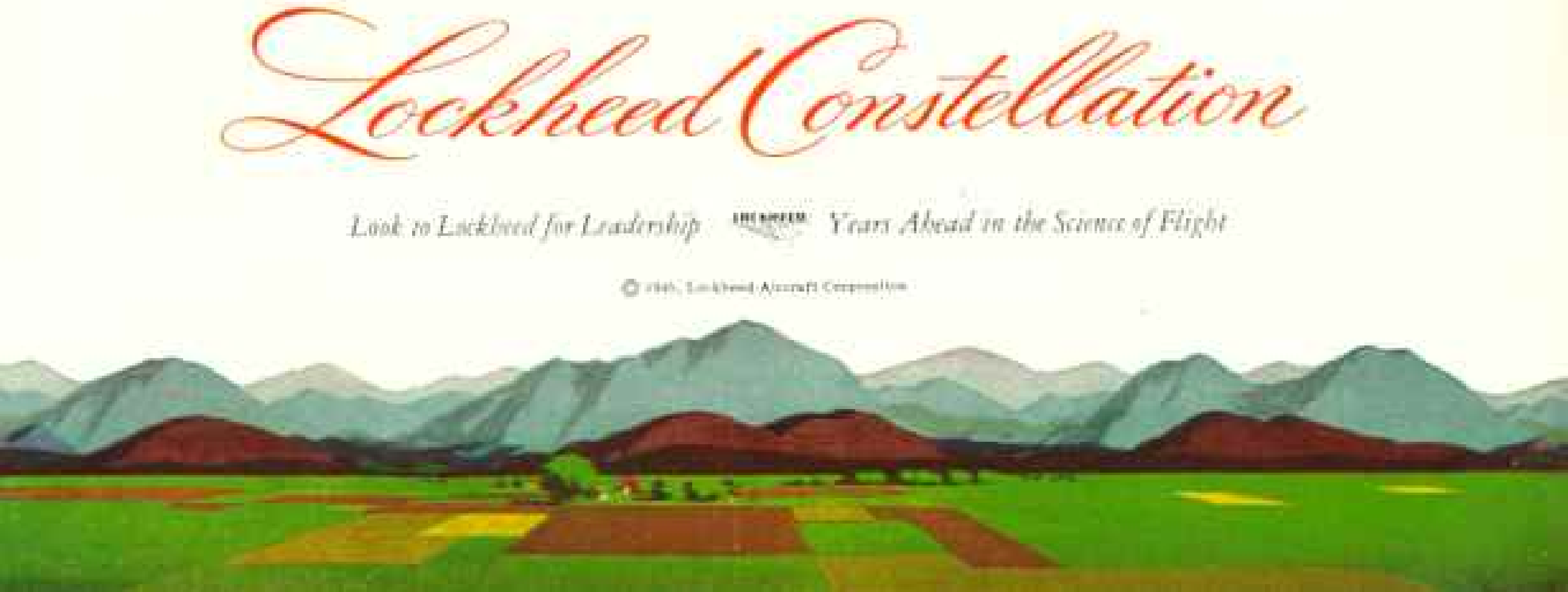
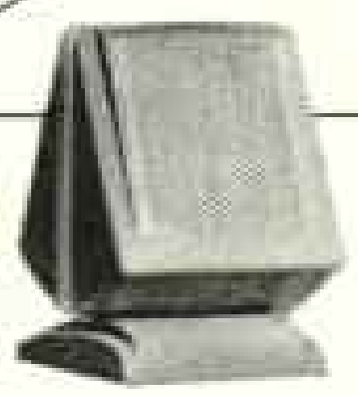
THE NEW AIRLINE STANDARD

Lockheed Constellation

Look to Lockheed for Leadership — *Years Ahead in the Science of Flight*





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Through the microphone heart of Dictaphone Electronic Dictation, this top executive gains a new and more precise control of his entire far-flung organization.

At will, he speaks his plans, instructions and decisions into the small desk microphone . . . even records over-the-desk discussions. He finds that it saves precious time to relax and talk his work away. Especially since his secretary, working independently, is free to protect him from interruptions . . . and do other work for him, too.

Learn about this new business expediter . . . how it can be the Control Center *for your* executive action. It's now available without priority.

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DICTAPHONE *Electronic Dictation*

1st

to use synthetic enamel on motorcars!

Ford

You've probably wondered why Ford cars have stayed so shining bright through the war years. The secret is a Ford "first"—the use of synthetic resin enamel.

This Ford enamel is a truly lasting finish. It holds indefinitely its color and luster. It protects more completely than other finishes, for it is applied in thicker coats, and needs no sanding or polishing. This synthetic enamel adheres more firmly to bodies and fenders. And it means added economy for Ford owners, for it reduces car finishing time from several weeks to a few hours.

In 1928, Ford introduced its use on certain car and truck parts. Five years later, methods of applying it to the entire car were perfected, and since then all Fords have been synthetic resin enameled.

This long-life finish is one result of Ford desire to better products and processes continually—an attitude that will bring many more Ford "firsts"—and ever-finer Ford-built cars and trucks.

TUNE IN . . . THE FORD SHOW . . . *CBS, Tuesdays, 10-10:30 P.M., E.T.* THE FORD SUNDAY EVENING HOUR *ABC, Sundays, 8-9 P.M., E.T.*

EXPECT THE "FIRSTS" FROM FORD!

World Record, 1893

The Empire State Express, with Engine 999, raced a mile at 112¾ miles an hour . . . a new record.

"The EMPIRE" hangs up a new record!

WAR RECORD, 1941-45

Today's streamlined *Empires* are New York Central's newest. Starting their runs on Pearl Harbor Day, 1941, they have flashed daily between Cleveland, Detroit and New York with nearly 3,000,000 passengers . . . sharing the task of busy night trains . . . and achieving a record of comfort and dependability that is rich in promise for the finer trains of tomorrow.

Two way Comfort

Says this business man, "The 100% comfort of *Empire* coach travel includes the comfort of knowing that my reclining seat . . . reserved without charge . . . will be waiting even if I catch the train at the last minute."

Divan for Two

It's easy to chat at the new divan tables aboard the *Empire*'s sound-proofed dining car. And how *much* the smart service and expert cookery add to the fun of daylight travel on the Water Level Route.

Headstart on Home!

Many a returning officer gets a foretaste of home comfort . . . and many an executive, busy with reconversion, finds a few hours of relaxation . . . in the *Empire*'s deep-cushioned parlor car chairs.

Living Room on Wheels

That's the *Empire*'s observation car, with its writing and card tables, magazines, radio and refreshment bar. And as in all *Empire* cars, the air is silently washed, warmed and completely changed every few minutes.

