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The Making of an Anzac

With 31 Illustrations and Map
of the Pacific War Area

HOWELL WALKER

Facing War's Challenge "Down Under"

20 Natural Color Photographs

Metal Sinews of Strength

With 35 Illustrations

FREDERICK G. VOSBURGH

California Says It with Wild Flowers

9 Natural Color Photographs

FRANCIS WOODWORTH
B. ANTHONY STEWART

War Meets Peace in Egypt

With 25 Illustrations and Map
of the Suez-Red Sea Region

GRANT PARR
AND G. E. JANSSEN

Mediterranean Checkerboard

With 20 Illustrations and Map
of the Mediterranean Lands

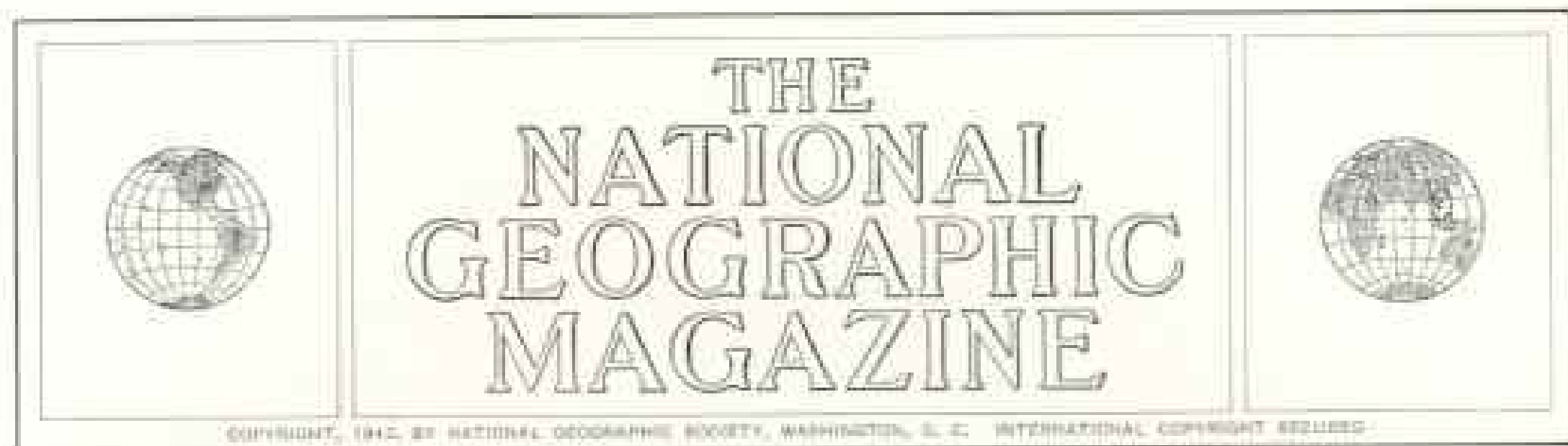
FREDERICK SIMPICH

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The Making of an Anzac

BY HOWELL WALKER

With Illustrations from Photographs by the Author

FIFTEEN HUNDRED husky warriors stormed a station on the then warless continent of a warring world. Full of fight and lusty banter, they raided the railway as Australians would.

Singing, laughing, cheering, they shared their fate as lightly as their cigarettes. The men entrained for a port of embarkation like week-enders off for the country. They were Anzacs leaving Australia for battle fronts thousands of miles away.

Men, yes; but carefree as boarding-school boys on a holiday. In addition to steel helmet hanging from shoulder, a rifle, bayonet, and overseas duffel, one Aussie found a couple of free fingers for a bulky guitar (page 418). Another Digger (any Australian soldier) thumping his chest with a big brown fist, humorously shouted out to me, "Last chance for a photo of the best man in the A.I.F." *

Whether giant or common six-footer, bull-built or lank, 40 years tough or 19 handsome, all enjoyed the inherited right to a refreshing superiority complex. Some who had experienced a taste of the First World War were returning for a second helping; one took his son along—both full-fledged soldiers, privates in the same company.

They crowded doorways and windows of the train, munched hot dogs, swigged soft drinks, shouted happy farewells to a few civilians on the platform. Because virtually no one is supposed to know when an entrainment will take place, you could count cats out of bags by the girls present. Only one Romeo succumbed to sentiment, and he did a manly job with his hat on.

* Australian Imperial Force.

"Now you know why an Aussie's lid is brimmed up on one side," remarked an old soldier.

When the train pulled out and whistled in the distance, I walked past half a dozen soldiers, fully equipped for overseas, frozen in after-the-storm silence. With faraway looks in their eyes they watched their comrades disappear.

"What about these?" I asked an officer near me.

"They are stand-bys," he answered. "If any men going away break down or vanish at the last moment, they fill in. No one broke down or failed to turn up this time; so the stand-bys simply have to stand by. They'll return to camp now, but will be among the first to entrain at the next transshipment."

"Stand-bys" Await Their Turn

I glanced again at the stand-bys. They just stood there, not saying a word. They all looked as though they had received notices of their mothers' deaths.

These men were separated from friends they trained beside, hoped to fight beside, prepared to die beside. That was hard to take; harder still, to be deprived of the journey to the front and the action to which they had been so keyed up. No mere observer can understand how much they wanted to get over there, and get there *now*. Weeks of more camp routine and training made the next transshipment of troops seem as far off as an old-age pension.

"Stiff luck for those stand-bys," said another officer. "They'll be wanting to pull their bloomin' throats out."



Thumbs Up! Anzaes of 1942 Pay a Last Visit to Their Fathers' Memorial at Sydney

Now these tough sons of famous fathers are making a name for themselves on many a battlefield. The word "Anzac" is made from the initials of the Australia-New Zealand Army Corps which won fame when it fought as a unit at Gallipoli in 1915.

When I could feel something of the stand-bys' heartbreaking experience, I began to understand the spirit with which 260,000 Australians had volunteered for active service abroad. Of course they can fight. They are Anzaes. They are sons of Anzaes. And some of them will be fathers of Anzaes. As long as men are born in Australia and New Zealand, there will be Anzaes.

Putting the "NZ" in Anzac

But New Zealand put the NZ in Anzac when the Australia-New Zealand Army Corps initially combined at Gallipoli, April 1915, to become the A.N.Z.A.C. And the little Dominion, a thousand miles from Australia, means to preserve the significance of the acrostic. Even before conscription came, in June 1940, New Zealanders doubled enlistment expectations.

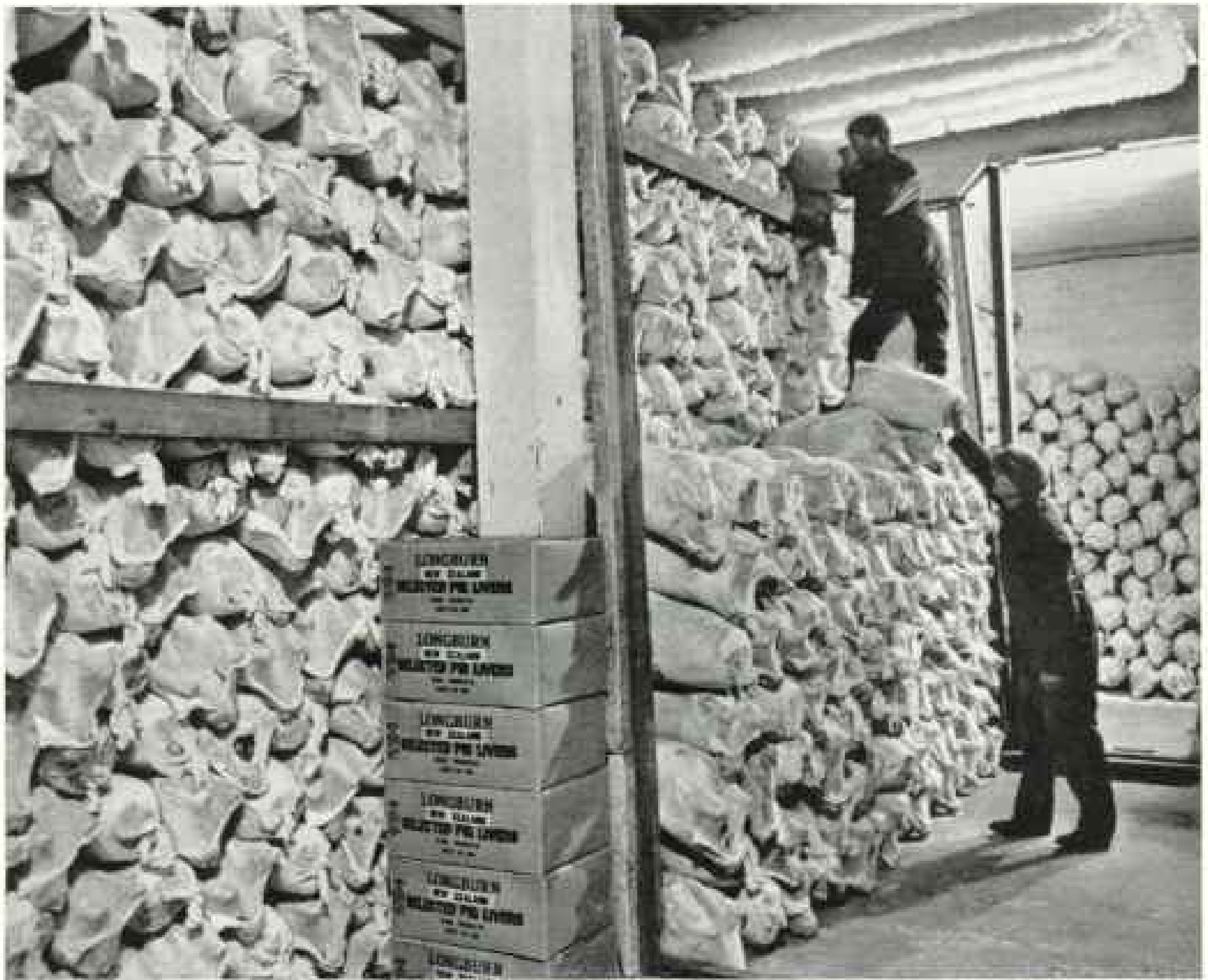
With 80,000 men in active service and in training overseas, the country whose total

population slightly exceeds one million and a half has already shared the courageous resistance in Greece and Crete; helped win the battle of Syria; pommelled General Erwin Rommel's panzers in Libya—always in co-operation with Australia.

New Zealand has conscription because New Zealanders wish it. Whether or not Australia continues voluntary enlistment, it is the essence of her sense of freedom.

At random I picked nine recruits waiting outside an Australian military medical office for their physical examinations. I asked each one what job he had given up to join the Army, and why.

A carpenter: "I wanted to do my bit." An orchardist: "Felt it was my duty." A salesman: "To join my chums overseas." A farmer: "I just thought I might come in handy over there." A motor driver: "To help, and because I like the Army; it's in my line." A clerk, grocer, surveyor's assistant,



Stored in Antarctic Atmosphere Are Fat Lambs, Calves, Pigs, and Beef

For six months the carcasses have been stacked in this cold-storage room at Longburn, North Island, New Zealand, awaiting shipment overseas. Asked where the meat would go, these men said, "Nobody knows in wartime!" The plant has a slaughtering capacity of 5,000 a day, mostly lambs and beef. The bulk of New Zealand's frozen meat exports, principally mutton, normally goes to the British Isles.

and textile worker more or less echoed the others' reasons.

Boiled down, most answers would carry the punch line, "It's up to a bloke to have a crack at Hitler." Actually, real reasons are rooted more deeply than age-old eucalypts in fair, decent, and free living. But you just don't talk about those things in the A.I.F.

A bugle, blasting the stillness of an early winter morning, awoke me. My room, really Captain Smith's quarters, was dark as midnight. Through the window I could see tiny stars in a cold, predawn, steel-blue sky. An officer in the next room coughed. The smell of wood freshly kindled made the air seem even colder.

On earthen paths between the huts heavy boots pounded hard, and I heard the noise of tin pots and pans rattled against each other. A husky voice called across the area. Someone blew a whistle; another bugle call.

Turning on the light, I saw that it was half-past six. Four thousand men in training at this camp were one day closer to battle.

Head of the camp's military police was a six-footer, nearly half as broad. Not fat; just plain beefy. He'd been in the last war. Like many other returned soldiers, Captain Scales wanted passionately to get overseas for the present "show"; but he was overage. However, he didn't grouse; he took his disappointment as he would a very sore boil.

Engaged in physical training since the last war, he maintained a splendid physique. He lit one cigarette from another all day, and he quenched his thirst the Australian way.

On a survey of the camp with Scales I puffed through spotlessly clean kitchens and mess halls bleached with scrubbing.

We inspected the trainees' living quarters—hut after hut, each accommodating 24 men.



Tall or Short, Anzaacs Are Ready for Trouble Anywhere

Training completed at a camp "somewhere in Victoria," they have answered final roll call for active service.



Australian Army Recruits Take the Solemn Oath of Allegiance in Melbourne

At Royal Park Military Camp they line up before an officer who is an overseas veteran of the First World War. After the Japanese invasion of New Britain, first Australian territory on which enemy forces ever set foot, recruiting offices opened Army ranks to the continent's small colony of resident aliens. Germans, Czechs, Austrians, Danes, and Italians enlisted to fight the Japanese.



Anzacs Take a Last Look at Sydney Before Going Overseas

Here in Martin Place, heart of the capital of New South Wales, the soldiers stand at ease following a downtown parade. Soon after the photograph was made they boarded a transport. The clock tower is on the General Post Office.

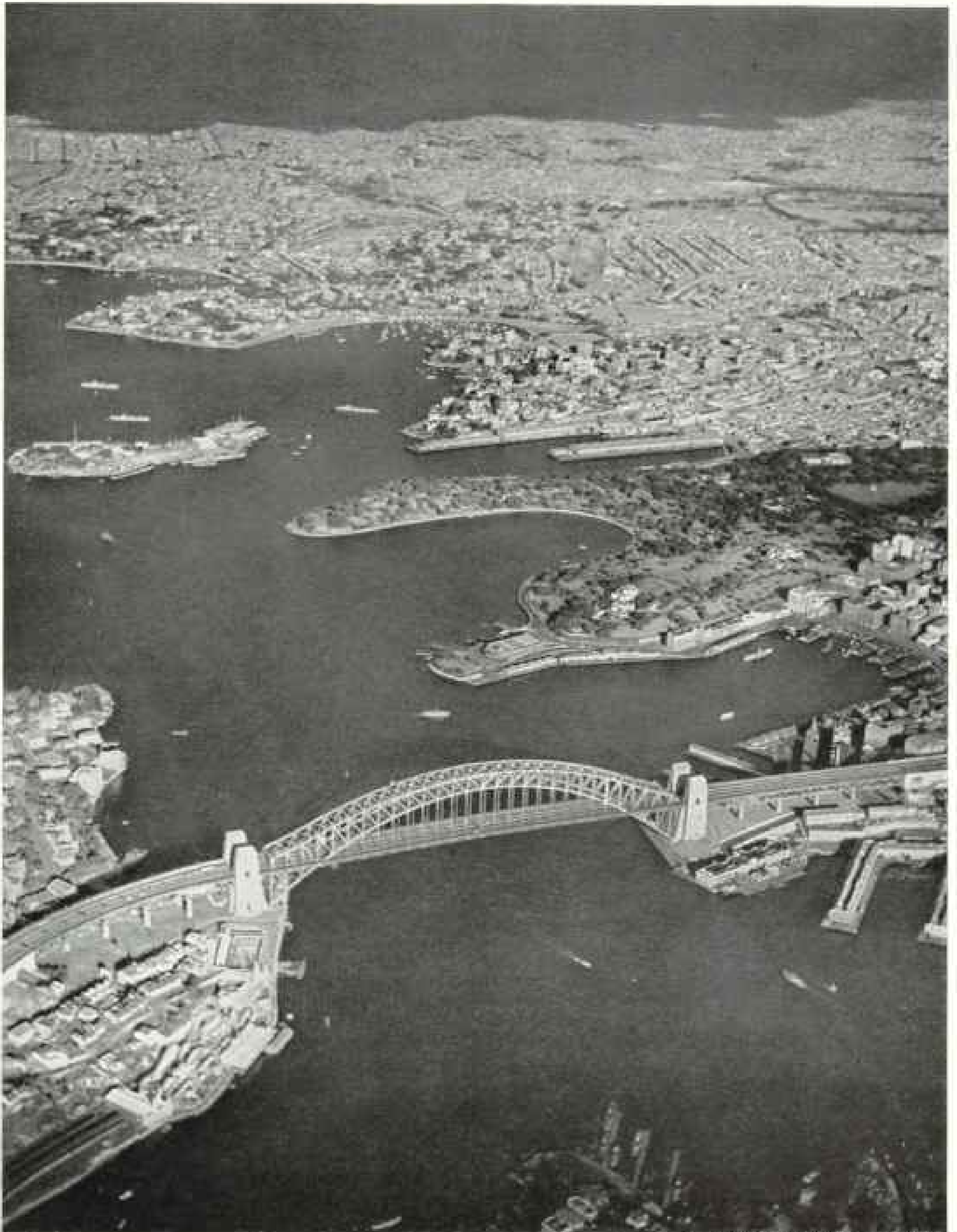
No cots or springs for the A.I.F.; they simply spread mats and blankets on the wooden floor.

During the day a soldier's bedding remained neatly folded up in the little space allotted him. On the walls some soldiers had pasted pictures of pretty girls clipped from newspapers and magazines. There were no other decorations.

The camp's commanding officer took time after lunch to beat me at ping-pong. As consolation prize, he arranged a ride in one of

the Bren gun carriers, those effective war machines constantly caterpillaring out of Australia and New Zealand munitions factories.

Somewhat like a small tank, but open on top, the Bren gun carrier can jump ditches, crash through trees, bump over stumps, zoom down steep hills, climb incredibly stiff inclines, and roar on the level. It bucks over rough ground like a frantic bronco. I had to hold on with all arms and legs to stay in one piece.



Australian National Publicity Association.

Birthplace of the Australian Nation—Sydney's Famous Harbor from the Air

To the right of the rainbow suspension bridge lies Circular Quay, landing place in 1788 of Governor Arthur Phillip's little fleet of 11 ships. His cargo was 778 English exiles, many convicted for minor political offenses, a few officers, and some Marine guards. From their small settlement along the quay has grown this second largest white city of the British Empire, only London exceeding it in size. Capital of the Australian State of New South Wales, it has a population almost equal to that of Los Angeles.



Tasmania Harnessed Lake St. Clair to Generate Electricity

From the crest of the hill water plunges 820 feet through the big pipes to the Tarraleah Power Plant. Current goes to large zinc and cadmium smelters, fruit-preserving plants, and other industries on this huge island off the south coast of Australia. Since 1901 Tasmania has been a State of the Australian Commonwealth. With a population of a quarter million, its area is three times that of Massachusetts.

Captain Scales' barrel-like chest began to expand as we approached a class in physical training. Two long ranks of powerfully built men, stripped to their undershirts, stood facing each other. Those in one rank wore lightweight boxing gloves; the other rank raised a rampart of "footstools" covered with canvas (page 423).

A trainer gave the word, and the men in gloves began to punch the heavy bags, first with left arm, then with right. Punching at something that offers any sort of resistance—blowflies in the sheep shed or cattle in the drafting yards—is daily routine for many Australians. Their energy and initiative exercised in war have a background of brawn developed at home.

One of Australia's largest permanent camps forms a virtually self-sufficient community of 500 officers, 6,000 men. On the premises are a bank, post office, fire station, hospital,

dental clinic, six churches of different denominations, two canteens, billiard rooms, an open-air theatre, Y.M.C.A., and athletic fields. Some 680 buildings include administrative offices, living quarters, mess halls, kitchens, cold-storage houses, warehouses, workshops, laundries, and drying rooms.

Life at Australia's West Point

When asked how often soldiers from the camp were allowed to go into the city, an officer told me "every night."

"Must they be back in camp at a special time?"

"Just have to be on the parade in the morning."

"A delightful sense of freedom," I commented.

"They wouldn't stand for anything else," finalized the officer.

Australia has a West Point in the Royal



Map by Norman Hamblett and H. E. Fairwood

For the First Time, Australia Battles an Invader

Never had an enemy set foot on the Commonwealth's territory until Japanese troops forced a landing at New Britain in January, 1942. This island, formerly a German possession, was assigned to Australia by the League of Nations in 1920. With a population smaller than that of New York City, Australia defends an area as large as the United States.





Eddie Hayes, "Yodeling Digger," Takes His Guitar to the Wars

These trained Australians are waiting for an embarkation train for overseas service. The carefree and adventurous Anzac is known as "Digger" (page 409). Originating in gold-rush days, the nickname was revived when the Anzacs dug trenches at Gallipoli and in France.

Military College of Duntroon. Situated near Canberra, the Washington, D. C., of the Commonwealth, it trains cadets to lead the A.I.F. (page 420). The normal four-year course is cut to three in wartime.

At 7:45 one morning I found the corps on parade for flag-raising. Afterwards, I joined squads learning the use of trench mortars, studied Bren gun mechanization with other groups, watched hand-grenade practice, took part as passenger in small-tank maneuvers.

In the administration building, formerly a sheep station homestead, an officer said, "Ultrademocratic, Duntroon is open to any young man who meets necessary educational and physical requirements. A special committee travels around the Commonwealth interviewing applicants. Acceptance of a candidate has nothing to do with his social standing. It costs nothing to attend the college; a cadet is paid 7 shillings and 6 pence

(about \$1.50) a week. His training costs the Government 1,000 pounds (\$4,030). He may resign after graduation, but that's not common."

The English came halfway around the world to settle in a free Australia. Those people were adventurers. Now the Anzacs are returning halfway around the world to fight for England's freedom and their own. These men have the same adventurous spirit and love of gambling as their ancestors.*

Gold Lured Settlers from California

Take gold. It has always been a gamble. With its discovery in Australia began the first earnest colonization of the country. Thousands of adventurous persons came here to dig in, many of them from California. Between 1851 and 1870 the southeastern part

* See "Beyond Australia's Cities," by W. Robert Moore, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1936.



"Make 'em Fit—There's a Bloomin' Lot of Walkin' to Do"

A quartermaster sergeant tries Army shoes on a rookie at Royal Park Military Camp in Melbourne. Another with rucksack filled with sand tests a new pair for marching comfort.

of the continent had a tremendous increase in population; gold was the drawing card.

If the glitter life failed to pan out, they discarded spades, shuffled their packs, and began to gamble with land. Whether it was gold or ultimately land holdings they wanted, one general belief prevailed: better ground lay farther out.

And so they pushed westward through incredible hazards—no roads, no water, staggering heat, seemingly impassable mountain ranges. But they loved it; they were natural pioneers. Their sons were pioneers; their grandsons, the men of today, too. There is room and opportunity in this vast continent.

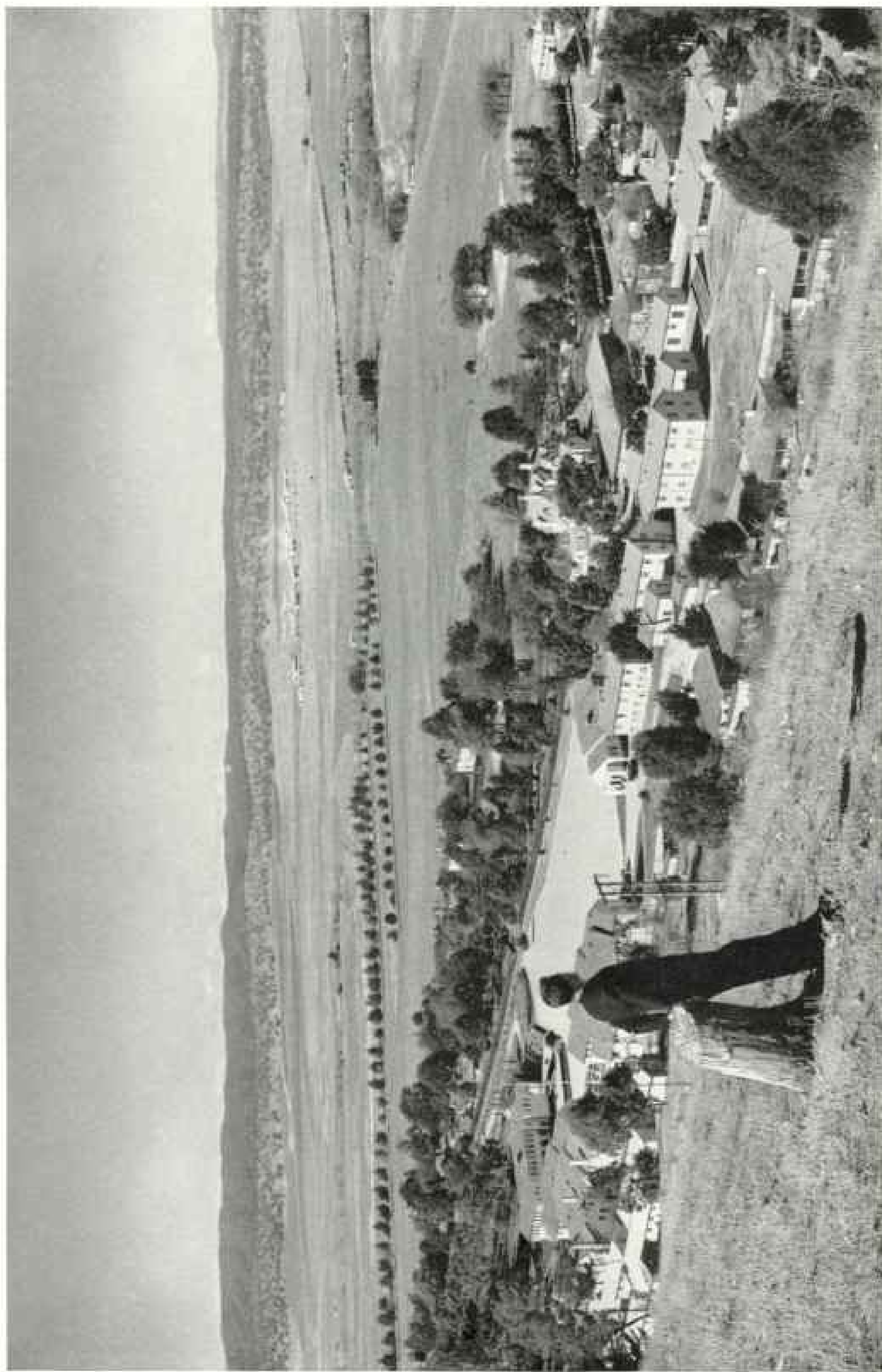
From the beginning Australians have looked to the bush. Their fighting qualities spring from a life close to the land. Born to hardship, they have become remarkably resourceful. The man outback has to, and can, think for himself. And there's freedom in the country, no matter how hard the life; so he loves the land, and fights for it.

As I write, the Sydney Morning Herald says: "Colossal war expenditure has brought prosperity to the capital cities and industrial areas of Australia, but much of the man power for the factories and fighting forces has been drawn from the smaller country towns, . . ."

Democratic Australia encourages an even more democratic Army. War turns the tables when a hotel waiter, now an officer, is served his meals by a former manager. A lieutenant of the last war told me that his old headmaster who had thrashed him as a barefoot country urchin was allotted to his platoon in France.

All the stocks and regional types in the British Isles, plus some Americans, blended to produce the Australian. He lives in a spacious land of sunshine and physical freedom, with plenty of everything except water. Every Australian travels in a one-class ship of state.

At lunch in a Tasmanian timber camp I sat next to a Government Minister. "For



Australia's West Point, the Royal Military College at Duntroon, Now Turns Out Officers in Three Years

Graduates from this school, founded in 1911, receive Army commissions as lieutenant, pronounced "leftenant" in the British Empire. Recently Duntroon has added an officers' training camp for A. I. F. enlisted men (page 418). Near by is the large Canberra airbase and pilots' training school.



Australian National Turf Association

Spectators Scan Their Favorites in the Paddock Before the Start of the Melbourne Cup Classic

This Australian Kentucky Derby has been run at Flemington Racecourse since 1861. The totalizator, an intricate electrical mechanism which automatically calculates odds on races, originated down under. First devised in New Zealand, it was further improved in Australia and now is used at many race tracks throughout the world.



If a Village Springs Up Here, It Will Be Called "Walker's Corner"

On a hunting trip, friends of the author put this sign up at a fork in the road north of Perth. From such casual markers many place names in the "outback" of Western Australia were born.

valor" in the First World War he received the Victoria Cross, highest of all British decorations. The hearty meal we ate off tin plates was prepared by Percy, the camp cook, also a V. C. winner. He didn't sit in Parliament; he stood in the kitchen and smiled when we praised the apple pie.

"Glad you liked it, Jack," he said simply to the M. P.

Leaders of Sheep Become Leaders of Men

All over Australia I sought clues to the qualities of her fighting men. Most universal answer was initiative. One original Anzac summed it up quick like a lamb's tail: "An Australian is used to leading sheep, not being one of 'em."

And Australians lead 120 million sheep to produce more than one quarter of the world's wool requirements. With only 105 woollies in 1792, the country gradually built up an industry that accounts for her most valuable export. "Australia still lives on the back of her sheep," an editor told me (pages 434 and 446).

Even Jason never worked as hard for the Golden Fleece as the men outback. It's a story of sheer effort, exploiting every possibility, exercising initiative, calling on re-

source, praying for rain, then hoping it would cease—a case of finding a bit of wire to "make it do" temporarily for anything.

Mr. Genge Martin met my train at Charleville, Queensland. I was going to his sheep station 120 miles from the railway. In his car we drove over a bush road, simply a cleared track through eucalypt forest, scrub growth, good grazing land, and desert.

Martin told me how he traveled this same route in Cobb and Co.'s stagecoaches on his way to and from boarding school in Brisbane. Cobb and Co. maintained its services here until automobiles staged their show in the 1920's.

Bottle trees, orange trees, flowers, and shrubbery almost smothered the Martins' low, rambling homestead—an oasis in his 20,000-odd acres where 9,000 merino sheep grazed in a world of grass and sky.

From sinking septic tanks to servicing a refrigerator plant, laying pipe lines or erecting fences, Martin did virtually all the work about his place. Engineering reservoirs in a waterless land or hollowing out logs for troughs were just jobs to him. He had to be mechanic in the garage he built himself, blacksmith, plumber, carpenter, and accountant, as well as have a thorough knowl-



Smack! Canvas-covered "Footstools" Absorb the Heavy Blows

One row of soldiers is equipped with lightweight boxing gloves. The facing group holds improvised shields for the boxers to pound (page 415). Punching at anything which offers resistance is part of the physical training in this Victoria Army camp.

edge of stock management. Yet he found time to make an excellent tennis court, and to use it.

"There's only one way to get these things done when you are out in the bush far from anyone," said Martin. "If you want something, you have to fend for yourself."

"Wintering in Tobruk"

Once I arrived at a fancier sheep station in New South Wales where servants carried the luggage to my room. Two waitresses served us in a dining room that had entertained Sir Harry Lauder. Four automobiles, swimming pool, tennis court, horses to ride, quail to shoot, and a sound moving picture apparatus gave the family and guests something to do when not counting sheep.

In this environment their only son (call him Colin) grew up. He attended the best schools and parties in Sydney; traveled to England and America.

Yet, when war came, Colin went—pronto, voluntarily. Now he writes from the front and heads his letters "Wintering in Tobruk."

Mail comes at lunchtime. All lose themselves in their letters and forget to eat.

One day each member of the family got

a letter from Colin. Spasmodically: "He received the sweater, socks, and cigarettes."

"He's now living in a culvert; wouldn't live in a shack or tent if they doubled his pay. Had to dig three officers out of an above-ground hut after a dive bomber's visit."

"Old Joe Dillon lost his big toe."

Once Colin cabled: "Well. Love. Please send six packs of cards." He really did not need the cards; he would have his family think things were going smoothly. Meanwhile, bombs were bursting on every side. For the last two months he had slept in all his clothes.

When you hear that a youth has been raised on a luxury sheep station, do not be surprised to learn that he makes as tough an Anzac as the fellow from the timber camp. Colin, only son and heir to 36,000 acres and 23,000 of the finest merinos, is an Anzac.

That fellow from the tall timber, and Colin, along with men who came from mines, farms, factories, or city offices, organized cricket matches while bombs fell on Tobruk (Tobruk). At heart the Australian in any walk of life is a true sportsman. Thousands satisfy their gaming souls at horse races, getting exer-

cise through frequent trips to totalizers (page 421). But generally armchair athletes take a back seat. Young and old, even limbless, spread over Australia's numerous playgrounds.

Recently I read in a Sydney Sunday paper: "Charles Hill, one-legged veteran of the last war, outswam two younger and fitter R.A.A.F.* lads at the Limbless Soldiers' Aquatic Club carnival yesterday."

Walk through city parks in winter, and you find groups of boys romping through a rugged game of football. Tennis courts working overtime on dusk-early days burn the floodlight "oil." Old men lay aside overcoats for a game of bowls.

The famous Sydney beaches so crowded in summer are never completely deserted in winter. One gray, cold, windy morning I found a crowd at Bondi Beach. Some 200 members of the Iceberg Club, ranging from 25 to 72 years, meet every winter Sunday for swimming races. The mercury hovers around 40 degrees Fahrenheit in the colder months; yet many brave a daily pre-breakfast plunge in the surf (page 436).

Sport gets a big shove in the larger cities checkered with playing fields. But it has pushed its way into the bush, too.

Take Pemberton, a southwest Australian village of 200 timber-minded, ax-handed, saw-swinging lumberjacks. In the great karri forests near by I watched men felling trees measuring 9 feet in diameter and towering 200 feet or more. Stripped to waists, they sweated long hours to get out timber urgently needed for defense projects (Plate I). Still, they managed to enjoy a golf course, football and hockey fields, tennis courts, cricket pitches, and a swimming pool—all cut out of the bush.

Gold Miners Relax with Football

One Saturday I dropped 3,500 feet into one of Kalgoorlie's gold mines (Plate V). Up-standing men stooped, squatted, crouched, and crawled through a dark but golden underworld. They drilled and picked, shoveled and shunted 60,000 tons of ore a month to produce 14,000 ounces of gold.

That evening I mingled with many miners. They had discarded underground lamps for floodlights playing on the track of the Saturday night trotting races. Next day I joined hundreds to watch a football match. Miners played railway workers, and beat them.

Not far from Cairns, away up in Queensland, I attended a bushmen's carnival or rodeo. Hard-riding, buck-jumping, cattle-crashing Queenslanders left the boldest bull fighters holding a butterfly bag. They rode

wild bullocks and fell hard, sometimes taking part of the fence of solid logs with them. Yet they got up and walked away to bounce back for more. Some badly hurt had to be taken away by ambulance.

Roughest exhibition of all was the buck-jumping, or riding of broncos. I saw one bruiser thrown from a particularly rambunctious animal into the fence. Before he could crawl out of danger, the mad horse pounded him frantically with forefeet. Less than an hour later I met this fellow walking about the grounds, somewhat bloody, but definitely unbowed.

A "Small Station"—12,000 Cattle

The men who handle Australia's 13,000,000 cattle have cultivated broad minds, generous hearts, and a hospitality wide as the vast pastures they ride. I stayed on a relatively small station in western Queensland—12,000 cattle to 1,350 square miles. Every bit of beef counts when A.I.F. men abroad, in addition to local markets, have to be supplied.

The manager was one of those fellows who quite naturally invited a man recently out of jail for stealing some of his precious cattle to have dinner at the homestead!

When I passed another station—6,000 square miles and 40,000 animals' worth of worry and work—at nine o'clock one night, the tea-drinking family had coffee and cakes waiting. Word came that an American had left Urandangle, 100 miles to the south, and was on his way to the Northern Territory. The American would drink coffee, of course.

Many as a cattleman's headaches may be, he has an unparalleled love for his life and work in the open. Take Clancey, manager of Barkley Downs station in the deep outfield of Queensland. His superiors ordered him to clear off the station for a much-needed month's holiday. He went to Brisbane, saw all the movies, spent a little money. In a few days he returned to the run. But he was told to stay away from the homestead; so he camped in a tent several miles away.

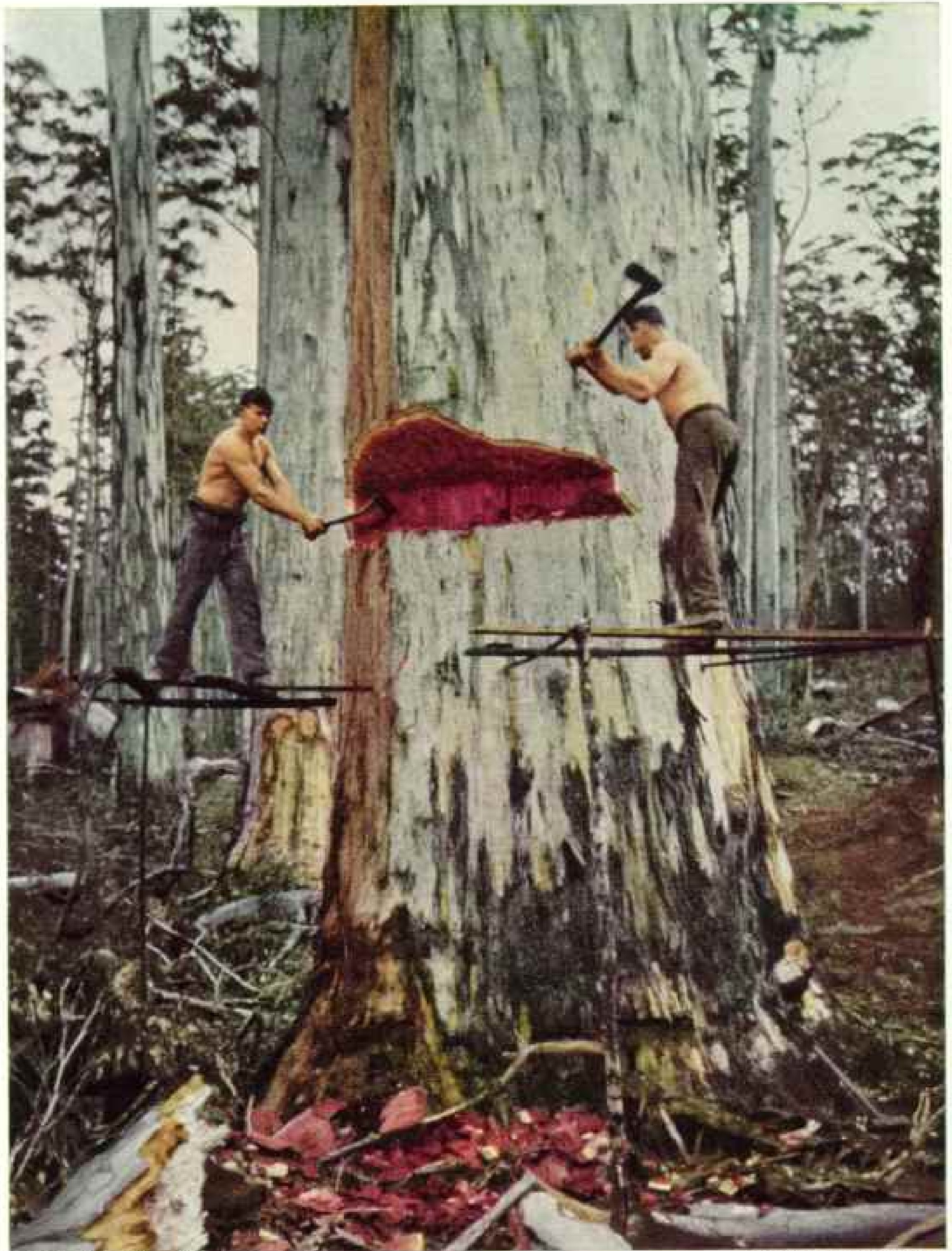
Clancey lived, breathed, ate, and *was* beef. About 6 feet 4 inches tall, he weighed about 250 pounds. His forearms, larger than my legs from knee to ankle, were hard as frozen meat. He would throw a young bullock over the fence rather than bother with gates.

Devotion to saddle and spurs on peaceful plains leads the beef-mustering, dust-conditioned cattleman to join light-horse regiments in war. And his own horse is as much a part of him as his brimmed-up hat with emu feathers flying from it.

In the present war mechanized units have

* Royal Australian Air Force.

Facing War's Challenge "Down Under"



© National Geographic Society

Kocherama by Horrell Walker

Axes of Bruwny Woodsmen Bite Deep into a Giant Karri

Lumberjacks cut the heavy tree from platforms 10 to 12 feet high, to get a clean break when it falls. If they chopped closer to the ground, the trunk would shatter badly at the butt, wasting much timber. Almost as tall as California's huge redwoods, karris often reach a height of 300 feet. They are one of Australia's 350 species of Eucalyptus trees. The tough, durable wood is used for heavy flooring and in bridgebuilding.



© National Geographic Society

Illustration by Howell Wood

"Somewhere in Victoria," Wackett Trainers Take Shape on the Assembly Line at a Commonwealth Aircraft Factory

In addition to these two-seaters, named after Wing Commander L. J. Wackett, this plant turns out Wirraway light bombers (right). Royal Australian Air Force pilots now are flying hundreds of these speedy monoplanes against the Japanese. The Wirraways are powered by Pratt and Whitney Wasp engines.



© National Geographic Society

Portrait of an Anzac

Rakish campaign hat and overseas collar insignia are like those worn by Australian soldiers on European battlefields during the First World War.



Photographs by Russell Walker

Medal Ribbons Show He Served in World War I

Bits of color above this New Zealand captain's breast pocket represent a decoration, general service and victory medals of 1918, and the coveted 1914-15 star.



© National Geographic Society

Koolbarumba by Howell Walker

Spectacular Waterfalls Lure Vacationers to North Queensland

This resort area lies in a mountainous region northwest of Cairns. Through the centuries streams have cut deep canyons into the rock formations. To obtain "mountain" views, visitors clamber down to the floors of these spectacular gorges and look up at the surrounding "peaks."

Facing War's Challenge "Down Under"



Pig, Brick, Bar, or Nugget—They're All Good as Gold!

This batch of metal has come to a Kalgoorlie bank in the rich Western Australia gold fields. Kalgoorlie's famous "Golden Mile" was discovered in June, 1893, by two miners who were hunting for their horses.



© National Geographic Society

Redirection by Howell Walker

The Red Cross Plays No Favorites

Friendly rivals for the smile which the Voluntary Air Detachment worker now bestows on the sailor, are an Australian soldier with overseas badge (left) and his New Zealand comrade with pointed campaign hat.



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Reductions by Howell Walker

Glenning White, St. George Bestrides His Charger Before Imposing Parliament House in Canberra

Statue and cenotaph are a memorial to King George V. Australia's capital was laid out in the valley of the Molonglo River, between Sydney and Melbourne in 1908. Its plan was drawn by W. A. Griffin, a Chicago architect. The District of Columbia, only one-fourteenth its size, has a population 60 times larger.



© National Geographic Society

Re-entrance by Russell Walker

From Queensland's Rich Mount Isa Mine Come 4,000 Tons of Lead Bullion Each Month

Intermingled with the lead ore is an annual output of 78 tons of silver. The lodes, in an area five miles long and one mile wide, will probably keep the mine busy 75 more years. The project is American-managed. Australia's most famous silver-lead mining district is Broken Hill, in New South Wales.



© National Geographic Society

Photograph by Howell Walker

In Open Cars, Atherton Tableland Farmers Send Shelled Corn to a Local Silo

Maize, as it is known in Australia, thrives only in Queensland and New South Wales, the hottest States. Yield is 26 bushels to the acre, compared with more than 50 for the State of Iowa. Wheat is by far the Commonwealth's most important crop.

largely replaced light-horse regiments. But the dashing horsemen fill a big gap in home defense. Since much of the coastal country is rough and roadless, the only way it can be traversed is on horseback (page 439).

Whether between men and horses, or just men, the spirit of comradeship covers the Commonwealth. It flows along the vines of South Australia's vineyards, which account for 80 percent of all the wine and more than one-quarter of the dried fruit produced in the country (page 437).

In the raisin and currant district of Berri I stopped to watch a pruning gang. The owner of the fruit block fell ill and couldn't attend to his land. So 43 neighbors, most of them returned soldiers from the last war, pitched in to get his work done for him.

"This idea of neighbors lending a hand," said one of the old soldiers to me, "is the Anzac spirit; it's just like we used to do in the Army."

Soldiers of the last war settled much of the present dried-fruit areas in South Australia and Victoria. Together the two States in 1940 produced 81,812 tons of dried sultanas, lexias (another kind of raisin), and apricots, pears, peaches, figs, and nectarines, of the 95,450 tons total for the Commonwealth.

Veterans returning from World War I came to Red Cliffs in this district to take a new lease on life amid brownish-red blocks of barren land. They carved out careers with irrigation channels; water and prosperity flowed in as vines grew out. Ground once worth less than a dollar an acre rapidly rose in price to nearly \$100.

Today the town of Red Cliffs forms the center of a fruit-growing circle with a 6-mile radius. Within this area all land is under cultivation and irrigation.

Largest veteran settlement in the British Empire, Red Cliffs holds the record for the highest percentage of enlistments in the Commonwealth for the present war.

Jungle Cleared to Grow Corn

After the First World War, veteran settlements on the Atherton tableland in north Queensland lifted cornfield acreage from 3,000-odd to 15,000. The fields have been steadily spreading over land that has had to be cleared from tropical jungle, or "rain forest," as it is called here (Plate VIII).

Until you have tried to walk through this sort of forest, much less work in it all day, you cannot appreciate what a terrific undertaking it is to clear the land. Bugs, mosquitoes, snakes and spiders, thorny vines, poisonous plants, weeds or leaves that make you sting

all over or itch all under if you touch them; blood-sucking leeches; heat, wet, sweat, darkness—these combine their hostile efforts to keep men away.

Jim McCarthy, returned soldier, sat on a sack of shelled corn in a shed on his farm. He talked to me about what he thought made an Anzac an Anzac.

"By the way," he interrupted himself half-way through a string of oaths, "do you swear? Because if you don't, you won't be understood around here."

McCarthy's conversation boiled down to this point: Australian soldiers in this war are what they are through inherited hardihood.

Slide down the hills into the wide valleys simmering with heat and waving with cane in the region around Cairns, and you view the only area in the world that grows sugar cane entirely by white labor.