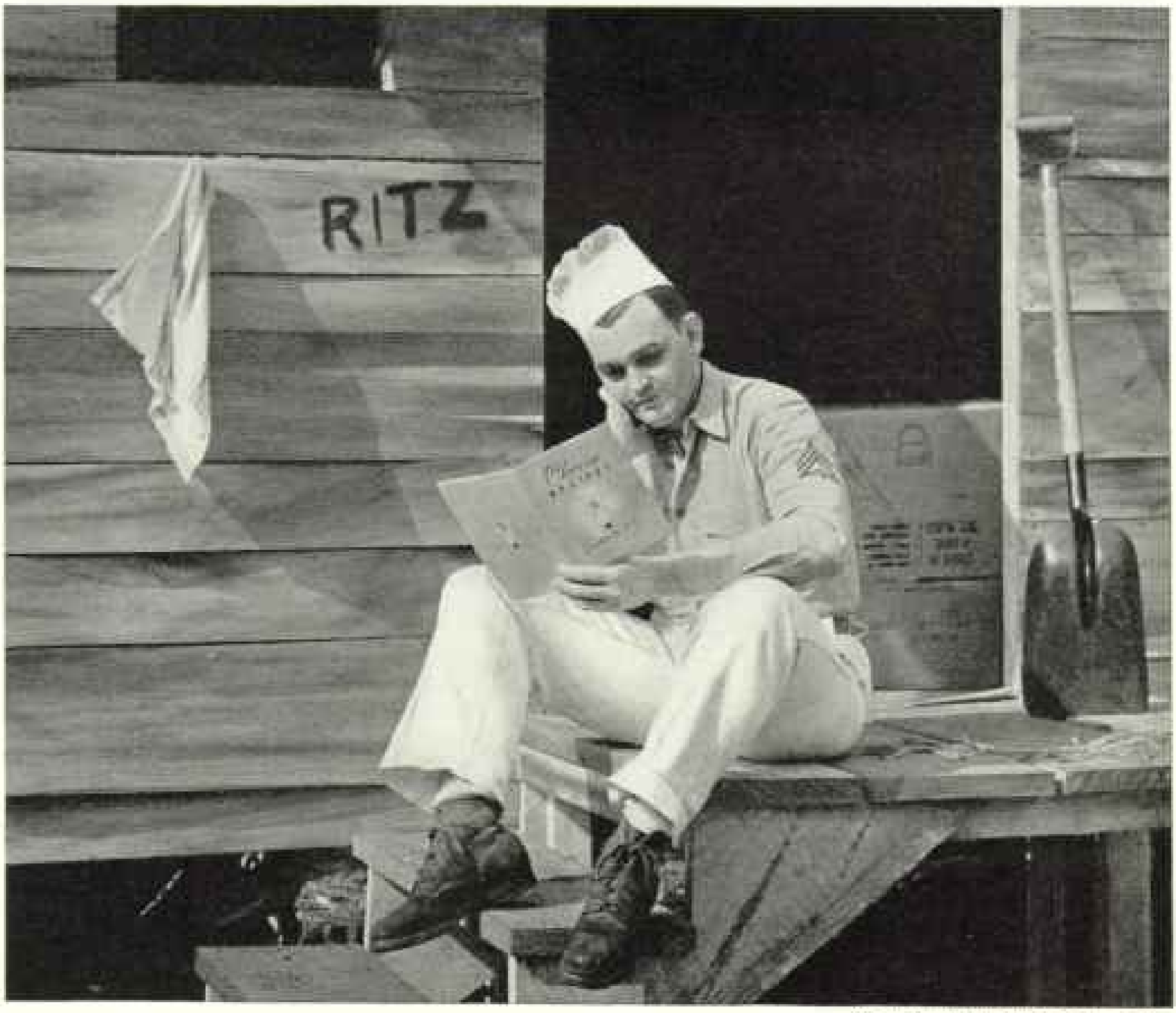
FREE NEW BOOKLET

"Out on the Line," with 48 sketches of railroaders in action, drawn by noted war artists. Write Room 1261E, 466 Lexington Ave., New York 17, N. Y.

BUY VICTORY BONDS

NEW YORK CENTRAL

THE WATER LEVEL ROUTE



KEEP ON BUYING VICTORY BONDS

It all comes under the head of research!

Mike, the mess sergeant, is studying a breezy little booklet entitled "Cheese Recipes for Service Men." They're not ordinary recipes. They're definitely designed for serving hungry men. Mike will get some new ideas. And his men will probably get some tasty new dishes.

That booklet* is a small sample of the broad service rendered by two National Dairy Kitchens—the Sealtest Kitchen in New York and the Kraft Kitchen in Chicago. Both are staffed with expert dietitians and home economists. Both arrange food demonstrations for clubs, schools, colleges and other organizations. Both prepare and publish colorful, informative booklets and recipe material.

Over 10 million pieces of this material were distributed last year, much of it on direct request. The recipes are practical, economical, timely. They are carefully tested for nutritional value. They offer menus for small children and big U.S.O. parties and everything in between—right around the clock and the calendar.

*Supplied by thousands to service cooks' and bakers' schools.

This is not test tube and microscope research. But it is in the same spirit. And it is just as truly a contribution to public welfare as the scientist in our Laboratories who develops a new pharmaceutical or fiber or plastic—a better butter, cheese, ice cream or a new baby food—from "nature's most nearly perfect food"—*milk*.

Dedicated to the wider use and better understanding of dairy products as human food . . . as a base for the development of new products and materials . . . as a source of health and enduring progress on the farms and in the towns and cities of America.

NATIONAL DAIRY
PRODUCTS CORPORATION
AND AFFILIATED COMPANIES

IT'S *today*, and *tomorrow*, and *every* day —as the boys come home.

Railroads played a major part in their comings and goings. Trains carried almost all of them—many of them time after time. More than a million a month are riding the trains right now. And trains successfully handled the even bigger job of carrying nine-tenths of the mountains of material which they needed to win the war.

The end of the war means many things to many people. One thing it means to the railroads is a chance to get long-denied material for building new locomotives, new freight cars to replace equipment worn by war service—and fine, new passenger trains to provide added comfort and luxury in swift, safe travel.

Railroads are at work on these things now, today and every day. In that great time just starting, they will serve you in better style than ever before—but with the same responsible and faithful performance upon which America has learned, both in war and peace, that it can rely.

LET'S FINISH THE JOB
BUY VICTORY BONDS

AMERICAN RAILROADS

—Looking Ahead

"Christmas is Coming"

You can't beat

* **Inter Woven Socks**

*REG U S PAT OFF.

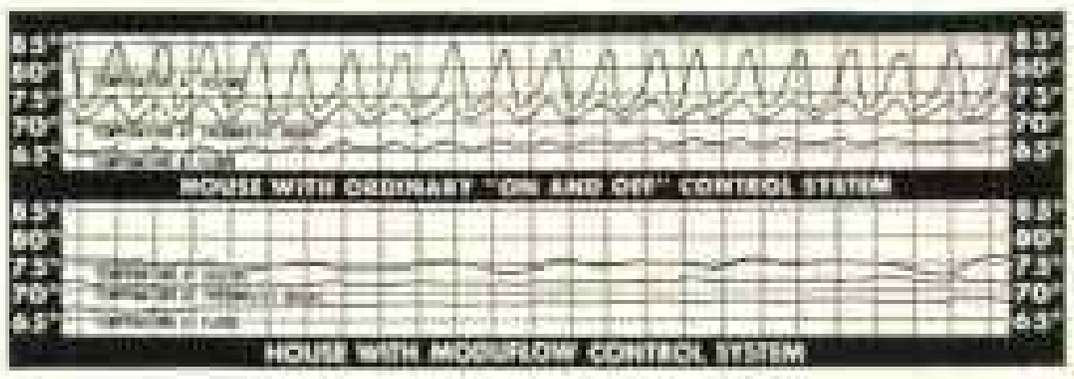
BY THE LARGEST MANUFACTURER OF MEN'S SOCKS IN THE WORLD

Give your living room
The THERMOMETER TEST

One of these days when weather gets down below freezing, just try this thermometer test in your living room. You'll probably be amazed to find that there is as much as twenty degrees difference between the temperature at your ceiling and on your floor. (See chart below.)