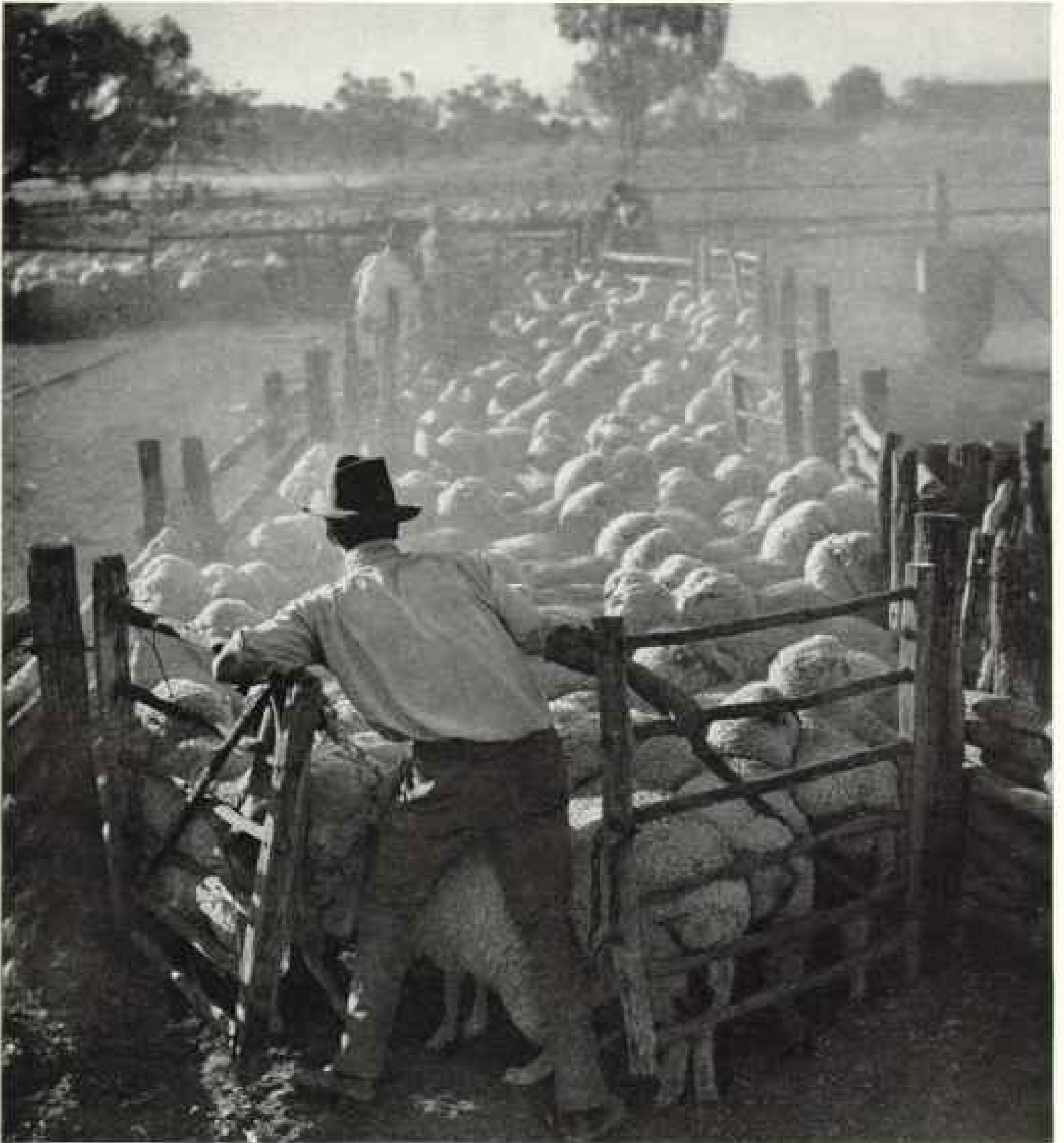
One day I went to a farmhouse in the little Mulgrave Valley near Cairns to photograph canefields in the valley bottom. An Italian family lived here. When war broke out, the father was interned as an alien. The oldest son had to carry on with the management of the farm, while a younger boy enlisted in the Australian Army.

Tough and capable as Anzacs are, they cannot win wars with bare hands. Incredible the strides Australia has made from primary pastures to secondary industries feeding on iron and steel. With munitions works, aircraft factories, shipyards, etc., the Commonwealth has become a vast Empire arsenal. More than 150,000 factory employees have turned their hands directly or indirectly to war work. And there are some 47,000 engaged in Government or quasi-Government factories.

A.I.F. men travel on transports convoyed by destroyers and mine sweepers built in Australian shipyards. Their uniforms and blankets are woven with wool from their sheep. They eat beef fattened on plains they know and love. Their sisters in the cities have had a hand in the making of the ammunition they carry in their cartridge belts.

For India and the military in the East, Australia supplies enough uniforms, blankets, and boots, plus other clothing, to outfit a whole nation in peacetime. And every month rifles, machine guns, mortar bombs, gun ammunition components, aircraft bombs of all sizes go in increasing volume to back up Britain's defense. Mounted also with anti-tank guns, Australian-made Bren gun carriers have successfully met the test of grinding warfare on the sands of North Africa.

In an ordnance factory concentrating on 3.7 antiaircraft guns and 25-pounders, I



Protesting Ewes Kick Up Clouds of Dust When Herders Take Away Their Lambs

Mothers are ready for shearing. Brought into these yards from the vast grazing paddocks of a Queensland sheep station, they will be clipped in big iron sheds. Groups of shearers travel from station to station, spending about a week at each. Using machine shears operated like barbers' electric clippers, each man can handle about 100 sheep a day, although experts have shorn as high as 300 (page 422).

talked with workers. One of them had served with the Anzac Engineers in Gallipoli and France. He had been decorated with the Military Cross and Bar. Because of his age, he complained that he couldn't go to this war.

The foreman saw three years of the First World War as a gunner and trooper in Egypt and France. Twice in the present war he has tried to enlist, but was put on the reserve list. Now that he couldn't go up to the front,

he did his bit by turning out guns that would.

Machines made in England and the U. S. A. sang with greatest volume; but we did stop in front of one that hummed a German lullaby. Hungry Nazis had traded the machine for foodstuffs shortly before the war began.

War imminence brought the manufacture of airplanes to Australia only in recent years (Plate II). From manager of the Commonwealth Aircraft Corporation down to watch-



A.I.F. Veterans Show Prospective Recruits What a Howitzer Looks Like

The big 105-mm. gun is on display outside the Town Hall in Melbourne to stimulate the drive for enlistments. Australian ordnance factories have grown enormously since the war began. Hundreds of workers served in the last World War and now are too old for active duty (page 433).

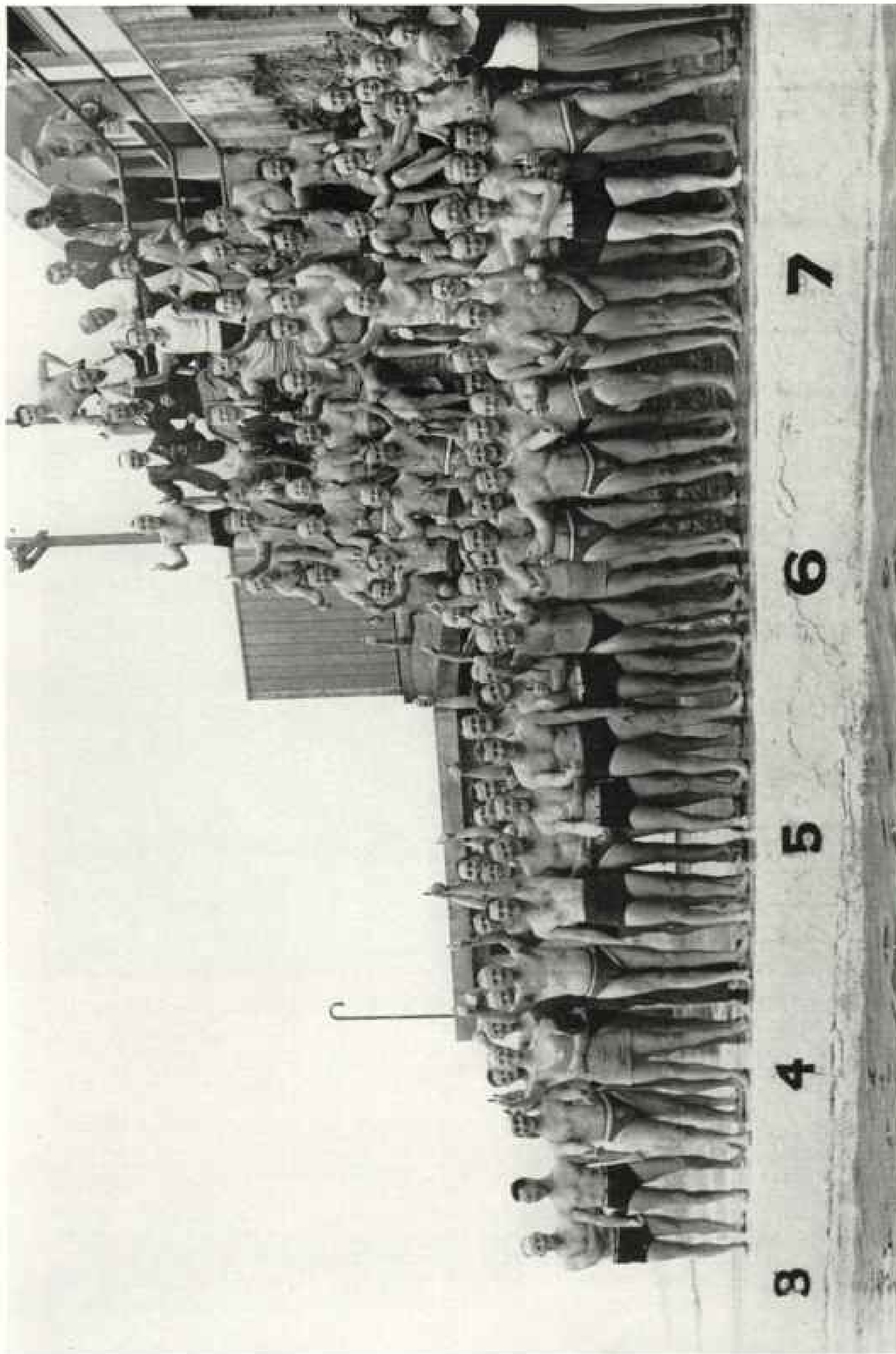
men, returned soldiers of World War I were represented in all departments. The superintendent himself was in the Royal Flying Corps in England during the last war.

We watched workmen assembling Wirraway bombers and Wackett trainers. The older men had seen active service in the First World War. Although engaged in "reserved" (essential) occupations, the younger men were just as apt to leave good jobs to enlist as their comrades did before them.

Following up a decentralization-of-industries policy, the Commonwealth encourages and furthers establishments in remote districts.

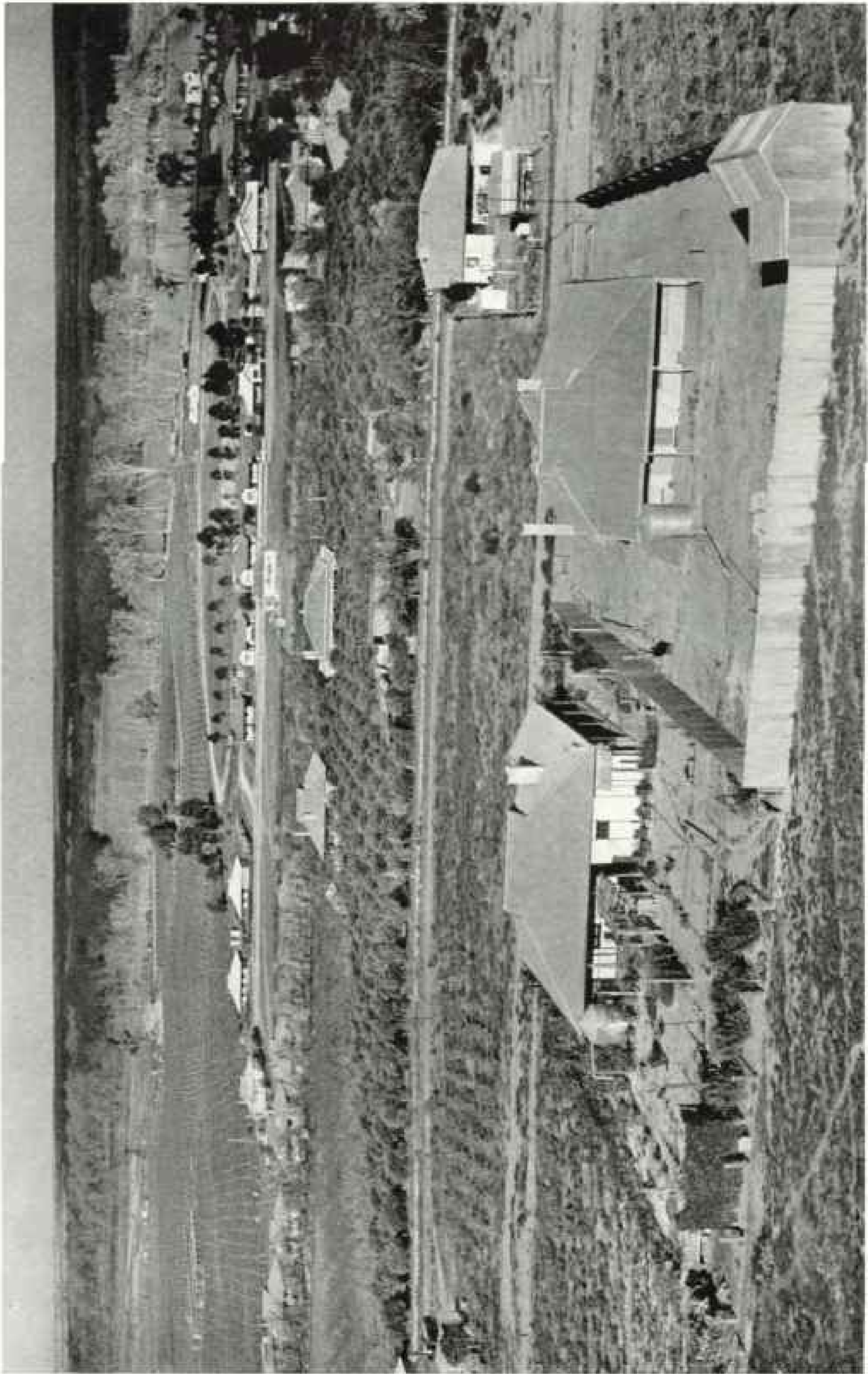
From 1900 to 1938 a small town (call it Casteel to save censor trouble) of about 1,500 souls existed somewhere in Australia.

"In the old days, back in 1938," said a personnel inquest officer, "when Casteel had a population of only 1,500, there were very few shops, just one small hotel, and scattered



Physical Toughness Is Required When a Banker or Taxi Driver Joins the Bondi Iceberg Club at Sydney

About 300 members, ranging from 25 years old to 77, meet for swimming races every Sunday morning during the winter, when the water averages 55°-40° F.



Anzac Veterans of World War I Turned a Wilderness into This Stretch of Vineyards and Orchards in Berri

When they returned from the battlefields of Europe, the Government gave them undeveloped land along the River Murray in South Australia (page 431). Here they dug irrigation ditches and planted grapevines, fruit trees, and alfalfa. Today a third of their 23,400-acre settlement is cultivated. Each year they ship vast quantities of raisins, dried apricots, pears, peaches, figs, and nectarines to market.



Arms

Bound for a Fall—Even an Aussie Can't Do Everything

This steer rider performs for spectators at Wagga Wagga, a prosperous town in the heart of Australia's richest farming district. When visitors from Sydney and Melbourne poke fun at the farmers' rural ways, they have a reply, "Ah, yes! But Wagga's the place for money."

homes in varying states of disrepair. Today, the mile-long main street is lined with prosperous business houses, two good hotels, and a third under construction. A new home goes up every week; Casteel's population increases 100 persons a month."

People migrating to Casteel must live in shacks and under canvas until permanent homes can be built for them. Makeshift shanties and tents spread over acres.

I stood melting by a blast furnace. I thought I was hot until I got a close-up of a tapper. With sweat washing the sooty furrows of his grimy face, he smiled. His teeth looked white as pearls against black wool.

"You can tell those Yanks that Aussies know how to work, too," he shouted to me.

One evening I sat on the front steps of a small country inn. Seven miles to the north the heavens reflected the brilliance of what seemed a big city.

"Six years ago you could see only four lights over there," the innkeeper told me.

This little spot has forged its iron way to second most vital foundry town in the Commonwealth.

But what of New Zealand? Youngest and littlest of Empire overseas Dominions, she is a fat land of sheep and cows. They graze wherever men aren't digging or sluicing for gold or burrowing for coal; and the ever-increasing stock must be patient until axes have carved still wider pastures from dense forests.

New Zealand's Hardy Pioneers

To an even greater degree of hardship than Australians experienced, New Zealanders have met, are meeting, difficult problems of colonization. Beginning with hostile natives, settlers struggled through jungles, battled blizzards in icy alpine passes, risked death to bridge devastating rivers, bogged down in depressing swamps, and gambled with unpredictable weather.

Earnest British folk came here to wear out old clothes and live in peace as farmers and traders. They subdued the natural enemies; gained the confidence of native Maoris. In fact, some 4,700 Maoris have joined New Zealand's present Army overseas.

Although conscription does not apply to natives, more than 5,000 have already enlisted,



Camera Pictures

Heavy Going Is Child's Play for Anzac Cavalrymen, Born to the Saddle

In peacetime they are hard-riding cowboys on the plains. Although mechanized units have replaced many light horse regiments, the dashing horsemen fill a gap in home defense by guarding rough and roadless coastal country (page 433).

almost 40 percent of those of military age (p. 447, and Pl. XVI). In Greece and Crete a special all-Maori battalion fought like Spartans, and in Libya took bloody revenge.

The Maoris Can Take It

Wars between British and Maoris proved the natives were fighters at heart. Traditionally, they battled only under conditions fair to both sides. If the enemy ran out of provisions, the Maoris called a truce to supply their adversaries; then they went on with the business of killing them in a fair fight.

Today, when a Maori enlists, his best friends habitually accompany him to the military camp where they expect to say farewell. However, upon arrival at the camp, these friends often sign up, too. Military life strikes them favorably; besides, they want to stick by their brother-in-arms.

That Maoris "can take it" their ancestors showed centuries ago. In canoes the original Polynesians sailed and suffered on nightmare voyages thousands of miles long. They left luxurious mid-Pacific islands* behind to

face a new life in a strange and virtually foodless land with a climate cruel to tropical constitutions.

Transplanted Britishers in New Zealand know and appreciate their task. Look at the Rhodes family. Seven years ago the father died in Dunedin. The mother and six children purchased 182 *uncleared* acres north of Auckland. Here they proposed to live by dairy farming (page 447).

With axes and sweat and perseverance the family won grazing ground from jungle on the hillsides. They uprooted cabbage trees and swordlike flax (*Phormium tenax*) bristling in swamps that had to be drained. So far, they have torn out pastures for 30 cows.

About a year ago Allen Rhodes tried to enlist in the Royal New Zealand Air Force. However, he had stopped studying when compulsory schooling ended for him at the age of 14 and so lacked certain educational requirements.

* See Map, "Theater of War in the Pacific Ocean," issued as Supplement to the NATIONAL GEOGRAPHIC MAGAZINE, February, 1941.



Camera Features

"Dear Mother: Am Having a Fine Time . . ." Australian Rookies in a Recreation Hut



Camera Features

Diggers of Darwin—Guardians of Australia's Front Doorstep

A.I.F. men make comfortable hammocks with mattress sacks, gum saplings, and stakes. Here they guard the continent's jumping-off place for the Netherlands Indies. Darwin is the northern terminal of Australia's "Burma Road," the only cross-country link between the sparsely populated north coast and the rich States and cities. The southern and northern part of this life line is a railroad, the central a military highway opened recently.

But he was determined to get into the Air Force. For the past twelve months he has spent most of his nights swotting at advanced subjects he did not cover in school. Recently word from headquarters advised that he will be accepted.

Asked why he chose the Air Force, Allen, who had done so much walking to and from school as a boy, replied: "I volunteered for the Air Force because I knew at least then I wouldn't have to hike it!"

One morning I talked with Allen while he washed out the cream separator.

"It's a great life," he intoned like a soldier peeling spuds. "The same old chores twice a day, day after day."

"But it has its interesting points," he continued. "During our six years on this farm, we have watched grazing areas and stock increase. And it's fun to speculate on what color the next calf will be, then watch it grow up.

"My brothers and I used to race to see who could clear the most land in a fortnight. I remember when we finally had one paddock in grazing condition. We thought we were in clover then. It seems as though we'll never get all 182 acres cleared. Yet at the end of each year we have a little more."

In the snug warmth of the Rhodes's kitchen I sat looking out of the window. A screaming nor'wester whipped over the hills, lashing horizontal rain before it like spray across the bows of a ship. Two dismal figures huddled in oilskins sloshed down the black, muddy lane toward the cowshed. Allen and his brother were going to the paddocks. Twenty-five cows had to be milked again.

Whatever the present condition of New Zealand's countless dairy farms, all, like the Rhodes's, had to start from scratch—if you can call jungle, mountains, and swamps that.

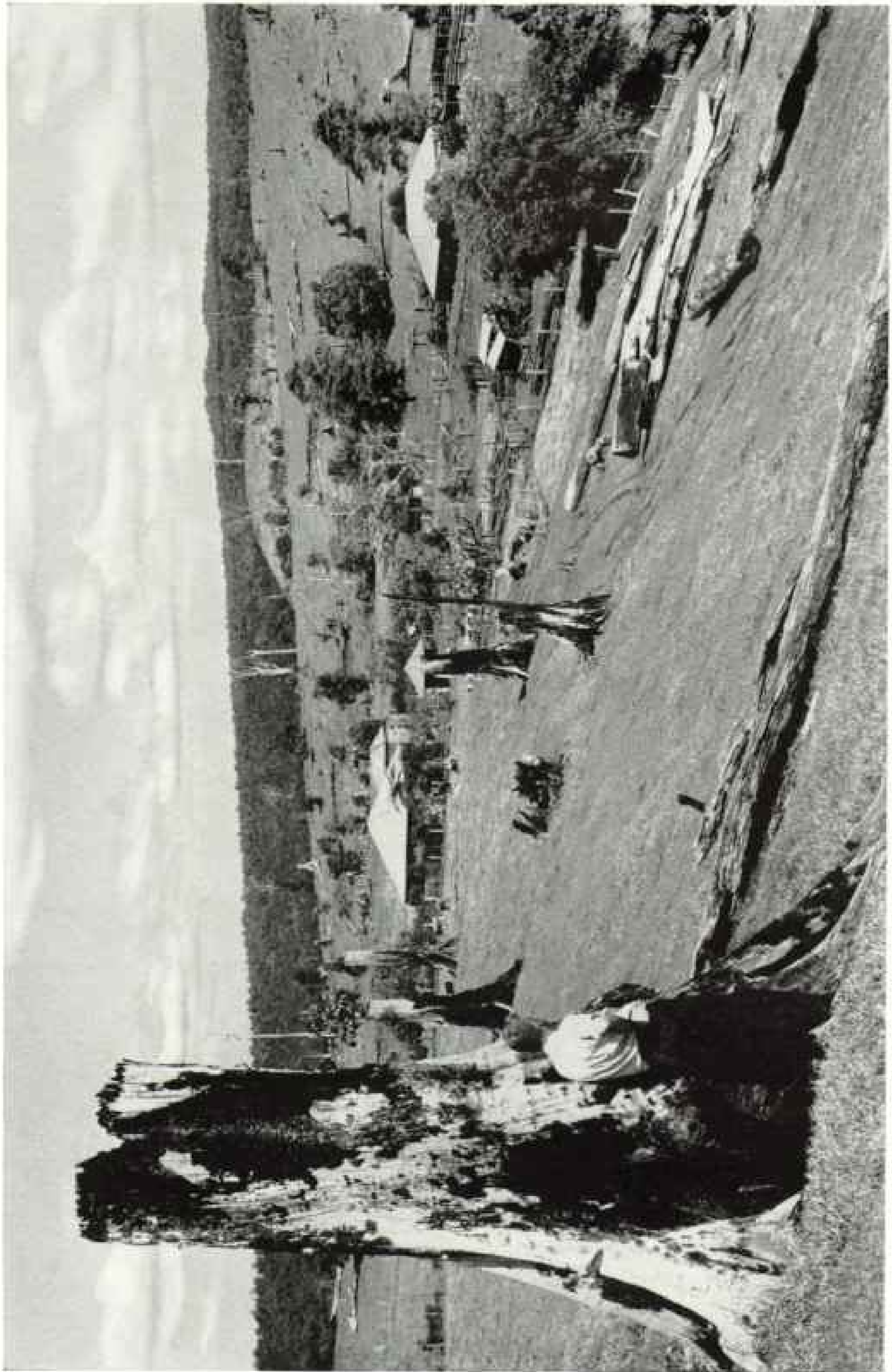
From the subtropical cow pastures in North Island to the bleak, shivering sheep lands of South Island is all the difference in two worlds.

A South Islander and I reached Hindon, 15 miles northwest of Dunedin, late one afternoon. We put on old clothes, shoved what we were going to take with us into rucksacks, and set out for John Graham's sheep station, five miles up and away. Only access was a mountain trail (Plate XV).



Before Big Timber Is Felled, Branches That Might Damage Other Trees Are Cut Away.

Sam Dowling, ax in belt, slings a rope around both the tree and himself, digs his spikes into the trunk, and mounts rapidly, shifting the loop as he climbs. This tree in Tasmania was 240 feet high and 10 feet in diameter at the base.



Like a Picture of Early Pioneer Days in America Is This Newly Opened Homestead in Queensland

Around the huge charred stumps of trees dairy cattle graze on freshly sowed pastures. The farmhouse, dairy buildings, hen coops, corrals, and fences were all fashioned from timber felled on the spot. In the background spreads more rain forest, or jungle, still untouched by man.



Camera Features

Anzacs Named This Row of Posts in Honor of Their Favorite

"Snifter" is an Australian equivalent for Walt Disney's "Pluto." The white posts mark the entrance to an A.I.F. camp in Darwin, north-coast military and naval base. This strategic port is the Australian gateway to the Netherlands Indies, on the northwest, and to New Guinea, on the northeast.



Camera Features

"Too Plenty Hot," the Tribesman Told His Instructor

With members of his tribe in Northern Territory, he learns of Air Raid Precaution, but without enthusiasm. The Warguits (pronounced Waukies) are hunters and fishermen who dwell in the tropical forest near Darwin. Much-bombed Ambaina, Dutch naval base, is only 610 miles to the north.



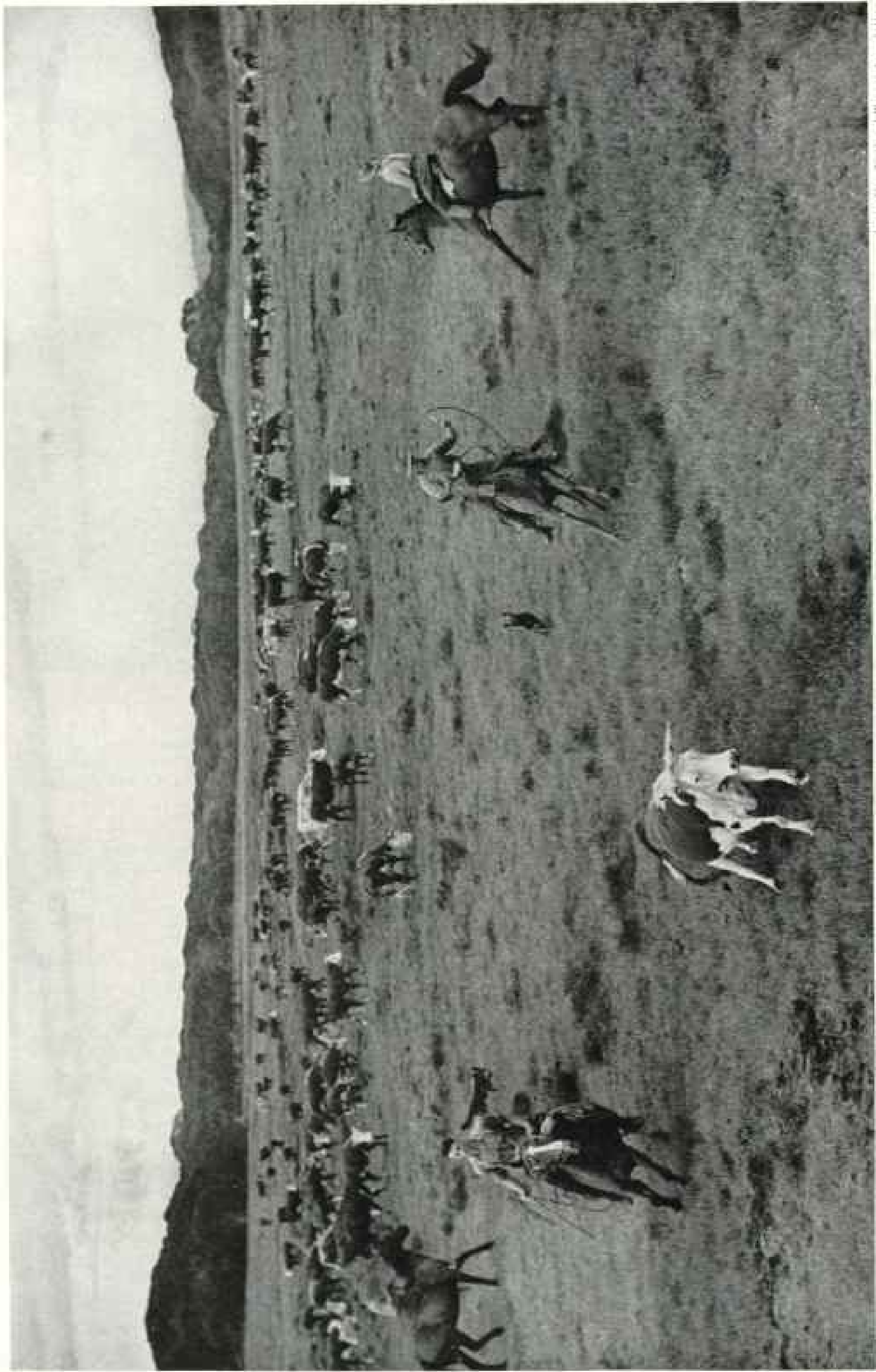
Gift Photographed W. Robert Moore

Farmers on Fertile Canterbury Plains, South Island, Use Steam Power to Thresh Their Wheat
 Some of these rich fields produce 70 bushels an acre. Average yield for New Zealand is over 30 bushels, double that of the United States.



Arnie

Horsemen Ride Hard to "Muster" Their Thundering Herd of Unruly "Walers" on the Australian Plain
 Muster means to round up. New South Wales horses exported to India in colonial days were called Walers. The name has stuck.



Australian National Travel Association

Cowboys Deftly Cut a Hereford Steer Out of the "Mob" on a Victoria Plains Cattle Range

Australian ranchers seldom use lassos. Reminiscent of the old days of cattle droving in western United States are the long treks of vast herds from ranches to nearest markets. Journeys of more than 1,000 miles over Government-maintained stock routes are not unusual. Across dry areas these trails wind and twist to touch every available stream and spring.



All Wool and Five Inches Thick—a Prize Merino Ram

His thick fleece may supply enough wool for half a dozen suits of clothes. From a few Spanish merinos which reached Sydney in 1797 by way of the Cape of Good Hope, the continent down under has built up its flocks to become the largest sheep-producing country in the world. With 120,000,000 sheep, Australia contributes about a quarter of the world's wool supply—as much as the United States, the Argentine Republic, and the Union of South Africa put together (page 427).

Hindon and its several homes huddle in the Taieri Valley like a Norwegian hamlet. Colossal mountains press it in between their steep walls. Higher up, we saw on a distant slope a small square of verdure like a tiny green patch on a big brown blanket. This was the homestead we were heading for.

Standing out more plainly at first than any of the other buildings was the sheepshed; then we saw the house, a one-story bungalow with a lot of roof. Shearers' quarters, stable, and several small outbuildings completed the settlement—all within the green patch.

Graham explained that everything on the place had to be packed in on the backs of men and horses or on a horse-drawn sledge. Yes, everything; and that meant lumber, cement, corrugated iron, barrels of paint, rolls of fencing wire, coal for the kitchen stove, plumbing fixtures, including a bathtub, and all the furniture, plus such luxuries as piano, radio, books, and pictures.

Wood for fires or construction was as rare in these wind-swept mountains as water in

central Australia. The trees I saw here were personally toted up by Graham. Six hundred Douglas firs and macrocarpas hedged the homestead for shelter; apple, plum, and pear trees bore fruit in a small orchard.

In winter snow fell by the foot and drifted by the yard. Only constant watch over the sheep kept them from getting snowed under. Often part of a flock stuck in a drift; more snow covered up the helpless animals; if not dug out, they smothered. Most difficult job was to locate buried sheep still alive.

Although roly and jolly, Graham retained a physical hardness. In about his 40th year, he impressed me as a man who had to work like a bullock earlier in life. Now his flock was his cake which he could eat and still have; he bred for both wool and meat.

Last year Graham had a woolly hand in the 940,000 New Zealand bales exported to help keep the Allied armies in sheeps' clothing. That's a heavy order when an average of 325 pounds of wool is pressed into each bale. His fattest flocks went to town to help the country's



In Seven Years the Rhodes Family Carved This Dairy Farm Out of Jungle

When her husband died, Mrs. Rhodes moved with her six children from Dunedin to a New Zealand wilderness tract of 182 acres (page 439). Now the boys have cleared enough pastureland for 30 cows. Here George and Allen, accompanied by their cattle dog, carry a can of cream to a roadside station.



Maori Recruits Take a "Shot in the Arm" with a Grin

Inoculations prevent tetanus and typhoid. More than 5,000 descendants of New Zealand's Polynesian settlers have enlisted in the Army; 4,700 are serving overseas (page 438). All Maoris are volunteers, for conscription does not apply to them. The grimace is for the benefit of the camera, not the needle.

thirty-odd freezing works export a \$43,000,000 dish of very cold lamb and mutton.

New Zealanders like a vigorous, outdoor life. In the beginning they challenged the land's front line of resistance. Even today, when bush settlers have cleared the way to profitable farming, they often sell out to start all over again in another wilderness.

As fond of sport as Australians, New Zealanders can hold their own against their cousins across the Tasman except in cricket.

The country contributed hardy men to epic exploration, including Capt. Robert Scott's last expedition. On other Antarctic journeys New Zealanders have accompanied Admiral Byrd and Lincoln Ellsworth.*

A Versatile South Islander

Meet a South Islander in his thirties. An all-round athlete at school, he excelled as boxer, swimmer, and footballer.

His professional life began in a chemist shop (drugstore). He was assistant cameraman to an American film unit at Lake Taupo, an electrician in a gold mine, timber worker, and taxi driver, Public Works laborer, and gold sluicer. While a workingman, he extended his sports to yachting and mountaineering. Mac, his wife, and two children live in a bungalow which he designed and helped build. Limited as they are for space, etc., they made me feel genuinely welcome.

I shared their Sunday supper of cold mutton, tea, and toast; helped wash the dishes and clean up. That night I spread my sleeping bag on their living room floor.

Proudly Mac exhibited a pill bottle containing some of the gold he had retrieved from sluicing. His enthusiasm showed me that he felt his claim was making good; he would be a gold sluicer for the next year at least.

Then what? Perhaps the Government can tell.

New Zealand is now calling up married men with children for military service. As great a love as Mac has for family and home, he will put on his uniform without one word of complaint to fight in his country's service if necessary. He is made of the stuff that keeps the Victoria Cross real.

Not all New Zealanders, however, can live and work outdoors or go to war. More than 11,000 factory employees make munitions and military supplies.

I watched men in railway workshops tool parts for Bren gun carriers; and I saw General Motors assemble them. The manager of an ammunition factory guided me through the 100 operations necessary to make .303-caliber cartridges. In an aircraft plant I looked over

the shoulders of men and women fashioning wooden frames for wings.

Already, textile mills have run off enough yardage for military clothing to reach from New York to Miami, Florida, and currently turn out 3,000 sets of full battle dress per week.

New Zealanders have the sturdy independence of Australians. They are ahead of the Aussies in experimenting with social legislation. Nevertheless, British sentiment holds strongly. "Gentlemen, the King!" brings reverent response in this distant Dominion. I asked the Honorable Peter Fraser, Prime Minister of New Zealand, what made an Anzac an Anzac. He questioned:

"Just what is an Anzac?"

I saw the point: you cannot define an Anzac as an individual.

Speaking of the New Zealand soldier, the Prime Minister said: "He is what he is because he lives America's Declaration of Independence. He is free and independent; as different from the Australian as one New Zealander is from another. Each lives his own way, draws on his own particular resources, and develops his own ways and means of meeting various situations. Yet, as a body, they show a remarkable co-operation.

"The establishment of social institutions has not stultified the New Zealander's initiative," Mr. Fraser continued. "In Greece when the Allies were forced to retreat, the order was given to leave Bren guns and Lewis guns and other heavy gear behind. New Zealanders disregarded this order, for they figured they could get their equipment out with themselves. And they did."

These two countries of the South Sea—one of vast plains and sunshine, the other of verdant valleys and rugged mountains—have cradled the Anzac. He is the Storm Trooper par excellence of the Democracies. He is the straight product of a free land where living is healthy, but tough.

Looking at an Anzac from his homeland, it seems perfectly natural that he should depart for the other side of the world, bronzed skin, cheeky grin, and all, to get into the fight. A quality of deep insight somewhere in these regions of go-as-you-please inspires men to protect their shores, thousands of miles away from the escarpments of Libia and the Pass of Thermopylae.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, by Rear Admiral Richard E. Byrd, "Conquest of Antarctica by Air," August, 1930, and "Exploring the Ice Age in Antarctica," October, 1935; and by Lincoln Ellsworth, "My Four Antarctic Expeditions," July, 1939, and "My Flight Across Antarctica," July, 1936.

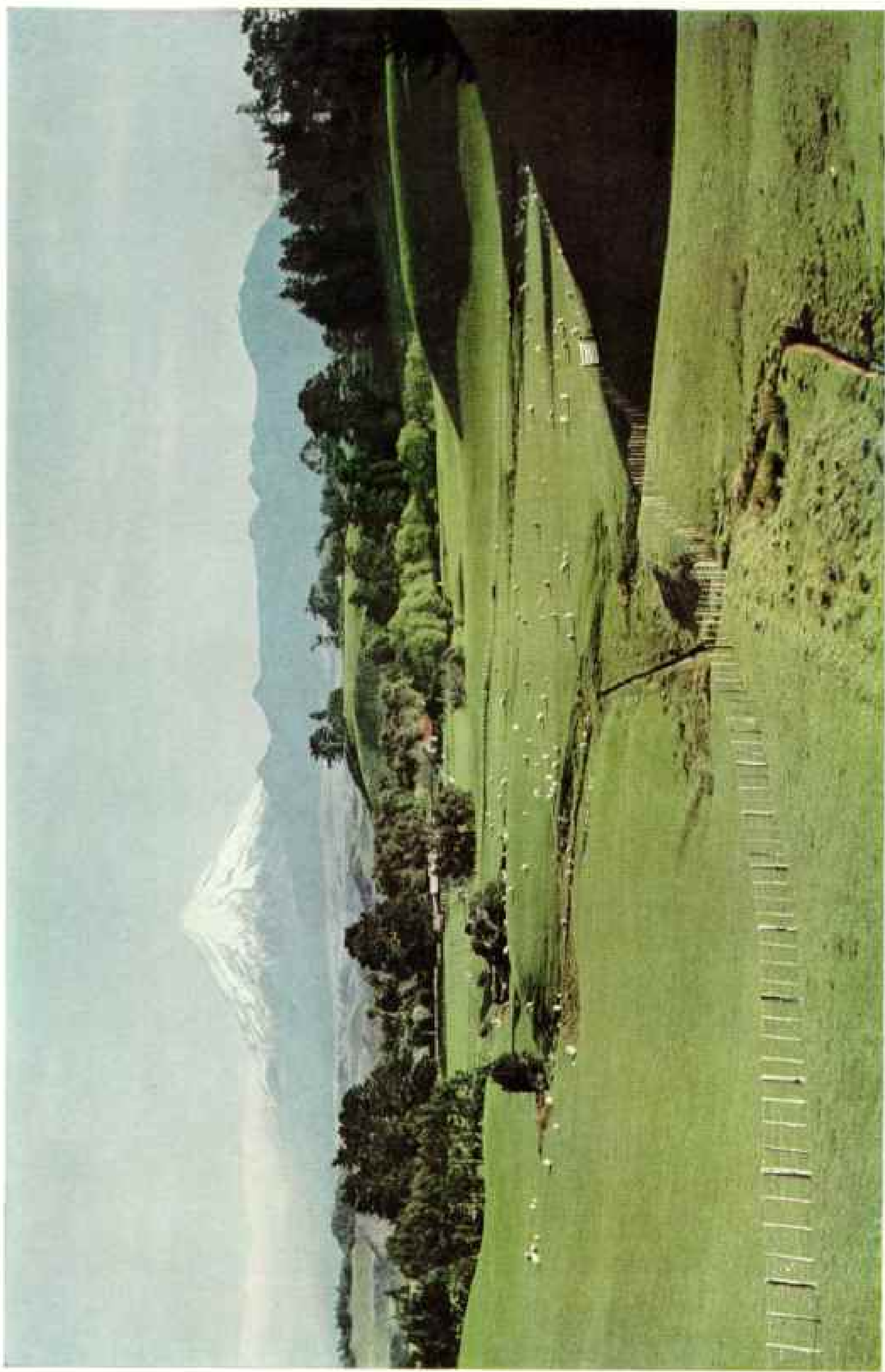


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Illustration by Howell Walker

New Zealand Sends Another Mine Sweeper Down the Ways to Meet the Japanese

Here at Auckland shipyards turn out small naval vessels under private contract. H.M.S. *Manuka* today proudly bears the designation H.M.N.Z.S., for New Zealand's Navy now has an identity of its own. The bow is decorated with a New Zealand tea shrub, called *manuka* in the Maori language.

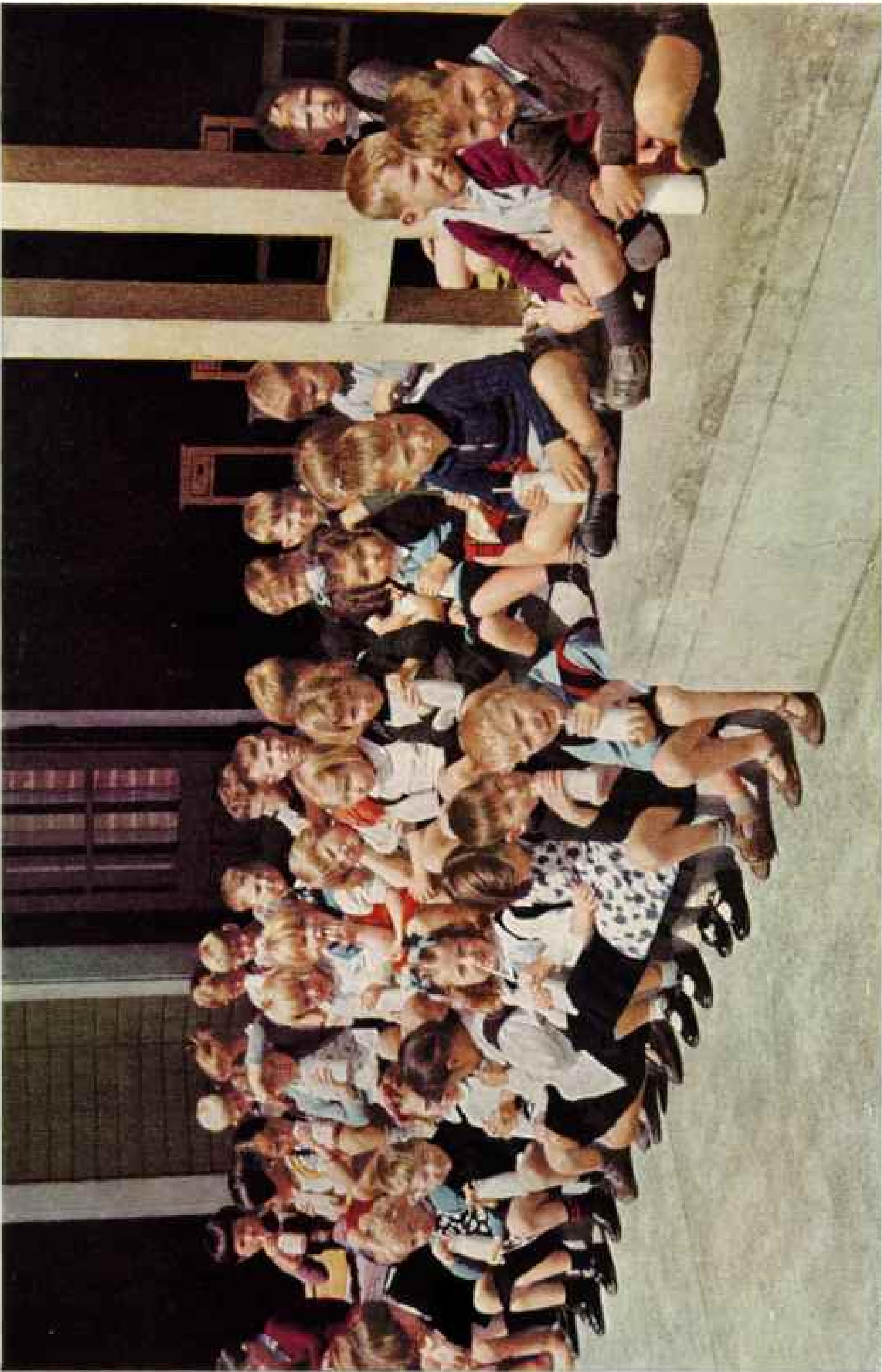


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Snow-capped Mount Egmont Rises Stark and Cold Out of a Land of Pleasant Pastures

This slumbering volcano, close to the western shore of North Island, New Zealand, soars 8,260 feet above sea level. When Captain James Cook first sighted it, in 1770, he named it for the Earl of Egmont. Climbing to the snow-clad summit is not risky in summer (January and February), because the slope is not steep.

Reproduction by Howell Walker

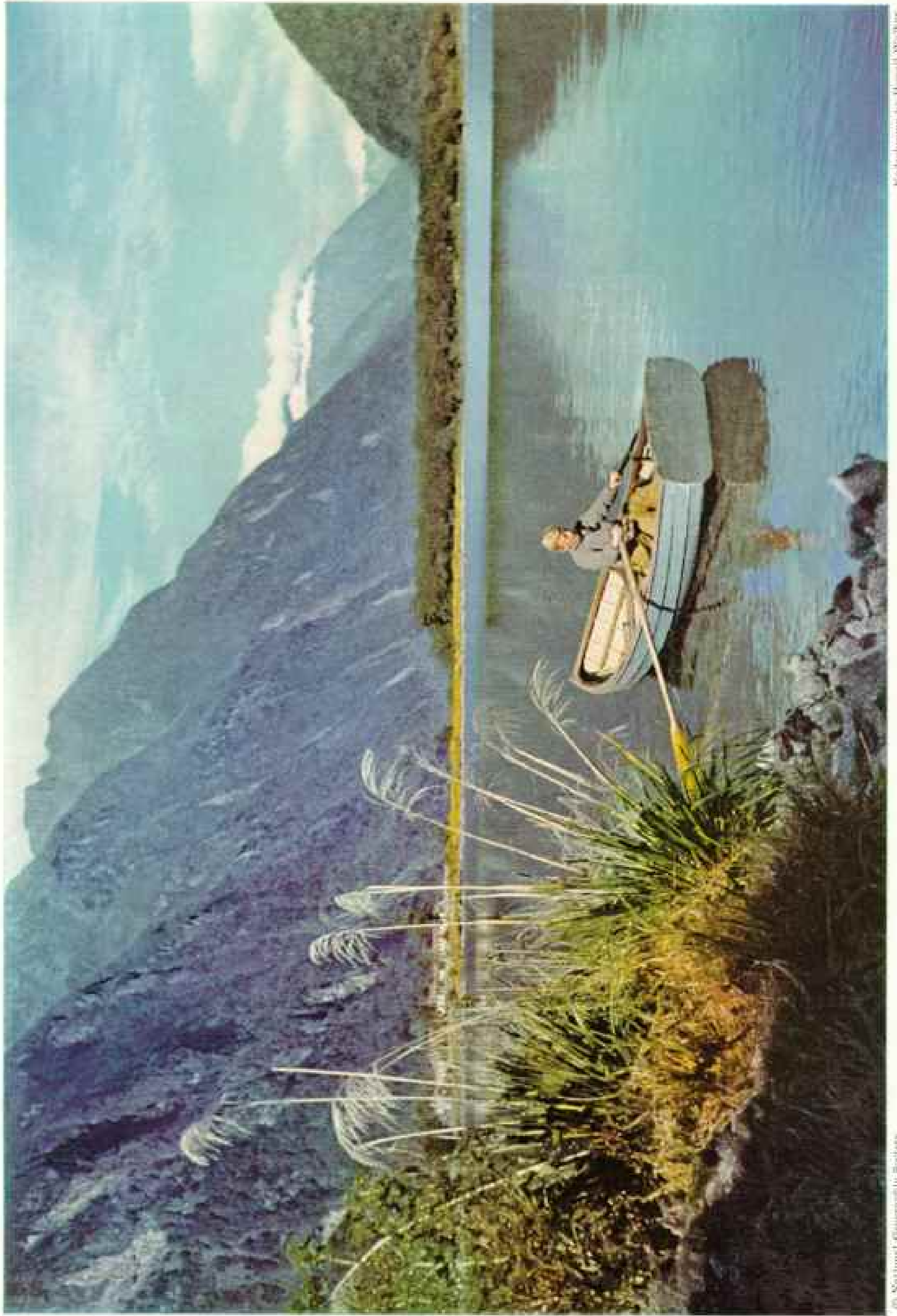


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Reproduction by Harold Webster

Free Milk Is Served Rosy-cheeked School Children of Auckland, New Zealand, Until They Are 10 Years Old

Even after they go to high school, the boys will continue to wear shorts. Long trousers and knickers come much later here. Regulations stipulate that shorts must be two inches above the knees.