That's because, in the average home, equipped with an ordinary on-and-off control system, the warm air rises to the ceiling, and the cold air forms in layers along the floor. But with Honeywell's new MODUFLOW control system, that's all different. By an ingenious method of control and supply, Moduflow nearly equalizes ceiling and floor temperatures. Much of the heat formerly wasted at the ceiling is used to heat the lower levels; result, blissful comfort from head to foot with greater efficiency of operation.

And here's the best news of all. Moduflow can be easily and inexpensively installed in your present automatic heating system. You don't have to wait until you build a new home. Only a limited number of Moduflow systems are now available, but production is gradually catching up with demand. The sooner you order from your heating dealer, the sooner you will be able to enjoy the comfort of Moduflow. Mail the coupon today for an interesting booklet that tells how Moduflow will "evolutionize" house heating.



See how Moduflow smooths out the up-and-down temperatures caused by ordinary control systems. Shown above are actual temperature recordings taken in two identical homes — one with and one without Moduflow. Without Moduflow, temperature varies as much as 20 degrees from floor to ceiling. With Moduflow there is comfort temperature from ceiling to floor.

Send for this book FREE!

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Please send my free copy of "Heating and Air Conditioning the Postwar Home."

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Address_____

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MODUFLOW

THE NEW HONEYWELL HEATING CONTROL SYSTEM

RAILROADING IS *People*

Nothing in this world is as interesting as—people! Nothing is as important as people . . . people who live and grow, love and get married . . . people with their habits and manners, their likes and dislikes. Nothing really matters but—people.

The city? We think of it as people. The countryside is people. And so is the railroad . . . just folks—all of them!

SOLDIER, SAILOR, MARINE: we wish to serve you well on your furlough.

Locomotives, cars, equipment . . . all these have been thought out, designed, engineered, developed and built by people for people. They are of value only as they serve people.

We of the Pennsylvania Railroad try to keep in mind always: everything we do is measured by how we help people, how we get along with people, how we treat people. Our greatest reward is in having people think well of us . . . because we have served them well!

PENNSYLVANIA RAILROAD

Serving The Nation

BUY UNITED STATES VICTORY BONDS AND STAMPS

Yes, its Engine is still out Front

PROBABLY it is no real surprise to you that the new cars for '46 have their engines out front where good engineering sense puts them.

Certainly it is no surprise to old-time Buick followers that the long, reaching bonnet of this car houses a power plant that is still out front in its field as it is in the car.

It's a '46 Fireball straight-eight that employs the matchless valve-in-head principle used in the engines of every American warplane.

It's a power plant, indeed, which in a fistful of vital dimensions is actually *made to closer tolerances than modern aircraft engines are.*

Put foot to treadle, and in the leaping response of weight-thrifty Fliteweight pistons you find still more lift and life than in the last Buicks to come your way.

It's an engine frugal on oil to the point of amazement — silkily smooth and ready from the very minute your car rolls from the line.

Yes, in spite of the times, we've found ways to do things to this Buick power plant — things you'll feel and thrill over the first time you can try it out.

The eyes are right in putting this Buick lovely at the head of the style parade; but nowhere more than in the engine is it plain that this 1946 honey is the *best Buick yet.*

BUY VICTORY BONDS

When better automobiles are built

BUICK

will build them

Luxurious lower-deck lounge of the Stratocruiser

London—660 minutes by Stratocruiser

Some millions of Americans have recently made new friends in countries all around the globe. Many of those friendships will continue to flourish. For there are no longer any "far-away places." The Boeing Stratocruiser will measure in hours the distance to any spot on earth.

You would expect such an airplane from Boeing—world's leading builder of four-engine aircraft, pioneer in supercharged planes for over-weather stratosphere flight, and creator of the mighty B-29. And the Boeing Stratocruiser will not disappoint you. It is what you want and the airlines need.

The Stratocruiser brings a new, unprecedented standard of performance, operating efficiency and reliability. For it makes full use of the aerodynamic, structural and mechanical advancements developed by Boeing for big bombers and transports during the war. It has a maximum cruising speed of 340 miles per hour and provides exceptionally low operating costs over a wide range of flying distances—from 300 to more than 3000 miles.

Most versatile of all large aircraft, its spacious double-deck design and big payload capacity fit the Stratocruiser for almost every type of medium or long range operation. In the standard, domestic version, 81 passengers may be carried—67 on the upper deck in large, comfortable reclining chairs and 14 in luxurious seats in the lounge—with ample luggage and cargo capacity. As a de luxe transocean plane, the Stratocruiser will accommodate 75 passengers on daylight trips or at night—provide 30 unusually spacious berths plus 15 additional seats—together with baggage and cargo. As a "commuter" transport, it can seat 114 passengers, and in all-cargo operation its 19½-ton capacity and easy-loading provisions make it outstandingly efficient.

For any of these kinds of service, the Boeing Stratocruiser offers the lowest direct operating cost per ton-mile achieved by any existing aircraft. To meet the need for all types of feeder and main line operation, other Boeing transports are also on the way.

• • •

The extraordinary performance of the Stratocruiser stems directly from Boeing principles of research, design, engineering and manufacture. You can be sure that any airplane "Built by Boeing" is built to lead.

DESIGNERS OF THE B-29 SUPERFORTRESS • THE FLYING FORTRESS • THE NEW STRATOCRUISER
THE KAYDET TRAINER • THE STRATOLINER • PAN AMERICAN CLIPPERS

BOEING

Early American Old Spice
Gifts in America's Own Fragrance

Bath Salts 1.00†
Toilet Water 1.00†
Dusting Powder 1.00†

Lovely Gift Bouquets from
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Toilet Water 1.00†
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Early American Old Spice
Gifts of Shaving Requisites for Him