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Glaciers from New Zealand's Lofty Southern Alps Feed Crystal-clear Waimakariri River

Kodakchrome by Howell Walker



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Two More Aussies Are Off to the Wars

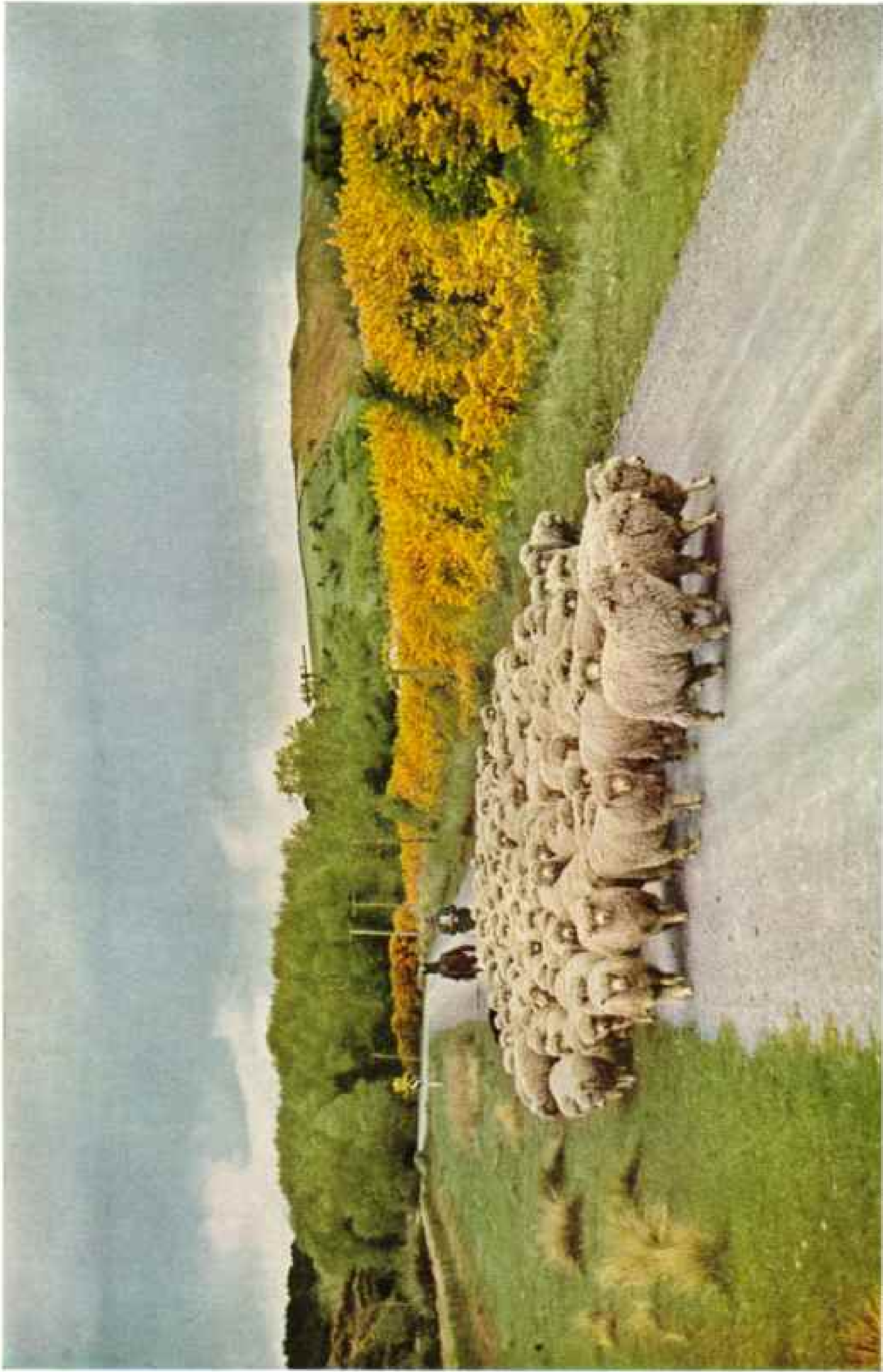
Members of the same Anzac company, they left Victoria for overseas service the day this photograph was made. Many A.I.F. men served all through the First World War; now they are going back for another taste.



— 11 Wikimedia Commons by Howell Whittier

Let the War Wait an Hour or Two—the Zoo Is Calling

A New Zealand home guard (back turned) and a corporal in overseas uniform start on a brief outing. When a new avenue was opened in Auckland soon after the First World War, it was promptly named "Anzac."

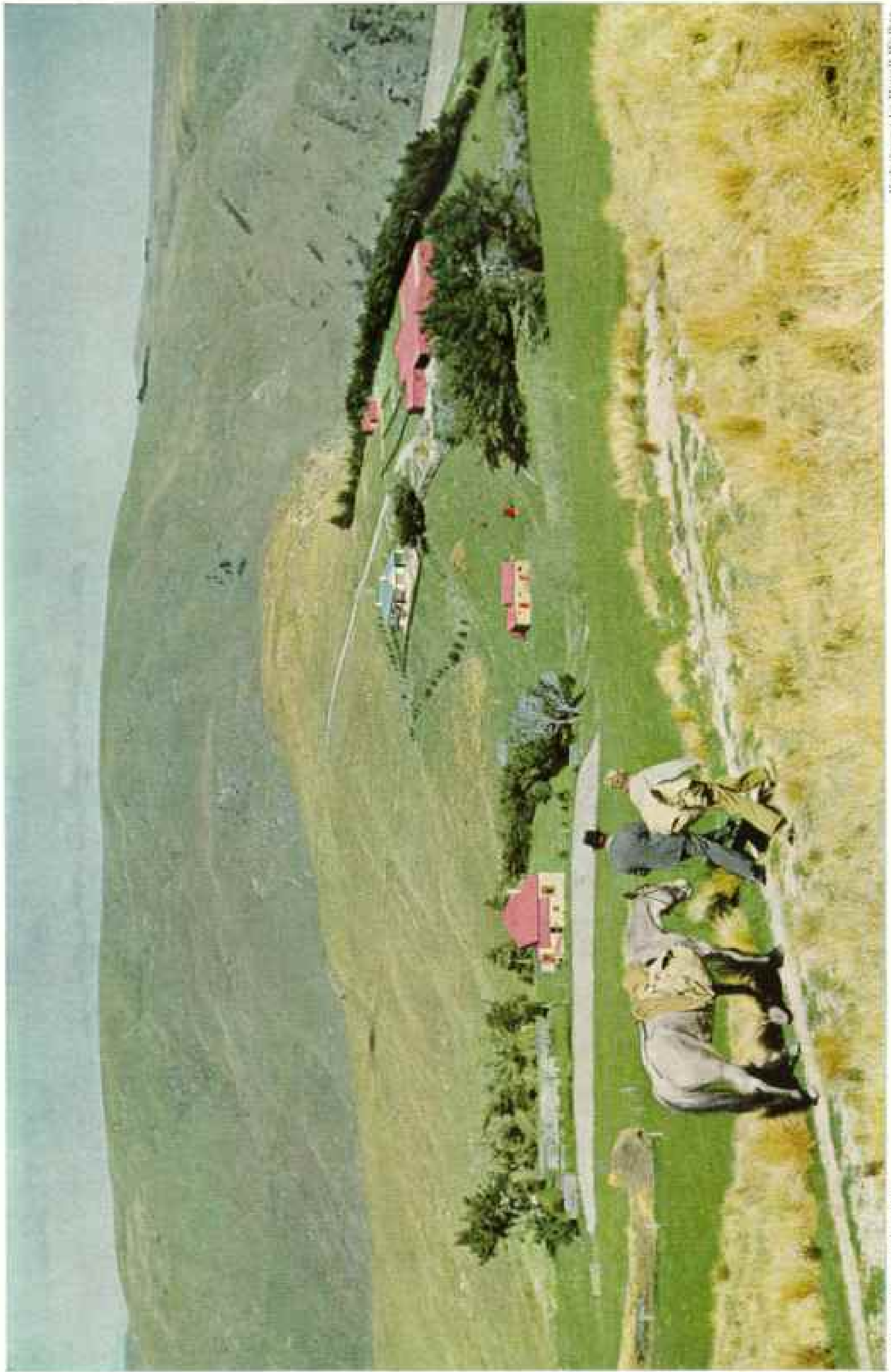


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Prize Corriedales Pass a Hedge of Golden Gorse on Their Way to Market in Geraldine

Reproduction by Herbert Walker

This breed, famous for both wool and mutton, was originated in New Zealand. The islands have 40 percent less area than Texas, yet their sheep population is three times larger than that of this leading sheep-raising State. For every man, woman, and child in New Zealand, there are 20 sheep—a total of about 31,000,000.



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Reproduced by Russell Walker

By Packhorse Trail a Sheep Rancher Climbs to His Isolated Homestead from the Floor of Taieri Valley

This rolling pastureland, near Dunedin, provides all-year-round forage for the flocks. Hereabouts the Maoris held cannibal orgies before the coming of Europeans to New Zealand. Today the highly civilized descendants of the tribesmen are represented in the Dominion Legislative Council and House of Representatives.



To This Sandbag Booth, New Zealanders Bring Gifts for a Spitfire Fund. The "shelter" outside an Auckland suburban branch bank was built to stimulate interest in V-for-Victory drives.



© National Geographic Society

Kodachromes by Horrell Walker

Maoris, New Zealand's "First Families," Drill to Defend Their Homeland

"Put them in uniform," an officer told Mr. Walker, "and they become rigidly military. They have an uncanny ability to learn Army ways quickly, and camp life appeals to them." A special all-Maori battalion has distinguished itself at the battlefield in Greece, Crete, and Libya.

Metal Sinews of Strength

This Is a War of Many Metals, for We Live in an Age of Alloys

BY FREDERICK G. VOSBURGH

AT THE Army's busy Bolling Field at Washington the other day I watched 14 tons of metal take the air—the big four-motored American bomber that the British call the Liberator.

"On the ground she looks as awkward as a hobbled goose," remarked an Air Corps captain, "but as soon as she's off and those wheels are folded back, she's as graceful as a gull."

Waddling to the head of the long runway, she poised, quivering, thunderous with power. Her aluminum skin was dark with war paint, a camouflaging coat of dull black, dirt brown, and forest green. Near the nose was emblazoned the proud name *Arabian Knight*.

This Consolidated ship, built at San Diego, had crossed and recrossed the Atlantic, flying over the jungles and desert battlefields of Africa on a bomber-route survey flight, and on across the strategic Near East all the way to India. Now young pilots were getting experience by helping fly the *Knight* to Wright Field at Dayton.

Horse's Strength with Kitten's Weight

These youngsters were riding a metal marvel more wonderful than any flying carpet. As the monster thundered skyward, it answered the terrific pull of 4,800 mechanical horses.

Hitched up like the reindeer of Saint Nick's sleigh, they would make a five-mile double line. But these horses are packed away in the motors like genii in a box, and each one, though as strong as any horse, weighs barely over a pound, or as much as a month-old kitten.

How has this wonder been achieved—a horse's strength with a kitten's weight? The answer lies in modern mechanical genius working with the new light metals and new high-strength alloys.

That is why we have been hearing so much of late about aluminum, magnesium, and beryllium, about tungsten, vanadium, molybdenum, and a long string of others which to most of us have been little more than names. Such metals are the fibers of strength to a great modern industrial nation, whether in peace or in war.

More than any other struggle in history, this is a war of many metals, and the lack of a single one may be a blow far worse than the loss of a battle. Eloquent is this incident.

As Germany's metal stock piles dwindled under the drain of months of war, urgent and mysterious requests for beryllium were received in the United States.

These rush orders came ostensibly from Swiss watchmakers. They wanted the metal, many pounds of it, shipped at once to Europe by Clipper.

Now, beryllium is a modern miracle metal and one of the increasingly important if least-known sinews of mechanical war. Less than two percent of it by weight, if alloyed with copper, will make that soft red metal so hard it will cut steel.

Like Hope, Beryllium Springs Eternal

Used in springs and in diaphragms of delicate instruments, heat-treated beryllium alloys stick to their job even under fiercely corrosive conditions. In tests made under a salt spray, springs of beryllium copper have gone on functioning long after their spring-steel rivals have broken.

"Hope springs eternal and so does beryllium," might be this metal's slogan.

Such Spartan refusal to quit in the pinches has given beryllium a small but crucial part in the vitals of today's mechanical armies, air fleets, and navies. It serves in the sensitive fire-control apparatus which aims big guns and in other military equipment so secret that details cannot be given here.

But beryllium's biggest use now is in airplanes, for parts whose failure would mean disaster. The metal plays its life-or-death role in the motor and instrument panel of every American warplane and those of every other major power—provided they can get it.

Hence the sudden urgent needs of "Swiss watchmakers" aroused a healthy suspicion in America, particularly since a few pounds of beryllium, alloyed as it is with 96 or 98 percent of copper, would make enough watchsprings to supply the whole world.

P. S. They didn't get their beryllium.

As a commercial metal, beryllium is young—little over sweet sixteen. Although it was discovered more than a century ago, up to 1925 few dreamed of a practical use for it.

Today its uses are steadily widening. Its lightness (two-thirds the weight of aluminum), and the astonishing strength it gives its alloys, stamp it as a metal with a brilliant future.

Beryllium comes from stones known as



© International News

Magnesium Punctures the Sky in Peacetime Fireworks over the White House

This prewar Fourth of July display owes its brilliance largely to the powdered metal. But nowadays all available magnesium powder goes into military pyrotechnics—parachute flares, star shells, tracers, and incendiary bombs.

beryl crystals, which are always six-sided (pages 460 and 461). Usually pale green, yellowish, or grayish white, common beryl is a poor relation of the fabulously valuable emerald, which is actually a kind of beryl.

The Roman Emperor Nero viewed gladiatorial gore through a monocle made of a choice bit of beryl.

In the world there are probably enough beryl crystals to last for several generations at any foreseeable rate of consumption. The ore is found on all continents, but Europe has comparatively little. Hitler acquired a limited amount of beryl in Austria, and if he had conquered Russia he would have gotten the beryl of the Urals.

Virtually all of the beryllium now produced in the United States comes from Brazilian and Argentine ores, though beryl in several of our States could be worked in an emergency. Beryl crystals are being imported today in vastly increased quantities.

Beryllium All About and Not an Ounce in Sight

When I visited the plant of the Beryllium Corporation of Pennsylvania, there was not an ounce of the metal in sight, although it was shipping thousands of pounds of beryllium copper a day.

The answer is that beryl crystals yield their metal only after a last-ditch struggle; so a way has been found to get beryllium into copper or nickel without producing the metal separately. Instead the marriage of metals is effected by using beryllium in the form of its powdery oxide, obtained from the ore. This cuts the cost to \$15 per pound of contained beryllium. Otherwise little could be used, so heavy would be the expense.

Fifteen years ago it cost \$500 to extract a pound of beryllium from its ore. Even today you would have to pay \$47 if you wanted a pound of pure beryllium.

What you would get would be a light-weight, steel-gray metal somewhat resembling aluminum and so brittle it would break if struck a sharp blow. It would be of no known commercial use, except in industrial X-ray tubes where its transparency to X-rays makes it useful; or unless, like the "Swiss watch-makers," you needed it so badly for making alloys that you were willing to stand the high cost of getting this ingredient in metallic form.



General Electric Co.

She Inspects the Tiny Tungsten Wire That Glows in Bulbs to Give Us Light

At top is the silhouette of a 60-watt Mazda lamp filament, enlarged 80 times. It is a "coiled coil," made by giving the smaller coiled filament in the center a second series of spiral twists. At bottom is a human hair to show scale. Tungsten is so tough and resistant to heat that it cannot be worked like other metals; such wires are made by "powder metallurgy"—pulverizing the metal and compacting the powder (p. 480).

As yet the potentialities of beryllium have been incompletely explored. Much secret research is under way.

Some Metals Will Float

Asked to name all the known metals in the world, few of us could give more than twenty. Yet the total list is more than three times that long—some seventy kinds of metal. Of these about thirty are useful today, though others may become so, with the advance of knowledge, just as beryllium did.

Some metals—lithium, potassium, and sodium—are so light they will float on water. In fact, lithium is little over half the weight of water and will float on oil; yet a bit of it mixed with other metals such as aluminum or lead will make them much stronger and harder. In molten metals it serves as a scavenger, removing impurities.

Potassium, silvery-white with a bluish tinge, is a metal that can be cut like cheese with a dull knife and kneaded in the fingers. If a piece is dropped on water, the metal bursts into violet-colored flame and fizzes about. At last, when the heat so decreases that water penetrates the fire and wets the potassium, it expires with an explosion.

Also remarkable, though less violent, is the reaction of sodium, the metal of common table salt. Metallic sodium, waxlike at room temperature, has been used as a conductor of electricity and heat, since the only other metals that are better at the job are silver, copper, and gold. It serves in aircraft engine exhaust valves. But conduits of sodium must be covered, for it oxidizes quickly in moist air and a drop of water will throw it into a rage.

Metal Even in Common Chalk

A useful though little-known metal is calcium, so-called because it occurs in chemical disguise in ordinary chalk (from the Latin and Greek *calx* and *chalix*). This is another of the good scavengers; it is used in making especially "clean" steel and also for alloying. Magnesium castings, now in such demand for airplanes, are given an improved surface by addition of calcium.

Widely distributed in limestone, shells, bones, and the like, calcium is one of the most abundant of elements; yet the metal is rare. Until 1939 its only producers were in France and Germany, but now a big new plant in Michigan gives this country self-sufficiency. The metal is made by running electricity



Staff Photographer Willard R. Carter

Beryllium, the Wonder Metal, Lies Hidden in These Six-sided Stones.

Whether they weigh a few ounces or a ton, beryl crystals are always hexagonal, just as Nature gave oak or maple leaves a characteristic shape. The metal extracted from these crystals—poor relations of the precious emerald—plays an important part in modern war (pages 457 and opposite).



Staff Photographer Willard R. Carter

Burning Magnesium Flares into Fury When Hit by a Stream of Water

How not to attack an incendiary bomb is demonstrated to the National Geographic Society air-raid wardens by Lieutenant Commander John P. Wetherill 3d, U. S. N. R. A jet of water makes the brightly burning metal explode, hurling forth a vicious fireworks display of white-hot magnesium. Water should be used only as spray, which causes the bomb to consume itself quickly but without explosion.



Staff Photographer Willard R. Carter

Gleaming Pigs of Beryllium Copper Look Like Bars of Gold

The handsome yellow alloy being sorted at the Beryllium Corporation plant will go into vital, delicate parts of airplane engines and instruments. A tiny bit of beryllium makes copper so hard it cuts steel (page 457). In powder factories and other plants where a spark might cause disaster, nonsparking safety tools of beryllium copper are used. Beryllium serves in cameras, vacuum cleaners, refrigerators, etc.

through molten calcium chloride. Calcium quickly takes on a white coat of oxide and looks like anything but a metal in the large "carrots" and cauliflowerlike lumps in which it is sold.

Selenium Quits When Darkness Comes

Another strange metal is selenium, a by-product of copper refining and sulphuric acid making. It has the extraordinary property of being a conductor of electricity in the light but virtually a nonconductor in darkness. Thus it is the basis of many inventions, including devices for turning lights on and off automatically.

In the points of our fountain pens are osmium and iridium, the heaviest metals known—nearly twice as heavy as lead. Close relatives of platinum, they are used in pen points as the hard natural alloy called osmiridium.

A few persons have metal in their skulls. A surgeon recently reported in the *Journal of the American Medical Association* that Vitallium, an alloy of cobalt, chromium, and nickel, had proved successful for patch-

ing holes in heads. In contrast to high-purity silver, which is soft, he found it tremendously strong—"stronger than bone"—and described the technique as much simpler than bone grafting. The alloy, he reported, had no reaction upon the adjoining tissue. The scalp grew over it, and the patient reported not even a headache.

Lightweights That Shake the World

Two of the most useful of all the metals exist on earth in fantastic abundance—aluminum in the dirt under foot and magnesium in the water of the sea. But so complicated is the job of extraction that we have known them in quantity for only a generation or two.

Today in planes and bombs of war these lightweights shake the world. Aluminum, about one-third as heavy as iron, and magnesium, less than one-fourth of iron's weight, are chiefly responsible for the wonderfully low ratio of weight to power in modern airplane engines.

Already aluminum seems an old friend, so intimately have we known it in our kitchens



AP from Press Association, Inc.

It Looks Like Snow, but It's Really Metal

Newly made magnesium clings to the cooling end of the retort furnaces at the new Permanente Metals Corporation plant in California. In this process the ore is rock—magnesite from Nevada. Pioneer American producer of magnesium is the big Dow Chemical Company, which makes the metal from subterranean brine in Michigan and from sea water in Texas (page 470).

and in uncounted everyday contacts. Yet there is unsuspected romance even in a frying pan. That aluminum skillet you gladly gave to help Uncle Sam "keep 'em flying" owes its origin to a substance like common clay and to the persistence and genius of men, particularly a young American named Charles Martin Hall and a French youth, Paul Héroult.

As a student at Oberlin College, Ohio, in 1883, young Hall heard a professor say that the man to discover a practicable method of producing quantities of aluminum would be a benefactor of the world and would make a fortune. Hall set himself to the task.

Aluminum had long been produced in Europe, but by such expensive chemical processes that the metal was only a costly curiosity—comparable in price to gold and platinum.

Genius in a Woodshed

Hall knew that aluminum lay hidden in bauxite, a claylike substance that takes its name from the old town of Les Baux, in southern France. He also knew that bauxite could be reduced to white, powdery aluminum oxide, called alumina. But how best to drive out the oxygen and thus get metallic aluminum—that was the problem with which he wrestled, week after week, month after month.

Working in his father's woodshed and spending every available cent for batteries, he tried electrolyzing alumina in all kinds of substances. He failed, but he kept on trying, and at last in 1886 he hit the one substance that would work—cryolite, or "ice rock," an icy-looking mineral found in Greenland and abundant nowhere else on earth (p. 469).

When alumina was dissolved in a molten bath of this material and electricity from a carbon anode was run through the bath, the oxygen united with the carbon, passing off as carbon dioxide, and metallic aluminum was deposited at the bottom of the tank.

In Europe at about the same time a similar discovery was made by the French scientist Héroult, and development of the new metal began on both sides of the Atlantic.

With several big new plants in production, the United States will soon be leading Germany and all others in output of aluminum, as befits the homeland of Hall and a country of immense water power.

So enormously is production being expanded that experts see an era of new low prices when at last the war's demands are over—war clouds with aluminum lining.

To produce a single pound of aluminum requires four pounds of bauxite and more electric power than most of us use in our homes in two or three days. It also takes three-quarters of a pound of carbon, for the carbon electrodes in the big electrolytic cells are swiftly eaten away. Greenland's cryolite is no longer essential, for synthetic cryolite is now made from bauxite and a fairly common mineral, fluor spar.

Aluminum itself is more abundant than any other metal in the crust of the earth. It is present in the rocks and dirt under our feet, and there are ways of making it experimentally from clay.

But the best commercial ore is bauxite (pages 471 and 477). Even the dreams of medieval alchemists are outstripped by the transformation of so uninspiring a substance into shining metal.

Aluminum can be extracted also from alunite, a whitish, sometimes red-tinted mineral found in Utah and other western States, and this is now being done by a newly developed process.

Aluminum Put the "Light" in "Flight"

Aluminum went up in the air with the Wright brothers in 1903 and has been there ever since. The new light metal helped make possible that first of all heavier-than-air flights, for an aluminum-copper alloy crankcase and water jacket aided in bringing down the weight of the 12-horsepower motor to the then phenomenal figure of 12.7 pounds per horsepower.



(Illustrated Aircraft Corp.)

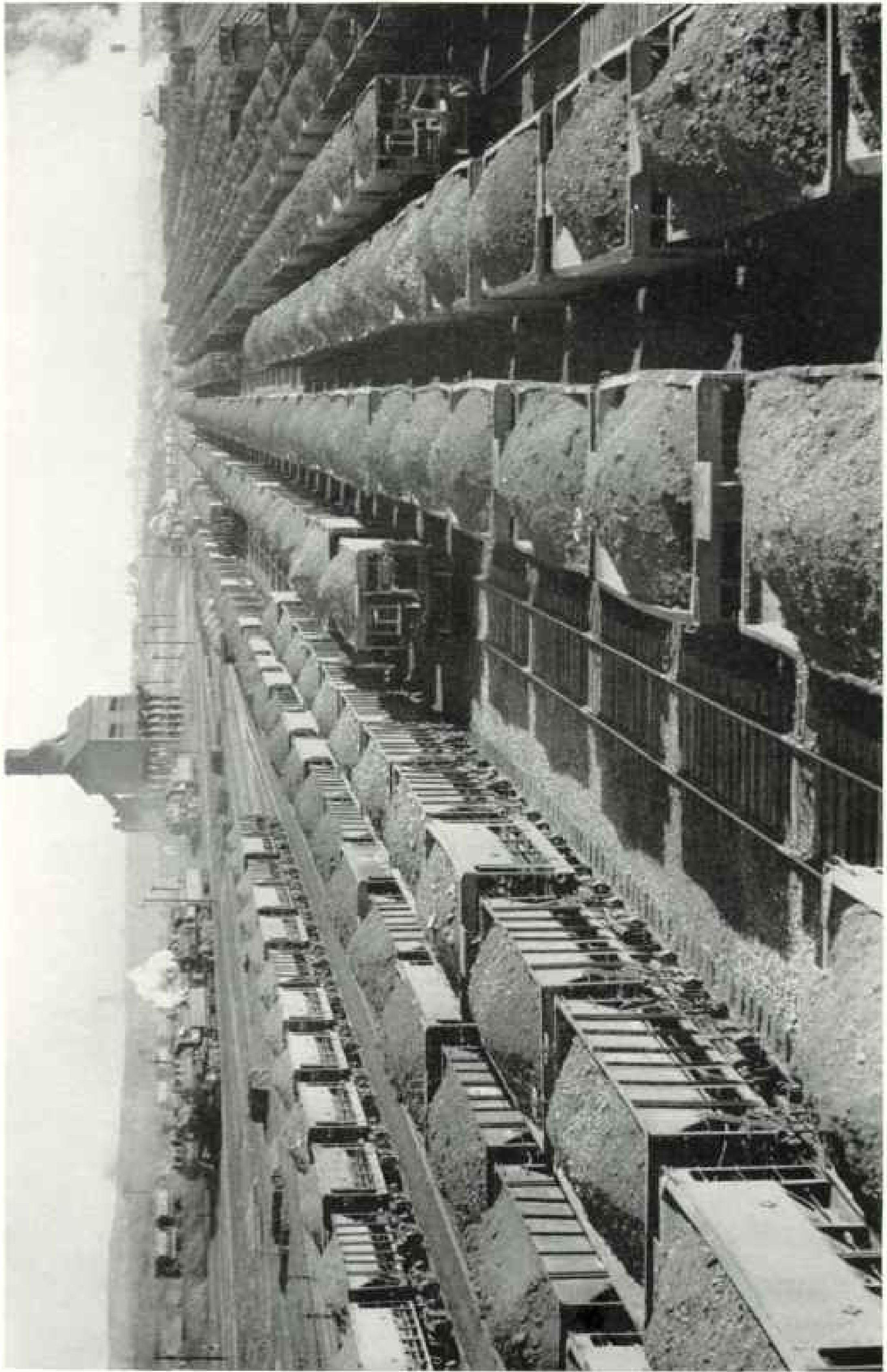
He Pours Molten Metal Over His Hand, but Doesn't Even Wince

The liquid is Bendalloy, an alloy of bismuth, lead, cadmium, and tin, which melts below the boiling point of water. It is hot, but scalding is more apt to be caused by the steaming water in which it is kept, since the water wets the hand while the molten metal rolls right off. In this airplane factory the liquid alloy is poured into a stoppered length of tubing, which is then cooled with water. The metal solidifies and keeps the tube from collapsing during bending. It also shows up hidden flaws. Remelted when the tube is placed in hot water, the alloy is poured out.

About a decade later, aluminum gave up one of its strangest and most significant secrets. A German scientist, Alfred Wilm, discovered that if aluminum was mixed with about four percent of copper, one-half percent of magnesium, and one-half percent of manganese—and if the resulting alloy was heated, quenched, then allowed to "age" several days at room temperature—this light and relatively soft, weak metal increased its strength four-fold. It became as strong as steel.

He called the alloy "duralumin."

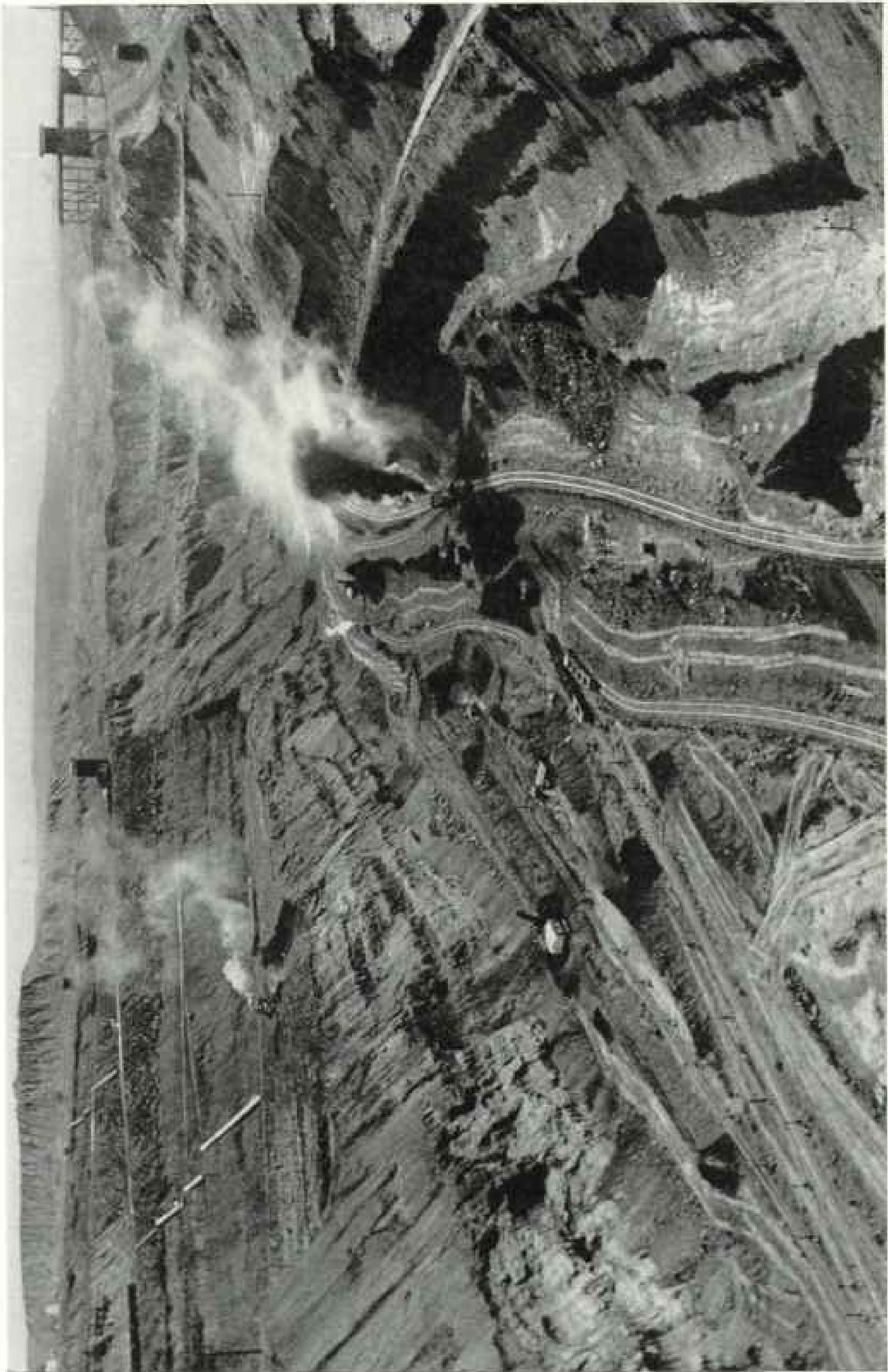
From that metallurgical miracle were born



Heavy-laden Cars of Iron Ore Are Shoved About as if They Were Toys at These Proctor, Minnesota, Sorting Yards

On their way from the mines of the iron range to the great loading docks at Duluth, the cars with their loads of rich hematite are halted here and quickly sorted into groups according to ore content. Thus a steel mill can order and get the particular grade it needs.

Sorting gateway



Hemmett Steel Corporation

A Man-made Grand Canyon of Iron Ore—Yet Only a Small Corner of the Vast Open-pit Mine at Hibbing, Minnesota, Shows Here
Biggest single contributor to America's industrial greatness is this source of hematite, from which iron and steel are made. Colors range from ochre and rust red to bluish, the richest ore. More material has been scooped out than was moved in digging the Panama Canal. The hole yawns on the old site of Hibbing (p. 474).

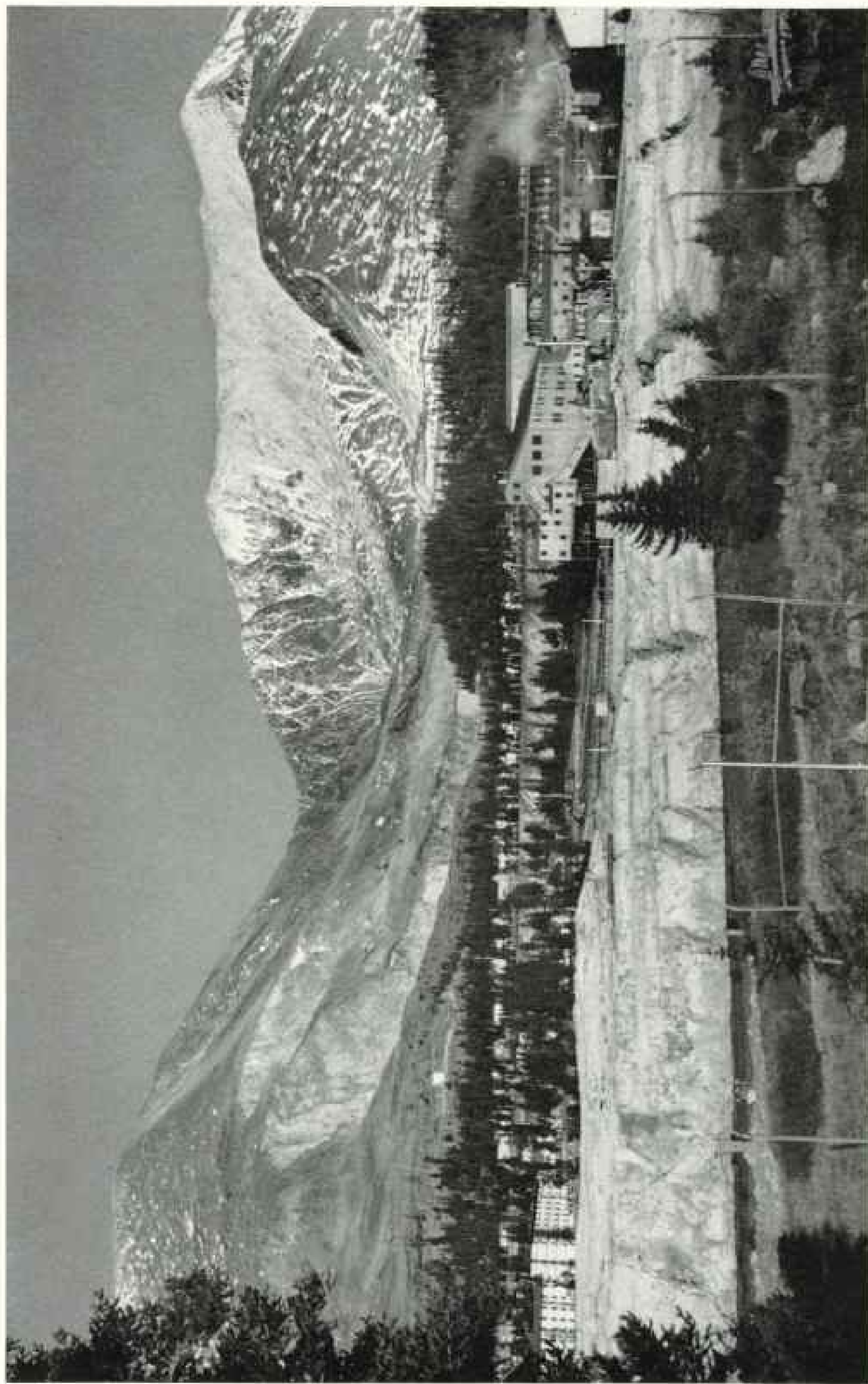
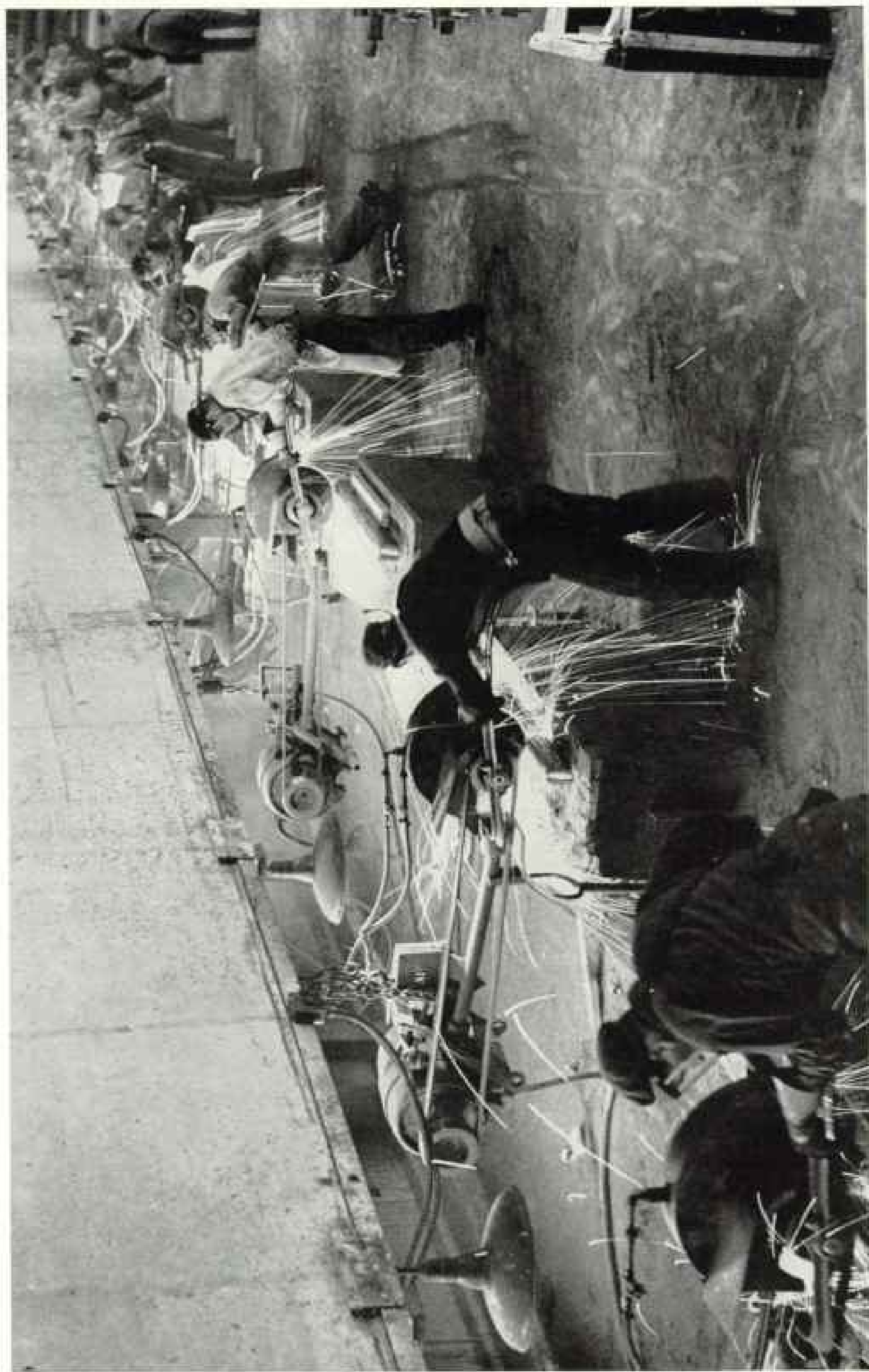


Photo Courtesy: Willard B. Carter

From a Single Mountain High in the Colorado Rockies Comes Most of the World's Steel-toughening Molybdenum.

"Glory holes" in the peak at left have been formed by blasting away its heart. Beyond the company town a tunnel penetrates the mountain and probes its thick core of granite veined with molybdenite. "Blocker" of ore above are blasted down by heavy charges of dynamite. Mine and ore mill (right) have long been running at top speed, for "moly" makes steel tougher and increasingly is replacing that hard-to-get metal, tungsten (p. 481).



J. H. Johnson and film

With Faces Masked Against Flying Sparks, They Grind Billets of Stainless Steel

In this Baltimore plant every bar is ground with an abrasive wheel to remove scale and surface imperfections. Metals alloyed with steel figuratively write their names in the spray of sparks from a high-speed wheel. An expert can quickly tell the dull-red spark of high-tungsten steel from the orange spear points of molybdenum steel or the tiny blocks of brilliant white light characteristic of nickel steel. Spark testing is often used for separating steels that have been mixed.



British Coalfield

Even Aluminum Legs and Arms Pour in to "Keep 'em Flying" in Britain

Similar collections of scrap aluminum in the United States have gone into such uses as deoxidation of steel, thus freeing high-grade virgin aluminum for use in planes.

the Zeppelins and the world's armadas of modern all-metal planes, for all consist largely of improved varieties of duralumin.

But duralumin had an Achilles' heel: it was vulnerable to corrosion. Pure aluminum, on the other hand, is highly resistant to corrosion, since it immediately acquires a virtually invisible coating of oxide which protects it from further attack.

Scientists of the National Bureau of Standards pondered the problem—and came up with the answer: "Coat the strong alloy with pure aluminum." Metallurgists of the Aluminum Company of America, after much experimentation, then developed a practical commercial method of producing "Alclad sheet." This is a duplex skin; the strong alloy wears, as a part of itself, a thin layer of high-purity aluminum (page 473).

Even if this epidermis is broken or marred, the underlying alloy is not attacked; for the pure aluminum has a higher electrical solution potential, and corrosive forces prefer it.

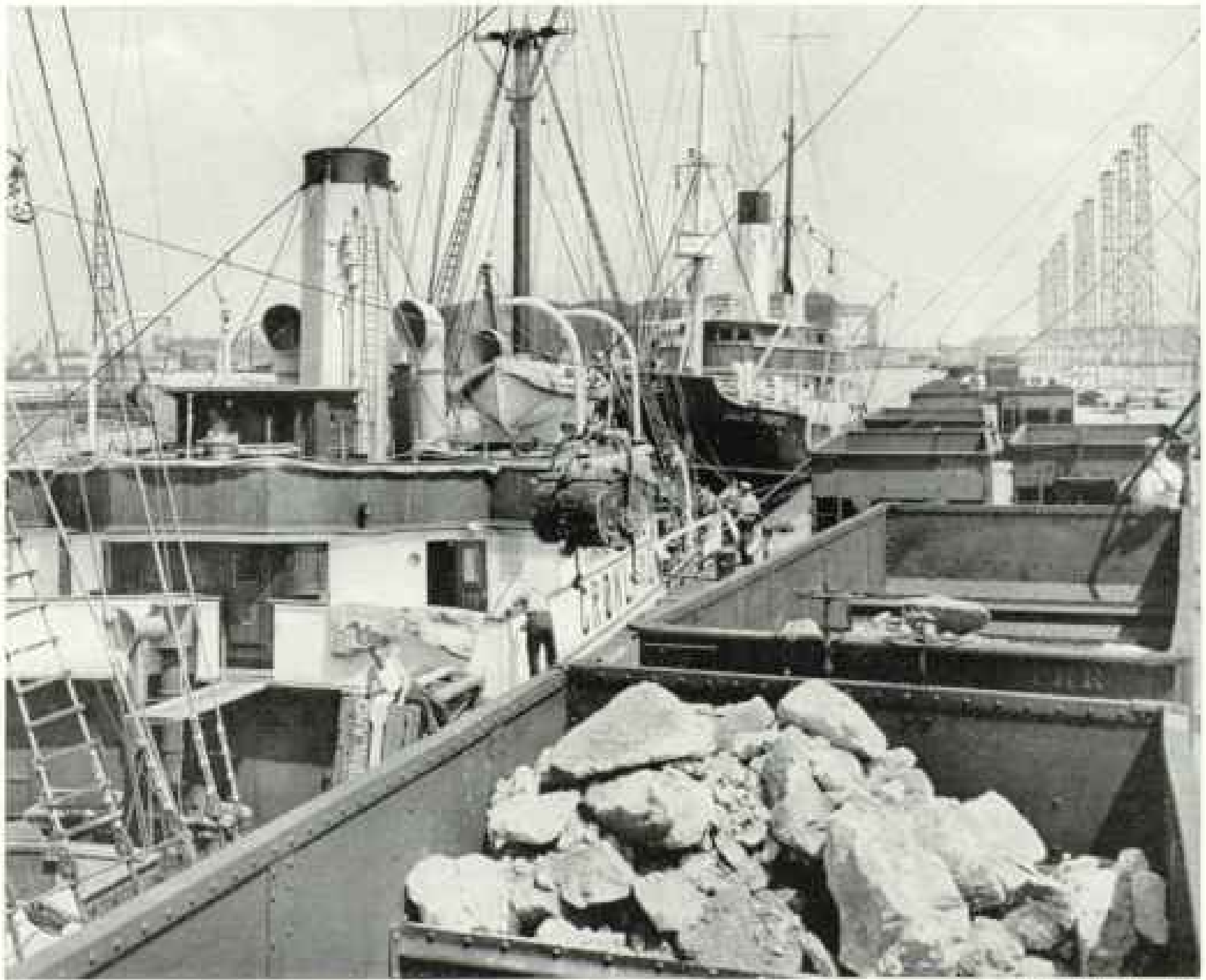
Wings and other surfaces of most big modern planes are made of this twofold metal skin, which serves their needs almost as well as our human skin serves ours.

Nearly four-fifths of the weight of today's all-metal plane is aluminum—enough in a four-motored bomber to make 30,000 skillets.

In warplanes virgin aluminum is used. Hence your old coffeepot or frying pan will probably never be reincarnated as part of a 400-mile-an-hour fighter, or roar through the blue with a load of bombs. But by filling more humdrum needs and freeing virgin metal for planes, it will have the same effect.