Shaving Mug 1.00
Invisible Talcum .75†
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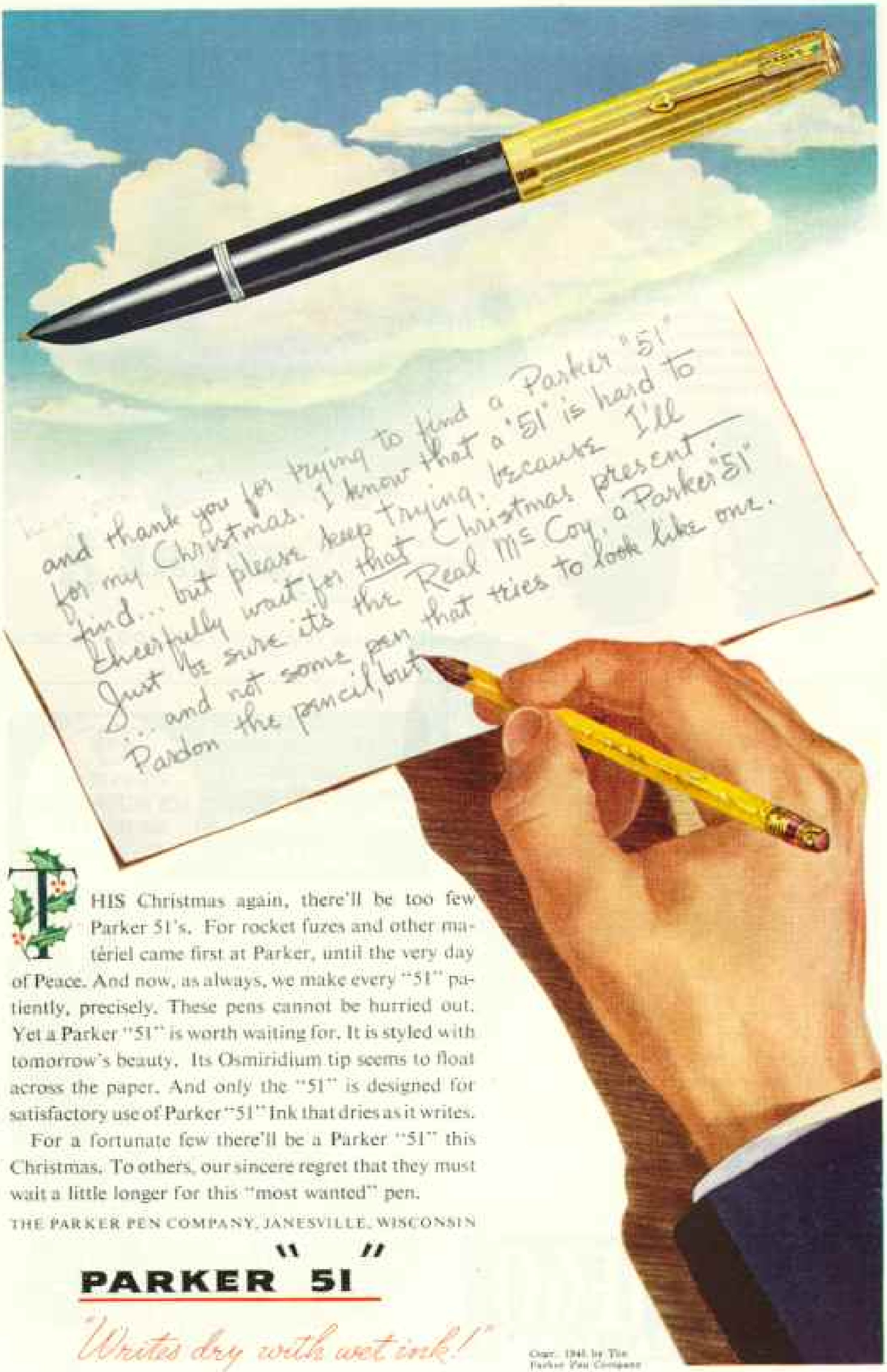

THIS Christmas again, there'll be too few Parker 51's. For rocket fuzes and other matériel came first at Parker, until the very day of Peace. And now, as always, we make every "51" patiently, precisely. These pens cannot be hurried out. Yet a Parker "51" is worth waiting for. It is styled with tomorrow's beauty. Its Osmiridium tip seems to float across the paper. And only the "51" is designed for satisfactory use of Parker "51" Ink that dries as it writes.

For a fortunate few there'll be a Parker "51" this Christmas. To others, our sincere regret that they must wait a little longer for this "most wanted" pen.

THE PARKER PEN COMPANY, JANESVILLE, WISCONSIN

PARKER "51"

"Writes dry with wet ink!"

"Buy Victory Bonds—They Identify You"

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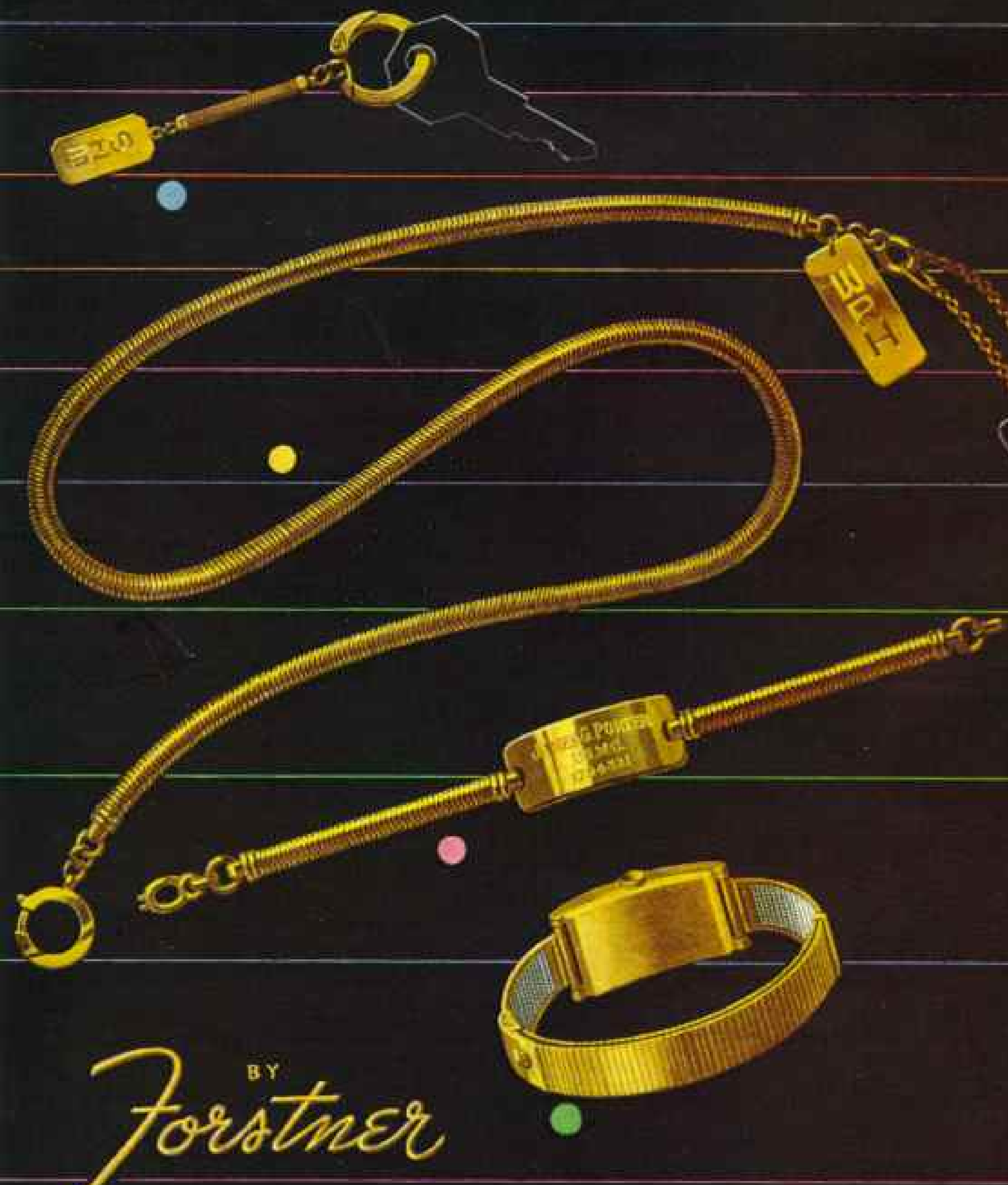