Aluminum rivets are used by the millions—some 277,500 in a typical patrol bomber. In the aircraft factories the visitor notes that the freshly heat-treated rivets are kept "on ice" like milk or butter until used. The reason is that they remain soft when kept cold, but at room temperature they get hard and tough.

One ingenious rivet, developed by Du Pont, locks itself into place by explosion (page 475).



Philadelphia Inquirer

Cryolite, or "Ice Rock," Arrives from Greenland to Help Make Aluminum

The mineral, which somewhat resembles ice, is being loaded into cars from Danish ships which brought it from Ivigtut, Greenland, to Philadelphia. In the Nation's expanding aluminum plants molten cryolite, or a synthetic substitute, forms the bath in which the metal is born at electricity's magic touch (page 462). Greenland is the only known place in the world where cryolite occurs in quantity.

But many a rivet is now losing its job to a newcomer known as the spot welder. Put two pieces of aluminum together, apply an electrode on each side, and turn on a powerful current for a fraction of a second—it's as simple as that. The metal between the electrodes fuses, stiffens, and the two pieces henceforth are one.

Already some specially designed planes have been assembled almost entirely by spot welding. One of the Glenn L. Martin production experts recently predicted that with improvement of this device it will be possible to put parts into a form and turn out half a plane at the touch of a button.

At the Aluminum Company's Research Laboratories, I saw aluminum being tested to the breaking point in elaborate "torture chambers." Parts must be strong enough but no stronger, for warplanes can carry no excess weight. On the walls of aircraft designing

rooms is the query, "Have you saved your ounce today?"

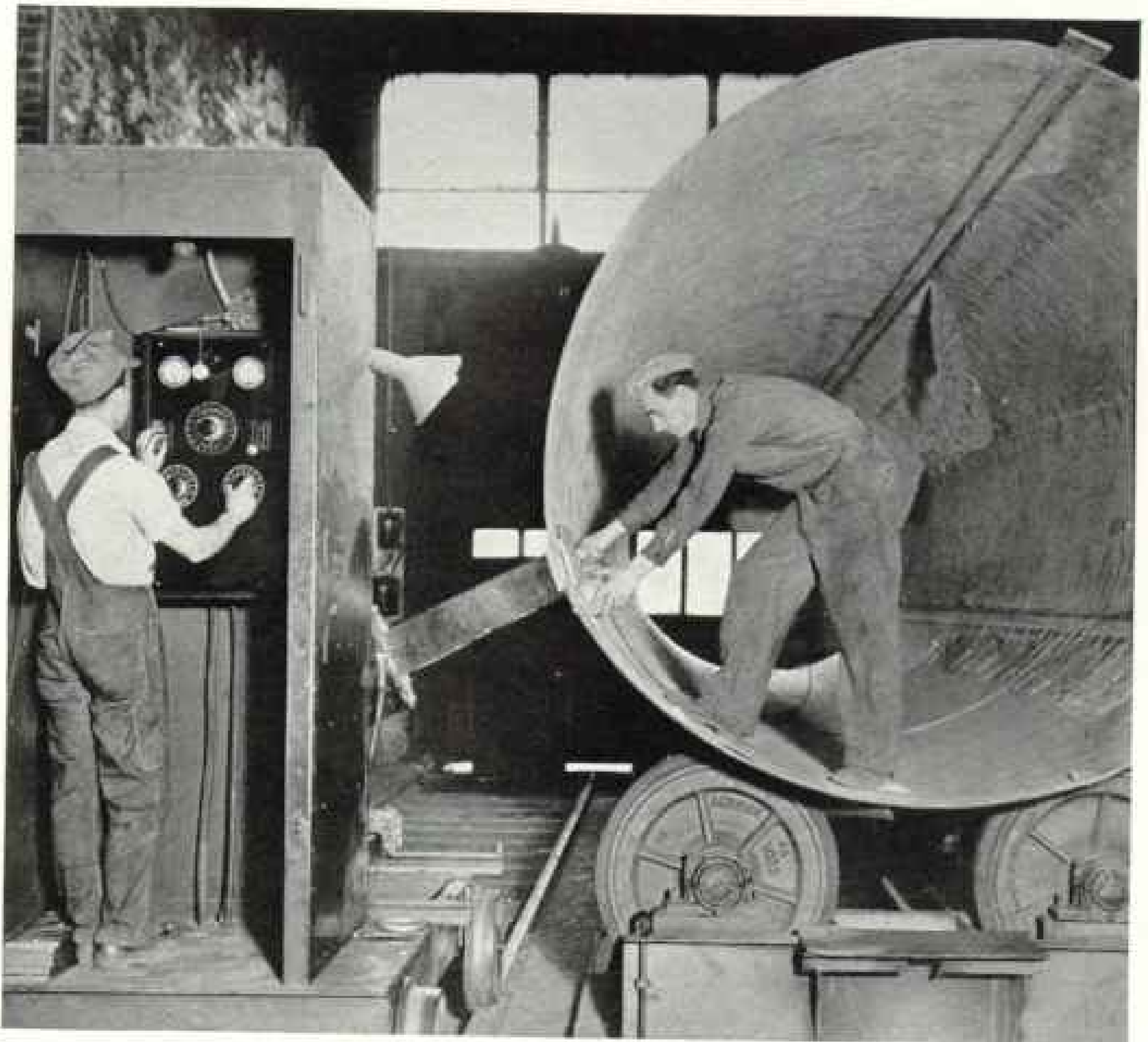
Many aluminum products are made by extrusion, the metal being squeezed like toothpaste through openings that give the desired shape. The metal of a whole store front can be squeezed out in a few simple pieces.

Powdered aluminum, plus iron oxide, forms the dread thermite used in incendiary bombs. When ignited, this mixture turns to molten iron, which will burn its way through a house from roof to cellar in a trice.

Some incendiaries are filled entirely with thermite. In others it merely serves to ignite magnesium (page 460). In peace thermite is used for welding steel.

Every Drop in the Sea Is Magnesium Ore

Rivaling aluminum for many uses is magnesium, lightest of structural metals. A bomber wheel of magnesium weighs only two-



International Nickel Co., Inc.

Tank Cars Can Keep No Secrets from the X-ray's Gimlet Eye

Welds on a nickel-clad-steel tank car are being inspected by an X-ray machine on wheels. From booth to car runs a lead sheathing, like a camera bellows, which protects operators and other workmen from scatter radiation. The man at right is placing the film holder over the welded seam. The first all-welded unit of this "bi-metal"—nickel inside for corrosion resistance and steel outside for economy—recently went into service carrying chemicals and other materials essential to war.

thirds as much as an aluminum wheel the same size.

On the Gulf of Mexico, in Texas, the Dow Chemical Company is making the silvery metal from sea water, for magnesium salts are present in every drop in the oceans.

Considerably richer is the salt water that underlies the rolling countryside of central Michigan, and until 1941 all of the Nation's magnesium came from this magic brine. Squarely between Lakes Huron and Michigan, two of the biggest *fresh-water* lakes in the world, lies this underground lake of *salt* water. The Dow Chemical Company has been pumping it out for more than 40 years; yet there seems to be just as much left as ever.

Pumps like oil derricks bring the water

gushing to the surface. Tasting it, I found it intensely salty, like the waters of Great Salt Lake.

From the various salts in the brine the chemists make more than 300 products, from ethyl for antiknock gasoline to milk of magnesia and Epsom salts. But the most important today is metallic magnesium. It is made by passing an electric current through molten magnesium salts. The metal rises to the top and is skimmed off like cream.

Its lightness is amazing. A magnesium alloy girder which one man can lift will support an automobile. If the girder were made of steel, four men could barely lift it.

Another of magnesium's strange characteristics is the readiness with which it bursts



AP from Photo Association, Inc.

Half-naked Miners Burrow for Bauxite in Faraway Surinam

Sometimes the dull, earthy ore of aluminum can be scooped from the surface, but other mines are underground. Much of our supply of bauxite comes from Surinam (Netherlands Guiana) on the northern shoulder of South America. United States troops have landed there to protect the mines.

into flame if powdered or in the form of foil. In incendiary bombs and flares, it burns with intense heat and vivid white light. If attacked with a stream of water it explodes (p. 460).

Both from brine and from the rocks known as magnesite and dolomite the Germans get their magnesium. The taking of Austria gave them one of the world's chief sources of magnesite.

To match and eventually outstrip Germany's immense production of magnesium, vast expansion is under way.

Supplementing the plants in Michigan and Texas, a big factory has been built in California, with the aid of a Government loan, and is now making magnesium from Nevada magnesite (page 462).

The world's largest known single plant for

producing magnesium is under construction in Nevada to help turn the State's magnesite into metal. New plants in Ohio and Louisiana will make magnesium from dolomite. Another, in Texas, will use both dolomite and a brine shipped from Carlsbad, New Mexico.

Like most metals in this age of alloys, magnesium is seldom used alone. Add a little aluminum, for example, and it gains sixfold in hardness and strength. The gondola of the National Geographic Society-U. S. Army Air Corps balloon *Explorer II*, which in 1935 attained the record height of 13.71 miles above sea level, was made of Dowmetal, a sturdy alloy of magnesium and aluminum.

Looking over the list of varied metals, one marvels at the versatility of Nature and the way she has hidden her bounty away—like



Bethlehem Steel Co.

In the Eerie Glow of Busy Steel Mills, America Makes the Metal of Might

Pygmy in size appears the workman just above the big ladle, in the weird spotlight cast by white-hot molten steel. The entire contents of an open-hearth furnace are being emptied into the cone-shaped ladle lined with fire-resistant brick. When it is full, the slag, being lighter, overflows into the cinder pot at the right. Next, the ladle is lifted high and the molten metal is poured into ingot molds (foreground). In steel-making capacity—prime measure of industrial greatness—the United States alone outstrips its combined foes.



AP from Press Association, Inc.

Antimony Once Beautified Egyptian Queens; Today It Hardens Shrapnel

Piled high on a pier are blocks of shiny, silvery, brittle antimony shipped from China in wooden boxes. It will go into ammunition, type metal, and bearings for wheels of war (page 490). Feminine charmers in Egypt long have used antimony ore, called stibnite, as shadow for the eyes.



Staff Photographer Willard B. Carter

Making a Patch of Skin for the Body of a Bomber

Workmen of the Aluminum Company of America are rolling Alclad sheet—strong alloy with a coat of pure aluminum to protect it from corrosion (page 468). After repeated rollings the thick, hot slab will become a thin sheet two feet wide and twenty feet long. Here ready tongs catch it and roll it again.



Staff Photographer Willard R. Curtis

Pressure Greater Than the Weight of Three Freight Locomotives Made This Lead Mold

In the sturdy hydraulic press the pattern plates for pages 270-271 of the NATIONAL GEOGRAPHIC MAGAZINE for February, 1942, have been covered with a sheet of lead, plus newspapers as padding, and subjected to a pressure of 1,100 tons. Thus every tiny dot in the fine-screen copper cuts has been transferred faithfully to the matrix. From such molds are made the long-wearing nickel-faced plates needed for printing this Magazine with its 1,250,000 copies a month.

a whimsical parent playing with children—so some would be easy to find and others hard.

Nature gave us gold in nuggets and dust, conspicuous in color, easy to see. That is why our ancestors discovered gold early; copper likewise, for it also often occurs in free metallic form. Such a metal as aluminum had to wait centuries, until electricity had been discovered and science had found the key.

Iron, the World's Most Useful Metal

But iron, the most important metal of all for the founding of a great industrial civilization, was made only moderately hard to produce and so abundant that it is estimated to form nearly five percent of the earth's crust.

Much of the earth's color comes from iron—the hues of the Grand Canyon and the Yellowstone gorge, the "paint" of the Painted Desert. Even the color in our cheeks comes from iron, in the corpuscles of our blood—or from rouge, which contains iron oxide.

One day last summer I stood on the brink of the vast Hull-Rust-Mahoning open-pit iron

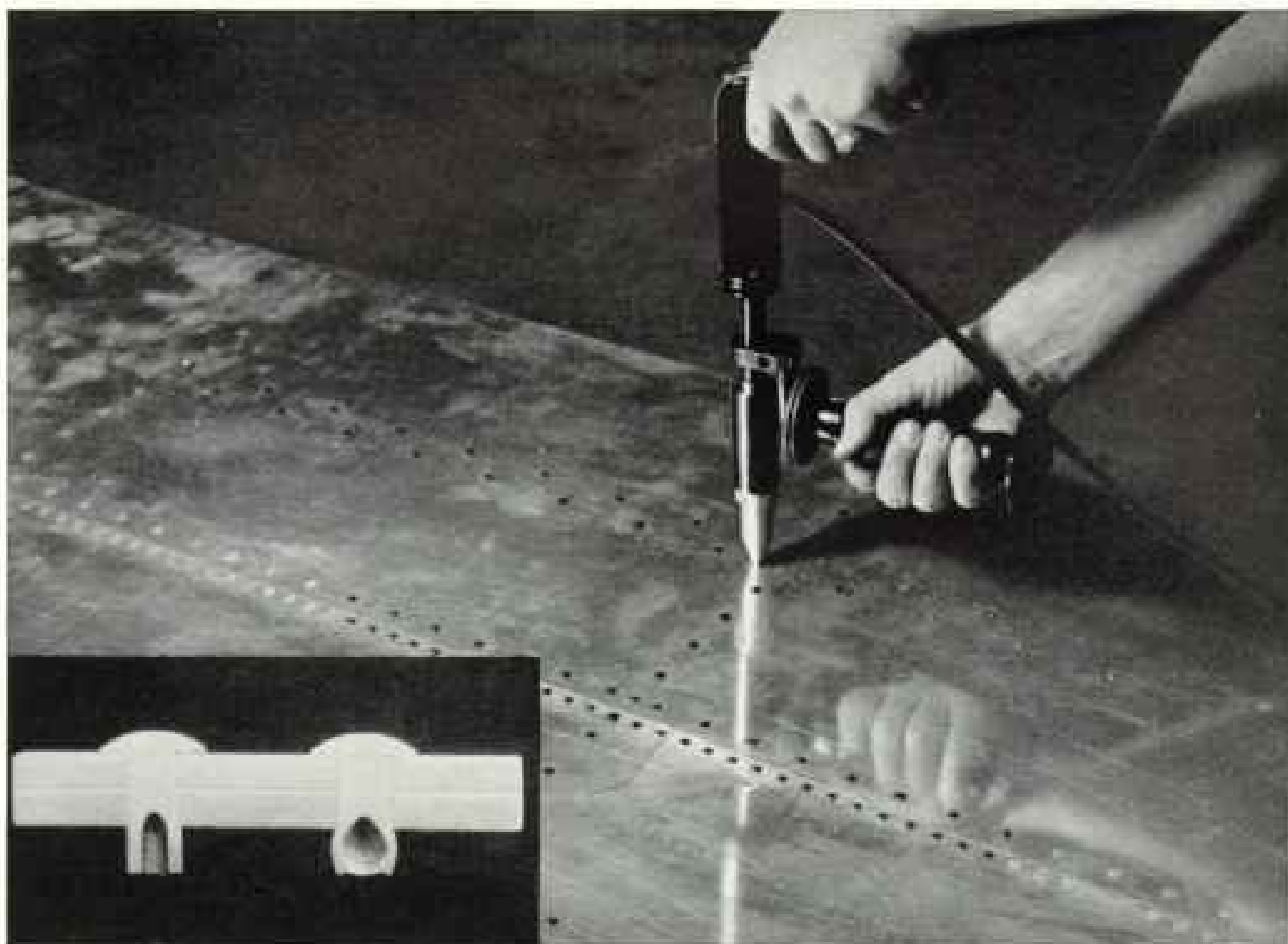
mine at Hibbing, Minnesota, and gazed out over that man-made Grand Canyon with its colors ranging from rusts and ochers to a dark bluish, the richest ore (page 465).

No. 1 Source of America's Power

Here is the No. 1 source of America's industrial power—and the biggest surface hole man has yet made in his earth. The Hibbing pit is two and a half miles long, a mile wide, and 400 feet deep. More material has been taken from this tremendous trench than was moved in the digging of the Panama Canal.

Long ago the growing, inexorable hole swallowed up the site of the town of Hibbing; its buildings were moved bodily a mile and a half away. Water and sewer pipes of the old town stick out forlornly over the pit yawning hundreds of feet below.

Far down on the terraces and floor of the mine giant electric shovels, dwarfed by distance, were taking 17-ton bites of ore and loading them into cars. A dozen trains were in sight at once. The ore, called hematite—



E. I. Du Pont de Nemours & Co.

This Novel Explosive Rivet Speeds Production of America's Air Armada

Aluminum rivets developed by Du Pont have a hollow end containing an explosive (inset, left). When heated by the electric gun shown, the charge explodes with a sound about like that of a cap pistol and the shank expands to the barrel-shaped closing head pictured at right in inset, tightly locking itself into place. These ingenious rivets are being used here for attaching an airplane's aluminum-alloy skin. Their use is growing rapidly in "blind" riveting.

from a Greek word meaning "bloodlike"—is more than 50 percent iron.

This, though the largest, is only one of many mines—some open pits and some underground—on the hundred-mile-long Mesabi Iron Range in northern Minnesota's "Arrow-head Country."

From the Lake Superior iron mines—the Mesabi, Vermilion, and Cayuna Ranges in Minnesota and the Gogebic, Marquette, and Menominee Ranges in Wisconsin and Michigan—comes 83 percent of America's iron ore. Two-thirds of the whole Lake Superior output comes from the Mesabi Range.*

Says a geologist for a big mining company: "There's enough high-grade ore hereabouts to last 35 to 40 years, at normal consumption, and enough low-grade for a thousand years."

From Hibbing I followed the long ore trains snaking down the 84 miles to Lake Supe-

rior, and walked out on the steel and concrete docks at Duluth, nearly half a mile long and 84 feet high, where the ore boats load. Big-bellied ore ships sidled up to the docks, and huge chutes like the necks of prehistoric monsters bent down with deafening roars to fill the hungry holds with carefully graded ore.

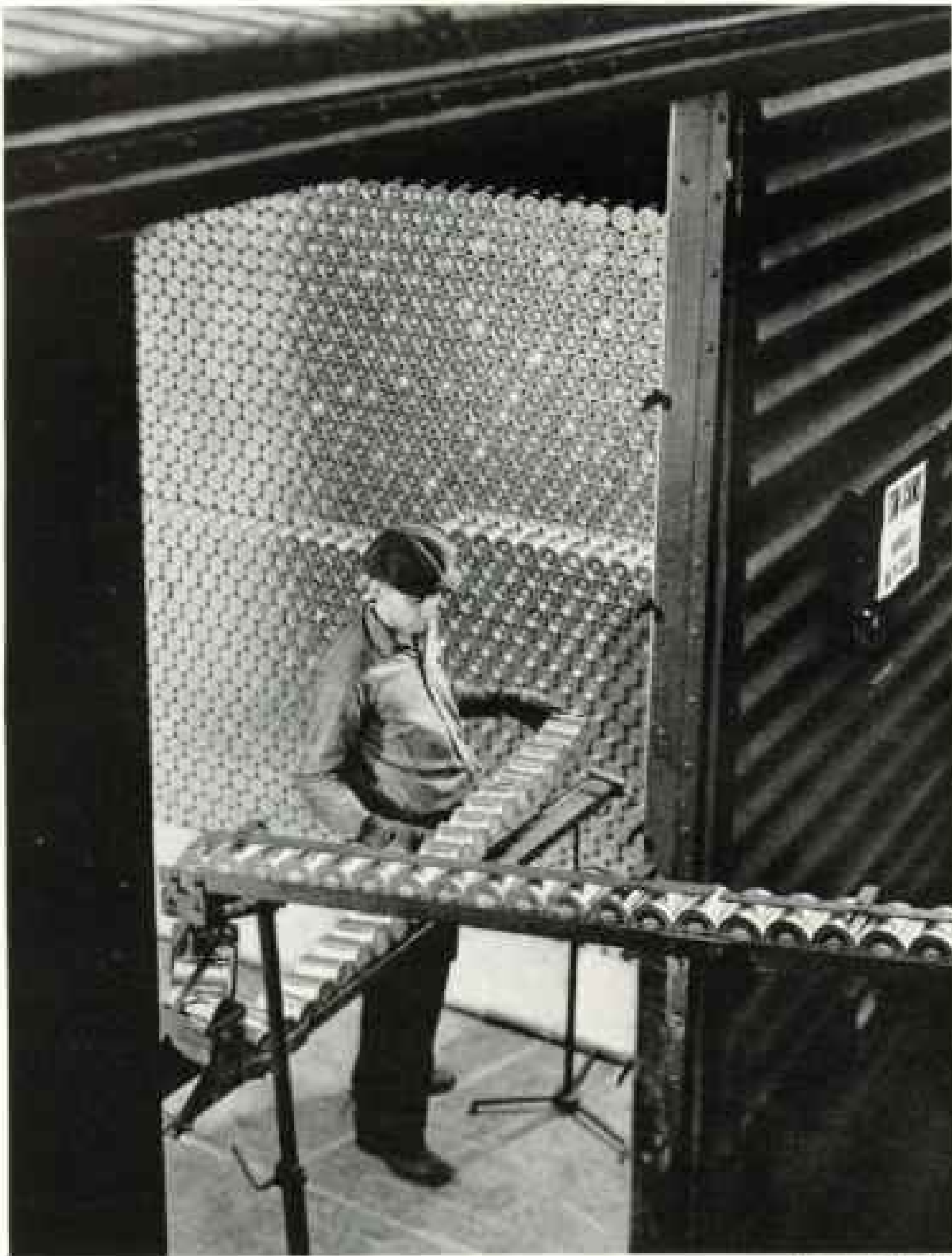
"Red-bellies" Busier Than Ever

"More ore is being borne down the Lakes today than at any other time in history, either in the First World War or in the record peacetime boom that ended in 1929," said an official of the Oliver Iron Mining Company, a subsidiary of United States Steel. "Yet the full capacity of the mines and docks has never yet been reached. We can turn out far more ore than the boats can carry away."

Orders have been placed for more "red-bellies," as the big ore boats are dubbed.

Over the docks, the cars, the shafts, and the sweaty faces of the men themselves lay a dusty pall the color of rust—the color of iron ore.

* See "Minnesota, Mother of Lakes and Rivers," by Glanville Smith, NATIONAL GEOGRAPHIC MAGAZINE, March, 1935, and "Michigan, Mistress of the Lakes," by Melville Chater, March, 1928.



American Can Co.

"Tin Cans"—Though 98¼ Percent Steel—Grow Ever Scarcer

This workman loads some 90,000 cans in a paper-lined car. Sharply restricting the use of tin, the War Production Board has banned the canning of many familiar products. Some wartime cans are thinner-skinned than usual—only 1¼ percent tin instead of the customary 1½ percent (page 490).

The resemblance is more than coincidence, for these immense beds of crumbly stuff are chiefly iron oxide, the same as the iron rust that formed on the wrench you left out in the rain. Iron atoms have an abiding affection for the oxygen atoms of air or water, and given the least opportunity they elope. The marriage transforms the iron completely, from a hard and useful metal to a useless dull-red powder.

From Rust It Comes and to Rust It Must Return

For man the great Iron Age was born when he found that by applying intense heat he could make metal out of "red dirt." Thus he

reversed the process of rusting. Today we turn this "rust of the earth" to iron in blast furnaces eighty to a hundred feet tall, with coke as fuel and reducing agent and with limestone to flux away the impurities by melting and forming a basis for slag.

But the real industrial revolution could not have come without the discovery that ordinary iron could be turned to strong, versatile steel—which is really an alloy of iron with carbon. This latter essential ingredient is supplied nowadays by coke (pages 472, 478).

In the face-searing heat of the open-hearth furnace, the fire-spouting Bessemer converter, or the white-hot, crackling electric furnace, we turn our iron into steel.

Later the red-hot steel is shaped, in the grip of relentlessly squeezing rollers or under the pounding of one-ton to 100-ton forging hammers so delicately handled that their skilled operators could crack an egg without breaking it.

Eventually the steel may become a girder, a rail, or part of a plane, cannon, or tank.