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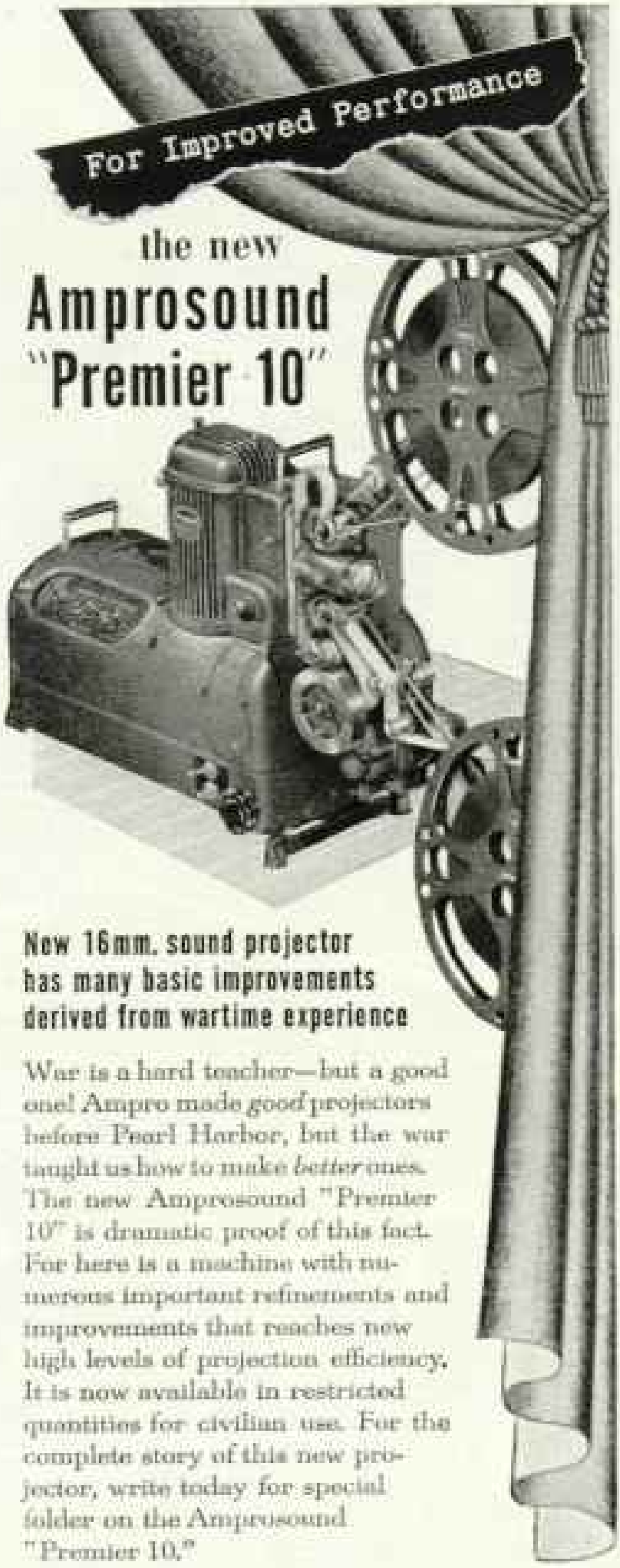

the new

Amprosound "Premier 10"

New 16mm. sound projector has many basic improvements derived from wartime experience

War is a hard teacher—but a good one! Ampro made good projectors before Pearl Harbor, but the war taught us how to make *better* ones. The new Amprosound "Premier 10" is dramatic proof of this fact. For here is a machine with numerous important refinements and improvements that reaches new high levels of projection efficiency. It is now available in restricted quantities for civilian use. For the complete story of this new projector, write today for special folder on the Amprosound "Premier 10."

AMPRO

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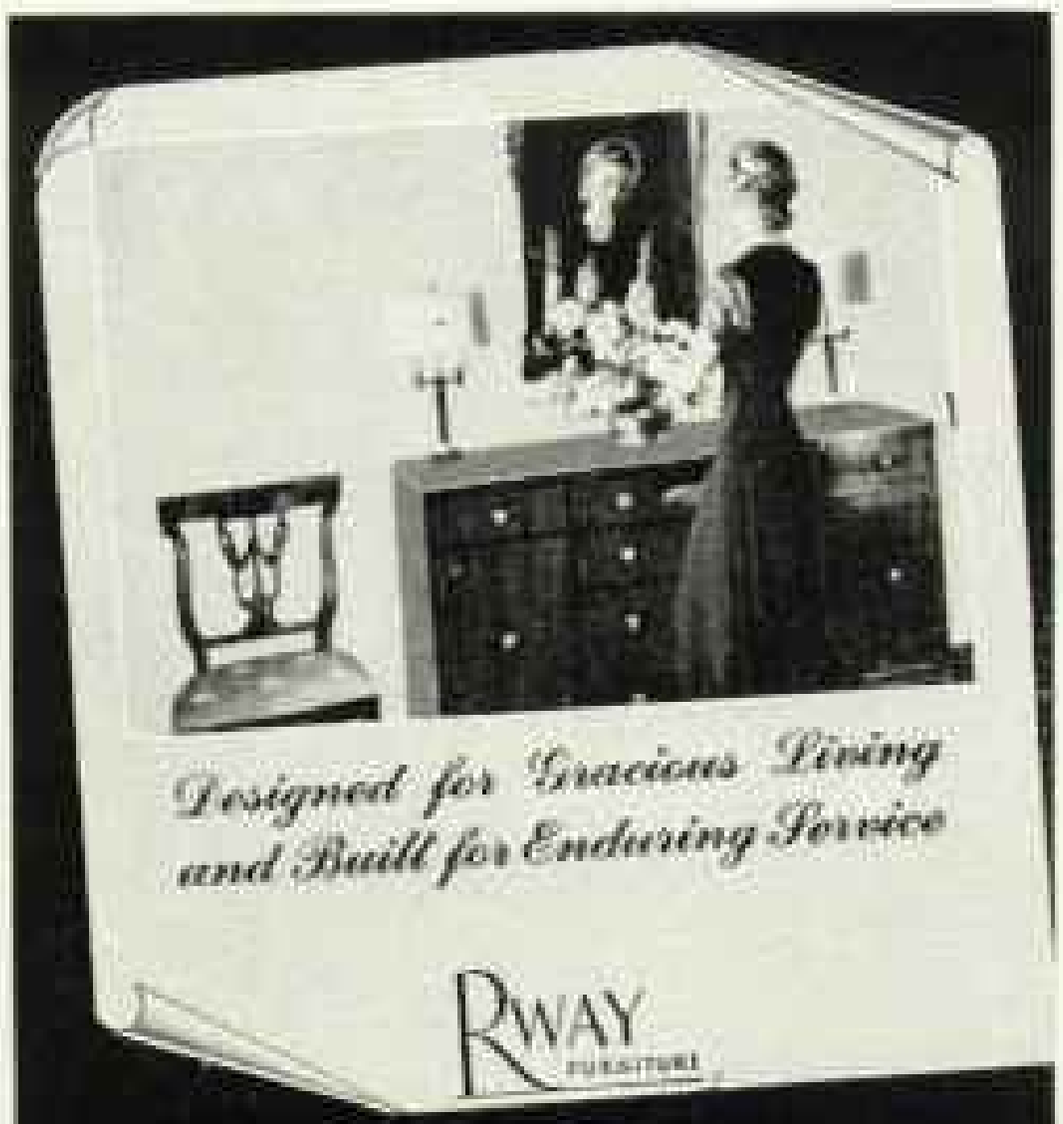

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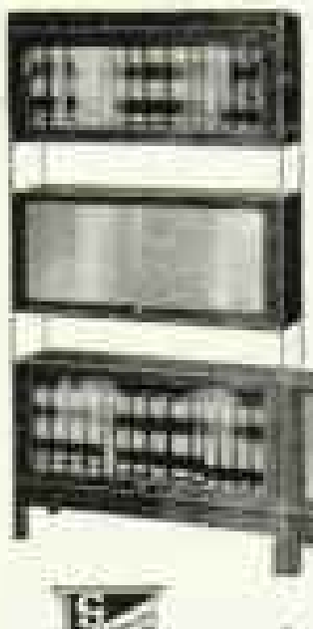

NO LIMITS TO *THIS* BOOKCASE

Expand it upward or sideways by adding sections as your library grows, or as wall space and harmonious furnishing require. Finest wood craftsmanship. The Globe-Wernicke Co., Norwood, Cincinnati 12, Ohio. Write for Free book, "Worlds Best Books," Dept. 3.

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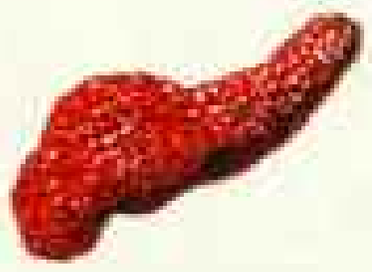
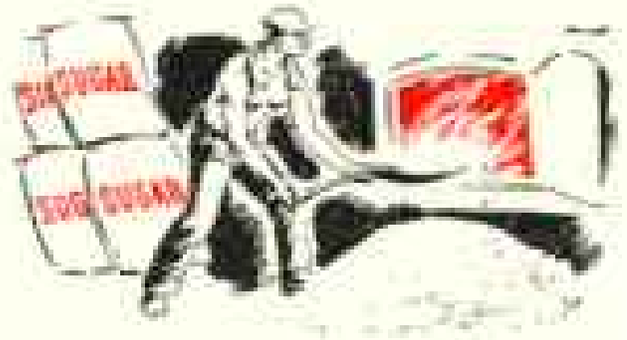
SECTIONAL BOOKCASES

Diabetes usually permits normal living, though insulin injections are generally needed. When the pancreas stops  producing adequate insulin, diabetes starts. Cells of the  pancreas, located behind the stomach, normally manufacture insulin needed to store and burn sugar.



If you're plump and middle-aged . . .

. . . watch for diabetes! Be on the lookout for these signs:

1. Constant hunger and loss of weight, despite overeating, because your body can't make use of the food you eat.

2. Continuous, or aggravated, thirst. Because the kidneys are working overtime to dispose of excess sugar, you try to replace the water lost.

3. Weariness and irritability. Because your body is unable to make proper use of food and water, it tires faster. Boils and carbuncles are often an indication of diabetes, particularly in older people.

These three conditions are indications of well-established diabetes, but are often absent in early or mild cases. Accordingly, it is important for everyone with a family history of diabetes—all the more if overweight—to have an annual physical examination, including urinalysis.

If you are diabetic, your faithful, intelligent co-operation with a physician will enable him to control the disease through *diet*, *exercise*, and *insulin*.

While injections of insulin won't *cure* diabetes—as yet there is no known cure—they will supply this vital substance and thus enable you to lead a practically normal life.

To learn more about diabetes and its treatment, send for Metropolitan's free booklet 125-N, entitled: "Diabetes."

Metropolitan Life Insurance Company

(A MUTUAL COMPANY)

Frederick H. Ecker, CHAIRMAN OF THE BOARD — *Leroy A. Lincoln,* PRESIDENT

1 Madison Avenue, New York 10, N. Y.

The crab that condemns itself to prison

In the Great Barrier Reef, off Australia, grow colonies of corals among which lives Hapalocarcinus marsupialis, a species of tiny crab.

In securing protection against her enemies, the female crab of this species, while still young, condemns herself to prison for life.

She takes up her home in the fork of two coral branches, and by constant movement sets up a current which seems to influence the coral's growth in a peculiar way. The branches broaden, curve out, then curve in again and unite over the crab's head, thus forming a round cage about the size of a marble.

Small holes let the sea flow in and out, bringing the tiny particles on which the crab feeds.

And there—snug, safe, protected from the hazards of her undersea world, but unable ever to venture out into that world again—she lives for the rest of her life.

Shutting yourself up in a stone cell is an effective way of escaping the dangers that beset the path of anyone who moves around in the world.

But man can't do that—and wouldn't if he could. While man wants security, he also insists on freedom.

So, very wisely, man solves his problem with insurance.

You may not be able to avoid having an accident which could prevent you from earning a living for a long time.

But through insurance, you can make certain that you will have money to pay the doctor and the hospital, to buy the medicine you may need, and to pay the rent and the grocery bills until you get well and can again earn a living for your family and yourself.

Christmas together…Have a Coca-Cola

…welcoming a fighting man home from the wars

Time of all times. Home at last . . . to wife, to child and to family.

With Christmas in the air and the tree lighted brightly. All the dreams of a lifetime rolled into one moment. A home-like, truly American moment where the old familiar phrase *Have a Coke* adds the final refreshing touch. Coca-Cola belongs to just such a time of friendly, warm family feeling. That's why you find it in homes big and small across the nation . . . the drink that adds life and sparkle to living. A happy moment is an occasion for Coke—and the happy American custom, *the pause that refreshes.*

* * *

Our fighting men meet up with Coca-Cola many places overseas, where it's bottled on the spot. Coca-Cola has been a globe-trotter "since way back when".

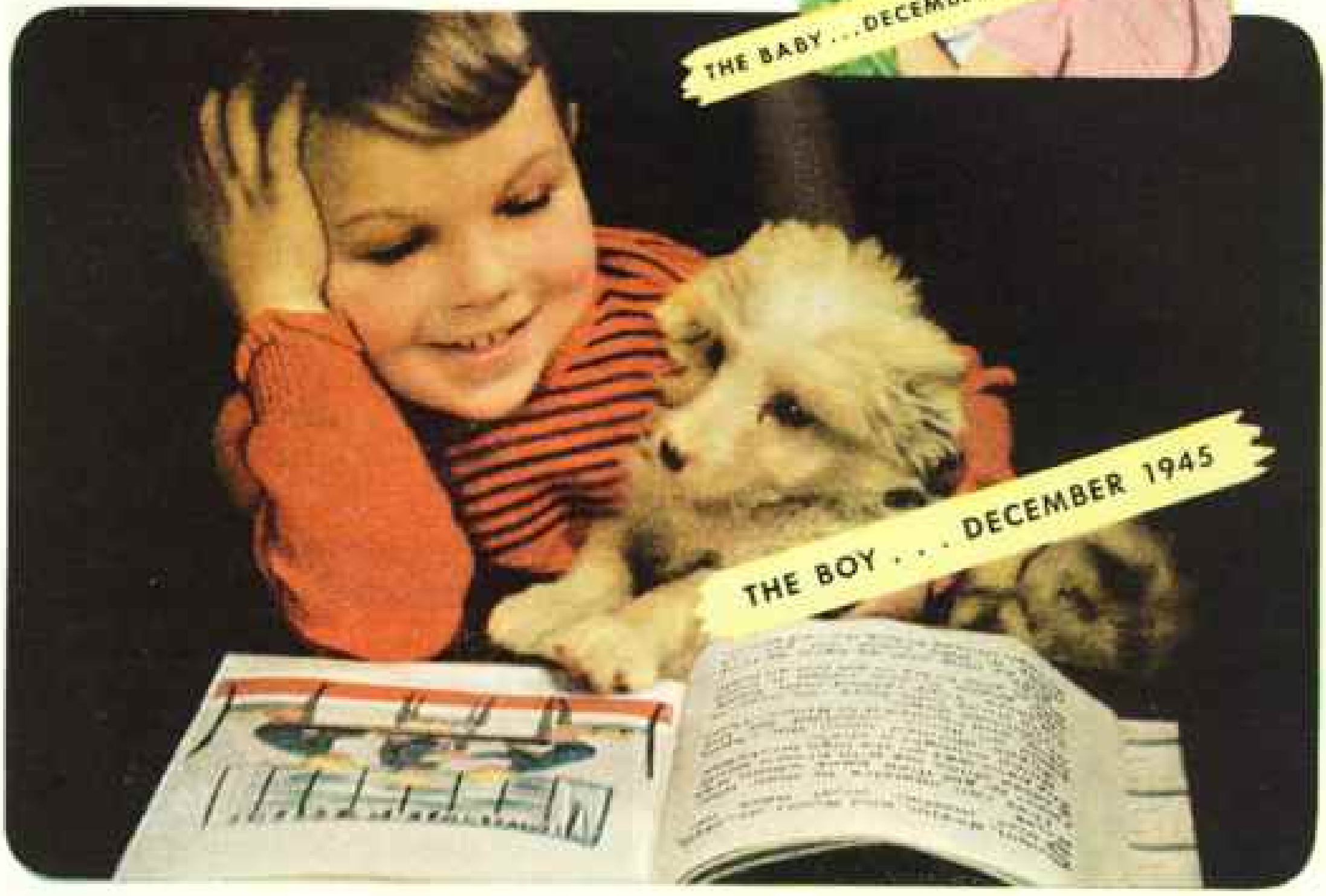
Coca-Cola

-the global high-sign

"Coca-Cola" and its abbreviation "Coke" are the registered trademarks which distinguish the product of The Coca-Cola Company.

GOOD NEWS FOR HOME MOVIE MAKERS

Ciné-Kodak Film is on the way!



Make up for lost time . . . plan the NEW Movie Record now

CINÉ-KODAK FILMS full-color Kodachrome and black-and-white . . . magazine and roll . . . 8mm. and 16mm.

SOON there will be no need to miss the movies that mean so much to you. Ciné-Kodak Film is on the way—full-color Kodachrome and black-and-white!

Get your movie camera ready. Plan—now—the many movies you'll want to make of all the things that mean so much in a personal movie diary. Movie-making time is coming back . . . For you and thousands of other movie camera owners! Whether you have an "Eight" or a "Sixteen" . . . loading with roll film, or with magazines.

IF YOU NEED HELP—If the principal camera-user in your family is still away, you've a special reason for pinch-hitting for him. Your Ciné-Kodak dealer is ready to check your camera for you . . . show you how easy it is to load and use. See him this week.

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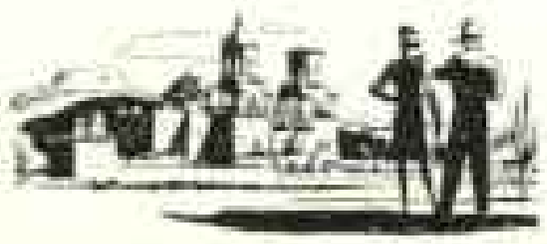

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This new Ford car—so big and smartly styled—offers more new developments than most pre-war yearly models . . . New multi-leaf springs give you a ride that's smooth and level . . . Brakes, too, offer major new advancements. They're oversize, self-centering hydraulics for quick, quiet stops . . . There's stepped-up power—and new thrift in gas and oil . . . Inside, new luxury awaits you. Colorful fabrics and trim in pleasing two-tone combinations . . . Choose from two great engines. The V-8, now increased from 90 to 100 horsepower; the 90 horsepower Six . . . Ask your Dealer about the smartest Ford cars ever built.

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Ford

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Steamboats plied the Mississippi, and one of the founders of our business travelled on the River, and by stage coach, to answer the call for pipes from the growing South and West. A reproduction of Steamboat illustration in colors, together with booklet illustrating Kaywoodie Pipes, will be sent on receipt of 10¢ to cover costs.

Ninety-four years devoted to producing satisfying pipes have culminated in the Kaywoodie Pipe of today. In it are incorporated the best qualities garnered from those years of experience. From the new Kaywoodie Pipes you will get everything that enhances the pleasure of pipe-smoking. Kaywoodies may be had at your dealer's. $3.50 to $25. Kaywoodie Company, New York and London—In New York, 630 Fifth Ave., New York 20.

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KAYWOODIE BRIAR

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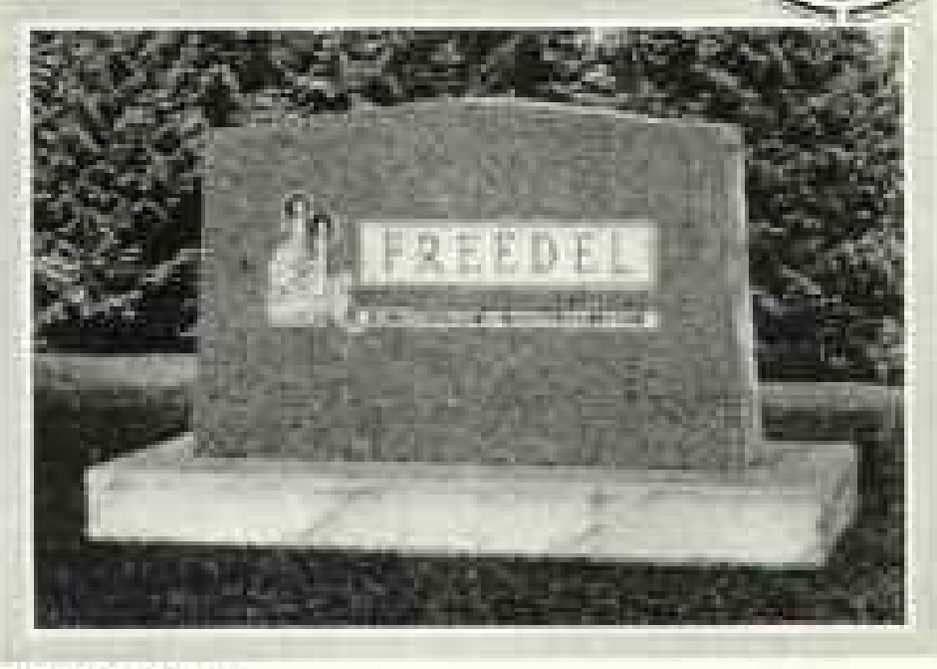

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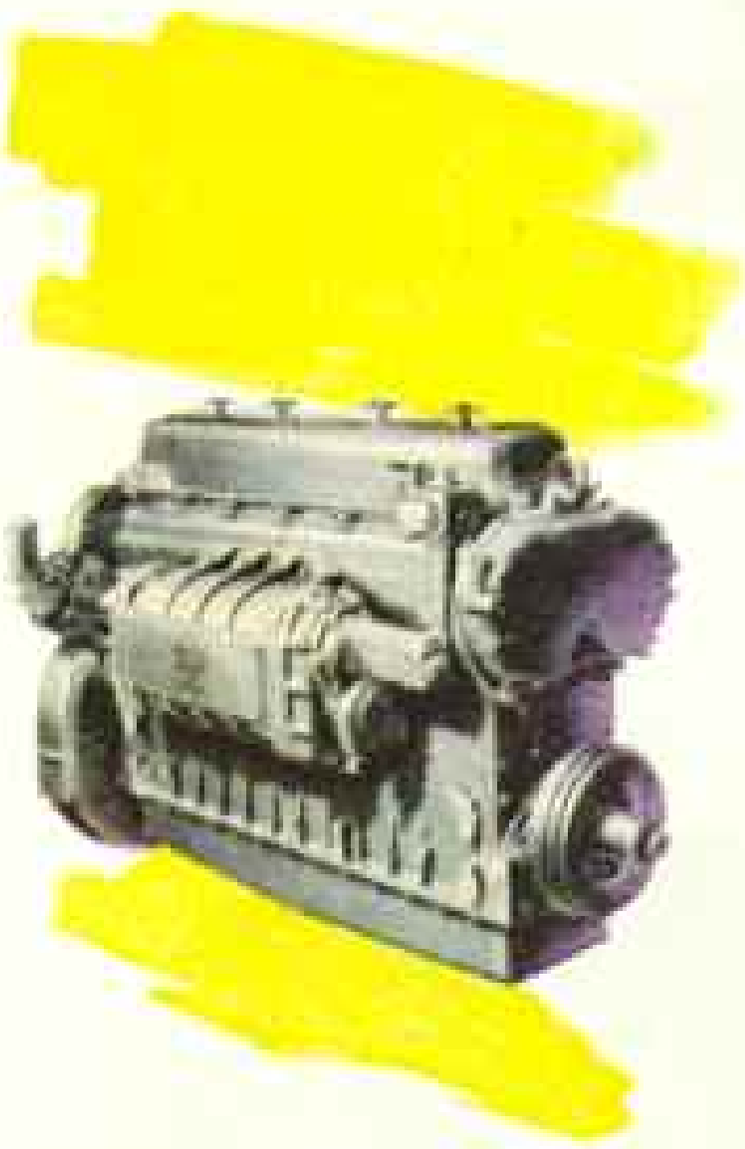
A MILLION MILES YOUNG



Any number of GMC coaches powered with General Motors Diesel engines have passed the million-mile mark. And they're still going strong. Still pulling upgrades smoother—still faster on the get-away—still turning in upwards of 50% more miles per gallon of low-cost fuel.

One reason is the GM "71" 2-cycle Diesel engine that packs big, tough horsepower into small space and light weight.

Coaches are just one example. These sturdy power plants hand out performance like this everywhere they're used—in tractors, boats, trucks, cranes—driving oil-well machinery, lumber saws and cotton gins.

All through the war GM Diesels have been working side by side with our fighting men, powering landing craft, tanks, tractor bulldozers and all kinds of hard-working machinery.

And as these boys come home, these engines will still stand ready to work side by side with them—ready to provide rugged, long-life, low-cost, easily maintained power in the countless applications of America's expanding industry.

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We, too, have our hands full this time of year.

For us, December 24 and 25 are always busy days at Long Distance switchboards—and they will be busier than ever this Christmas.

There will be unavoidably long delays on Long Distance and some calls may not get through at all.

You will get quicker service a few days before or after the holidays.

BELL TELEPHONE SYSTEM

...what else is in store for these Man-Made Gems?

THAT'S A GOOD QUESTION. But at this point no one can give you the complete answer to it.

The full possibilities of these man-made gems have not been explored. The making of synthetic sapphire and ruby in this country is an infant industry—born in World War II.

Prior to the war, all our synthetic sapphire and ruby were imported. When our supply of these war-vital materials was cut off, THE LINDE AIR PRODUCTS COMPANY, a Unit of UCC, at the request of the government condensed into months the research necessary to master the techniques of quantity production.

Of all the gems, synthetic sapphire and ruby, like their natural forms, are second only to the diamond in hardness. Already they have many uses.

They are long-wearing thread guides in textile mills. They are the bearings in watches and delicate navigation instruments. They make phonograph needles that will far outlast metal. They are much in demand for jewelry...and are used for many types of cutting tools, gages, spray nozzles, burnishing wheels and insulators.

What else are they good for? If you are technically minded and read the italicized paragraph below, you may come up with a new answer or two.

* * *

In addition to extraordinary wear resistance and great beauty, LINDE synthetic sapphire and ruby are highly resistant to most chemicals and have high strength at temperatures up to 3,000 deg. F. and higher. Electrical losses at all frequencies are low. They can be given an exceptionally smooth surface, and can be bonded to other materials. They are available in half-boules up to 150 carats and in rods of 0.065 in. to 0.125 in. diameter.

For additional information send for the folder F-12 "Synthetic Sapphire Production."

LINDE SYNTHETIC GEM MATERIALS