Ancient swordmakers who pounded out the famed blades of Damascus knew the magical power of heat treatment. They noted that a blade acquired a mysterious hardness if it was heated to the color of the sunrise and then quenched suddenly. Tradition records that some blades were quenched by plunging them into the bodies of slaves.

In Europe, from the tenth to the nineteenth century, it was thought that the best of all substances for quenching iron was urine—preferably that of a young red-headed boy!

Why the boy had to be red-headed is not clear, but one of the recent developments in

metallurgy is the hardening of steel by use of ammonia, a constituent of urine. Tank armor, for instance, is "nitrided" in hot ammonia gas. The surface picks up nitrogen which case-hardens the steel.

Electricity Strengthens Tanks

In a new process for surface-hardening mechanical parts, the object is enclosed in an inductor coil and heated by electrical induction.

At the right temperature it is automatically quenched by water which shoots out of the inductor. The whole process takes only a few seconds.

Achilles' heels in a combat tank are the track pins which hold together the caterpillar tread. They must stand the fiercest shocks. It used to take 36 hours to harden an 11-inch track pin. Induction does it in 15 seconds.

In another process the part is heated by flame.

Such advances are pioneered by metallurgists peering into the "innards" of steel through increasingly high-powered microscopes. Actual molecules have been made visible by the new electron microscope, so powerful that, if a human hair could be shown, it would look like the trunk of a giant redwood tree.

"Irish-stew Steels" May Contain Six or Seven Metals

Precise knowledge of what happens inside steel has made possible a bewildering variety of processes to produce steels of certain characteristics. They call for heating to various temperatures, quenching quickly in water or more slowly in oil or compressed air, and just the right amount of reheating (tempering), and aging. No longer is steel just steel.

Nowadays there are as many different kinds



Aluminum Co. of America

Before Becoming Aluminum, Bauxite Must Take a Bath

Only the first step in a long process is the washing and screening of ore in a large rotating drum (page 471). This is Arkansas bauxite—white, buff, pink, yellow, red, or any combination of these hues.

of steel as there are different kinds of cake. A small but vital and growing percentage consists of stainless and other special-purpose steels. One typical firm, which produces stainless steels exclusively, has doubled and redoubled its capacity in the last six years.

Alloy steel is made in electric furnaces which would make the "fiery furnace" of the Bible seem cool. These are the hottest furnaces ever made.

The terrific heat comes from man-made lightning—electric arcs leaping between big graphite electrodes. In this man-ruled inferno temperatures and ingredients can be accurately controlled.

Some "Irish-stew steels" contain small amounts of half a dozen or more metals.



HAROLD C. ATKINS

By Measuring the Glare of This Inferno, He Takes the Temperature of Steel

While a giant suspended ladle pours a 150-ton open-hearth "heat," or batch, of steel into 16-ton ingots, a workman inspects the molten metal with an optical pyrometer, which operates on the principle that the intensity of the light radiated varies with the temperature. Highly important to the quality of the finished steel is control of temperature in the furnace and during pouring. This photograph of "teeming" was made at the South Chicago Works of the Carnegie-Illinois Steel Corporation.

Let's consider some of the handmaiden metals that make King Steel what he is today.

Take manganese—and Uncle Sam these days is taking all he can buy in odd corners of the world or scrape up in his own domain, for war has cut shipments from such usual sources as Turkey and Soviet Russia. Ordinarily more than 95 percent of our manganese comes from overseas.

Of all the metals listed by the Army-Navy Munitions Board as strategic or critical, meaning vital and hard to get, manganese is probably the most important. Without it we could have no steel.

In pure form manganese is silvery white and highly brittle. I just dropped a bit of it on a table and the metal shattered into four pieces. Alone, it is wholly useless.

But, paradoxically, this brittle metal makes steel less likely to break. Mixed with molten steel, it finds and removes weakening oxygen and unites with harmful sulphur to form manganese sulphide, which is less objectionable.

Into every ton of steel goes at least 12½ pounds of manganese, usually combined with iron in the form of ferromanganese.

Also important is the function of manganese in heavier proportions in the making of special alloy steels. The more you roll, hammer, or otherwise manhandle high-manganese steel the harder it gets. It thrives on abuse. That's why you will find it in railroad switches and steam-shovel buckets. Every time a train bangs over the switch or the giant bucket hits a boulder the manganese steel gets harder.

Mixed with other metals, notably copper, aluminum, and magnesium, manganese works similar wonders. A tiny bit of it—1¼ percent—makes aluminum cooking utensils last longer. For alloying, it is now made electrolytically to a purity of more than 99.9 percent.

"Richest Hill" Yields Pink Manganese

Besides drawing heavily on mines in Brazil, Cuba, and Africa, defense officials are spurring the output of low-grade American ores.

At Butte, Montana, I saw one of the biggest of these domestic manganese ventures. From under the outskirts of the city—not far from the copper, zinc, lead, silver, and gold deposits which have made this "the richest hill on earth"—tons of a pretty pink crystalline rock known as rhodochrosite are being dug.

This flesh-colored ore runs about 25 percent manganese. But that isn't good enough; so a giant kiln has been set up at near-by Anaconda by the Anaconda Copper Mining Company to turn handsome but comparatively low-grade

ore into unsightly black high-grade stuff for the Government.

When I saw this defense-born plant last summer, the 270-foot rotating oven had been finished only a few days, but already several big black heaps of 60 percent manganese nodules bore witness to what it was doing. Before being cooked in the big kiln the ore is put through a flotation process. Bubbles lift the manganese carbonate to the top while the silica sinks (page 480).

They're Hunting Tungsten with Lanterns

For tungsten Uncle Sam's need is so great that men are out looking for it with lanterns! The explanation is that scheelite (calcium tungstate), one of the ores of tungsten, glows with eerie fluorescent light in the rays of an ultraviolet lamp; so prospectors in our West go tungsten hunting by night (page 482).

Richest tungsten strike yet made under the spur of war need is in the Yellow Pine district of central Idaho. Men exploring low-grade antimony deposits stumbled upon a big bed of tungsten ore, some of which, reports the Bureau of Mines, is "very high-grade." Other finds include deposits in Nevada, California, and southern Arizona.

But the total U. S. output is small and much of our tungsten still must come from abroad. Every available pound is being bought in South America, and the Government has built up stock piles of tungsten brought from Burma and China (page 481).

Tungsten gets its name from two Swedish words meaning "heavy stone." It weighs almost as much as gold. The chief ore is wolfram, or wolframite.

Wolfram rushes, with the frenzy of a gold rush, are reported in Portugal. Metal-hungry German armies provide a voracious market.

Europe has little tungsten. In the First World War, in 1916, the German long-distance trading U-boat *Deutschland* which hobbled up at Baltimore sought precious tungsten for the Kaiser's war machine.

To a modern industrial country at war there are few catastrophes to compare with a shortage of tungsten. It gives strength to certain steels and armor-piercing projectiles. In high-speed steel cutting tools it carves the parts for man's machines, and hence the destiny of nations.

"Hard as iron" and "true as steel" might well be superseded today by a more modern simile, "tough as tungsten." In pure form, unalloyed, it forms the filament in electric light bulbs, glowing brilliantly and sticking to the job much longer than any other known metal (page 459). Tungsten can take it.



Staff Photographer Willard H. Carter

In This Foaming Bubble Bath, Manganese Ore Gets Purer

Pink crystalline ore from Butte, Montana, is powdered and churned in water in the presence of chemical flotation agents that make a froth like soapsuds. Particles of manganese cling to the bubbles and rise with them to the top while the silica and other impurities sink. The manganese is then further concentrated by roasting in a huge kiln (page 479).

High tungsten steel has the sterling quality in metal or men of "getting hot without losing its temper." Machine tools of tungsten high-speed steel cut metal so fast that the points get red-hot; yet they retain their edge and keep right on cutting.

Tools of Powder Cut at Blue Heat

But even this showing is eclipsed by the new tungsten carbide tools made, incredibly, from powder. They cut at speeds so great that the edge is *blue-hot* from the fierceness of friction. Their invention has speeded up production by 20 to 200 percent and cut machining costs by 25 to 75 percent.

In making this amazing material, powdered tungsten is roasted with lampblack until metal and carbon unite, forming carbides. Now a little-known but important metal, cobalt, enters the picture. It serves as a binder. Carbides and powdered cobalt are mixed, placed in a mold, subjected to tons of pressure, and sintered by heating in a gaseous atmosphere. The grains unite to form an intensely hard, ready-shaped tool.

Recent developments have produced many improvements, variations, and brands, notably those in which carbides of tantalum and titanium are used.

Tungsten carbide, though excellent for cutting other metals, didn't work so well on steel. But tungsten-titanium carbide, invented in 1937, did. Today three-fourths of all carbide tools are used for machining steel.

Sintered carbides are the hardest cutting substances known, except diamonds. They supplement high-speed steel in tools for tailoring the suits of armor plate worn by tanks, battleships, and the like. Germany has led the United States in their development, but the emergency has brought an awakening.

Powder metallurgy, though in its infancy, is a lusty and promising babe. Many 1942 cars contain 25 or 30 parts made in this way.

Among the miracles born of powder is the "oilless bearing." Powdered copper and tin are mixed with graphite or a low-melting metal powder. Pressed and heated, they form a "metallic sponge." Next, the part is immersed in oil, which seeps into the pores. The



AP from Press Association, Inc.

Strange Treasure on a Pier—Precious Tungsten Ore from China

"Just a lot of dirty bags of dark-colored stones," the layman might say of this humble-looking heap, but to the Nation's war effort it is far more precious than gold. The bags are part of a \$5,000,000 shipment of wolframite, ore of tungsten, vital steel-hardening and machine-tool metal (page 479). The characters mean Kwangtung, southern China province. The ore came out over the Burma Road.

bearing can then be put into an electric clock, a car, or the like, and forgotten. It will lubricate itself.

One Colorado Mountain Yields Most of the World's Molybdenum

Ranking high as a toughener of steels is the metal known as molybdenum, from a Greek word meaning "lead." Alloyed with steels, it strengthens them and takes out the "creep"—the tendency of steel to stretch under strain and heat.

Of major importance is the discovery that molybdenum can be substituted for much of the tungsten in making high-speed steel. Here Uncle Sam is fortunate, for this country produces more than 90 percent of the world's molybdenum. Sixty-six percent of the U. S. output comes from a single mountain in Colorado.

To visit this trove of unusual treasure I rode up from Denver last summer, through the ermine peaks of the Rockies. At last we came to the heavily guarded gates of the mine, more than two miles above sea level. Beyond

the high wire fences, too, lay the modern company village, like a 20th-century counterpart of the walled towns of ancient times.

I was hospitably admitted—after I had wired to Washington for proof I was not a spy. Such caution is understandable and commendable, for this is a key defense industry. Nowhere else in the world is there the like of this mountain of molybdenum ore.

Miners Court "Moly" with Dynamite

Unassumingly it rises above the town, neither so high nor so impressive as dozens of snow-patched mountains roundabout.

But one spectacular feature sets it apart. In its side gape vast raw wounds lined with shattered yellowish rock. These are the "glory holes" of the mine—outward signs that men and dynamite are eating away the mountain's heart (page 466).

The ore, in thin dark veins, had early prospectors guessing. Some thought it was lead and others silver.

Today's miners dub the metal "moly"—pronounced like the girl's name.



Lewis J. Smith

"Thar She Glows!"—Scheelite, an Ore of Tungsten

Rocks containing the mineral—doubly precious in wartime—glow with a weird luminosity in the rays of an ultraviolet lamp. This strike is on the California-Nevada border, where prospectors are tramping the hills again as war brings a tungsten boom (pages 479 and 481).

In a whole ton of this rock there is only about six pounds of the metal of molybdenum. The ore is put through a flotation process and the precious material is extracted in the form of molybdenite concentrate, a gray-black powder that looks and feels somewhat like graphite. To look at it you never would think that it could give added toughness to steel. Rather, it appears more adapted for blacking up a minstrel show.

But actually moly is twice as effective as tungsten in producing "red hardness" in high-speed steel. It is also cheaper, pound for pound, and—most important—it's a "have-got" metal, not a "have-not" headache like tungsten. In metallic form, moly is used

in radio and X-ray tubes. It also serves in the dye, color, and ceramic industries and acts as a catalyzer in production of gasoline.

Next to this Colorado mountain, the chief U. S. sources are copper mines where moly forms a by-product.

Vanadium Gave Lizzie Her Long Life

Another notable toughener of iron and steel is vanadium, named for a Scandinavian goddess though originally discovered by a Mexican professor.

Pioneer use of vanadium steel was the chief secret of the strength and stamina of the old Model T Ford. Today vanadium, unsuspected, serves us in many a vital spot—in automobile axles, crankshafts, and the like, in armaments and machine tools, in locomotive piston rods, and countless heavy-duty jobs.

Ores of this "critical raw material" come chiefly from the United States, Peru, Africa, and Mexico. Among them are vanadinite,

found as deep-red crystals in Arizona and New Mexico, and canary-yellow carnotite from Colorado and Utah.

But vanadium's strangest "ore" is smoke! In Italy, where the metal is badly needed, soot is collected from the smokestacks of oil-burning ships and factories and treated to yield vanadium pentoxide. Italy also gets vanadium from bauxite as a by-product in making aluminum, and Germany extracts the precious substance from vanadium-bearing iron ores.

From Plumbing to Projectiles

All around us in the days of peace we have seen shiny metal—gleaming nickel and chromium. But now they are going from the

radiator grilles, door handles, and dozens of other places where their silvery sheen has long been taken for granted. War is rubbing some of the luster off our nickel- and chromium-plated world.

Instead of winking back at us in automobile hubs and plumbing fixtures, these metals increasingly are going into projectiles and armor plate. Nickel and chromium confer upon steel the boon of strength, resistance to heat, and relative rustlessness. Without them there would be no stainless steel.

This is no new alloy. Its forerunner—our first nickel-alloyed iron—was made by Nature ages ago, far out among the stars. Iron reaching the earth in "falling stars" averages from seven to nine percent nickel.

Long before man learned to smelt iron from its ores, this metal from the heavens was known and prized, for it made the best weapons the world had yet seen. But meteors were scarce and the metal rare; iron swords were reserved for princes and kings. Today the alloy of steel with nickel, chromium, or both is being made by the millions of tons for far more lethal weapons.

When engineers about fifty years ago produced chrome-steel projectiles that readily pierced the best armor plate of that day, all the warships of the world became obsolete overnight. The answer was—and is—armor plate of chromium-nickel steel.

Luckily the United States lives next door to the world's greatest source of nickel. From the Sudbury mines of Ontario, Canada, comes 85 percent of all the nickel used on earth. Yet so tremendous are the demands of Ameri-



Aluminum Co. of America

With Ease She Holds Half a Horse, When It's Aluminum

Instead of paddling her own canoe, she attaches a baby outboard motor which develops one-half horsepower though only 21 inches long and weighing but 10½ pounds. American production of light metals is being expanded so enormously that vast quantities of aluminum and magnesium will be available for new civilian uses after the war (page 463).

can and Allied production that the metal is under strict priority control (page 470).

To most of us "nickel" means a coin. But even in ordinary times a "nickel" is only 25 percent nickel, the other 75 percent being copper. To save nickel and copper for war, plans for the future call for a "nickel-less" nickel—half copper and half silver. For similar reasons, zinc is being substituted for nearly all of the one percent of tin in the penny.

Old Nick's Metal

Nickel-copper alloys make many things—including the grim cupronickel jackets of army rifle bullets. Plus zinc, the same two metals

form "German silver" or "nickel silver," which contains no silver at all. The widely used Monel metal is a natural alloy of nickel and copper, which occur together in Canada's Sudbury mines.

Stubborn nickel, hard to extract from its ore, made early German miners fume. They expected copper, and the pallid metal they got instead was disgustingly dubbed "kupfer-nickel"—"copper demon" or "copper imp."

Nowadays this imp is hard at work. One of its alloys makes possible our modern long-distance telephoning. Nickel serves in radios and has greatly speeded up cable transmission. Some of its alloys vary so little with temperature that they are used in measuring tapes, hairsprings of watches, and parts of other precision instruments.

These very words were printed by nickel, for plates faced with this hard, long-wearing metal are required for printing the NATIONAL GEOGRAPHIC MAGAZINE with its large press run of 1,250,000 copies (page 474).

Chrome Steel Endures Heat and Acid

Chromium helps nickel turn ordinary steel into supersteel that stands up under the withering attack of powerful acids and intense heat in furnaces, power plants, oil refineries, and chemical plants. One of the most widely used of these alloys is "18-8"—steel alloyed with 18 percent chromium and 8 percent nickel.

In a stainless-steel plant I saw a big pile of South African chromite, a mountain of gray powdered chrome ore which at close range shows flashing facets of light. Half of the chrome ore used in this country serves metallurgical needs in normal times, and this proportion is increasing under demands of war.

Little known to the layman but highly important is the use of chromite for firebrick for lining the terrifically hot furnaces in which ores are smelted and steels are made. Forty percent of all the chrome ore used in the United States goes into the making of furnace linings.

Third are chrome's "chemical" uses, which include chromium plating and paint making.

The United States is by far the world's largest user of chrome but one of the smallest producers. Nevertheless, there are resources of chrome in this country and now under the pressure of war they are being urgently exploited.

Biggest known U. S. deposits are in Montana, near Yellowstone National Park, although California and Oregon have many smaller ones. In Montana's Stillwater and Sweet Grass Counties, roads have been built to lonely regions formerly reached only by horseback, and big plants have been erected

for concentrating the ore, a grayish-black shiny-faceted rock known as chrome-picotite.

These mountains of the American West hold a mighty metal heritage which the Nation today is using to the full. Not long ago I visited two of the most productive and spectacular mines in the Rockies, both producers of that all-important war- and peacetime metal, copper. One is nearly a mile deep, beneath the streets of Butte, Montana. The other is North America's largest open-pit copper mine, in Bingham Canyon, Utah, where a whole mountain side has been blasted away so the ore can be scooped up fast (pp. 486, 487).

From that far-off day when a cave man first pierced prey or foe with copper spear or arrow points, or hammered out an ornament for his hairy lady, this ruddy metal has served mankind. Not even iron has service stripes so long.

A wonderful conductor of electricity, copper really came into its own with the dawn of our modern electrical age. In brasses, bronzes, and innumerable alloys it is vitally needed now for cartridge cases, time fuses, gun metal, for torpedoes, bullet jackets, propellers of ships, for electrical equipment and other machinery. Little wonder, then, that our copper mines are running at full tilt, and that we are also getting as much as possible from Chile.

Beneath the Montana city of Butte run 2,700 miles of shafts and tunnels. Half a mile below the surface in the Leonard Mine of the Anaconda Copper Mining Company, I saw men drilling into veins of grayish chalcocite, one of the richest copper ores in the world.

In the old days, when copper kings fought over this rich hill, belching smelters in and around Butte laid waste the countryside with their fumes. Their poisonous breath killed the grass and other greenery.

Today the ores are smelted at Anaconda's huge plant twenty miles away. There the fumes are purged of poisons as they rise through half a mile of flues leading uphill to a 585-foot smokestack, 30 feet taller than the Washington Monument. Arsenic and other death-dealers, instead of cursing the countryside, are extracted from the smoke and sold.

Copper from Waste of Earlier Days

Among the characteristic sights of Butte are the piles of old tailings—the waste of earlier mining operations—that rise like dreary dunes above the city. These are now being carted away to Anaconda, for modern flotation methods of ore concentration have made it practicable to extract the small percentage of copper in these waste dumps of a less efficient day.

Even the water flowing out of this hill is made to yield copper—6,000,000 pounds a



Staff Photographer Wilbur R. Carter

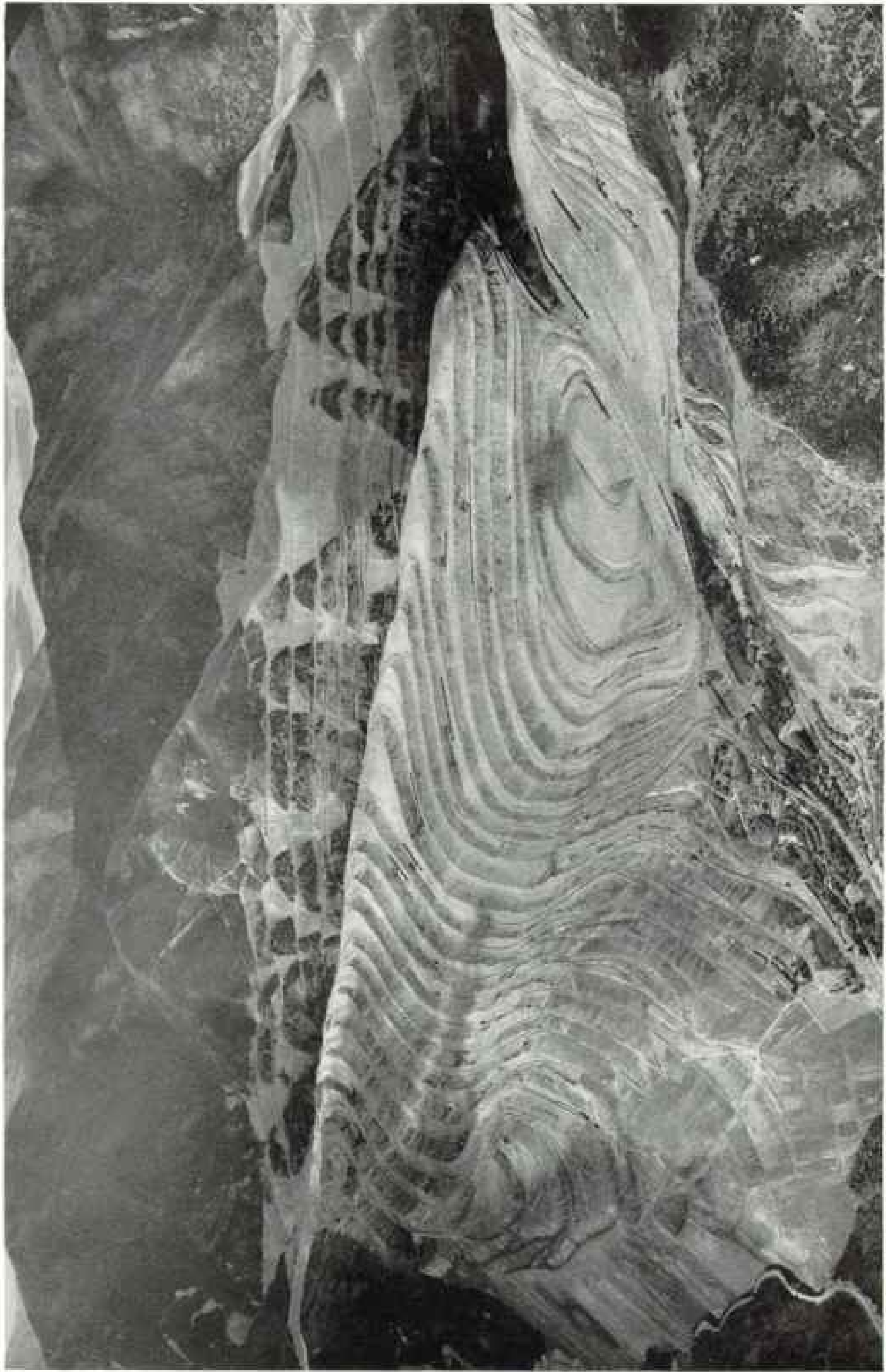
Powerful Electromagnets Pick "Tramp" Iron from Copper Ore on a Conveyor Belt
Rusty old spikes, pieces of wire, and bits of broken tools are extracted automatically from the ore stream.



Staff Photographer Wilbur R. Carter

From Water and Old Iron He Gets Copper!

Basis of the seeming miracle is the fact that the water flowing out of the "richest hill on earth" at Butte, Montana, carries copper sulphate leached out of the ore. The sulphate combines with iron and drops copper in the form of brown muck. Thus millions of pounds of copper a year are recovered from water which once went to waste. The man holds remnants of a steel rail, soon completely eaten away (p. 484).



© Spence from Esling Gallery

North America's Largest Open-pit Copper Mine, in Bingham Canyon, Utah, Where a Whole Mountain Is Being Eaten Away

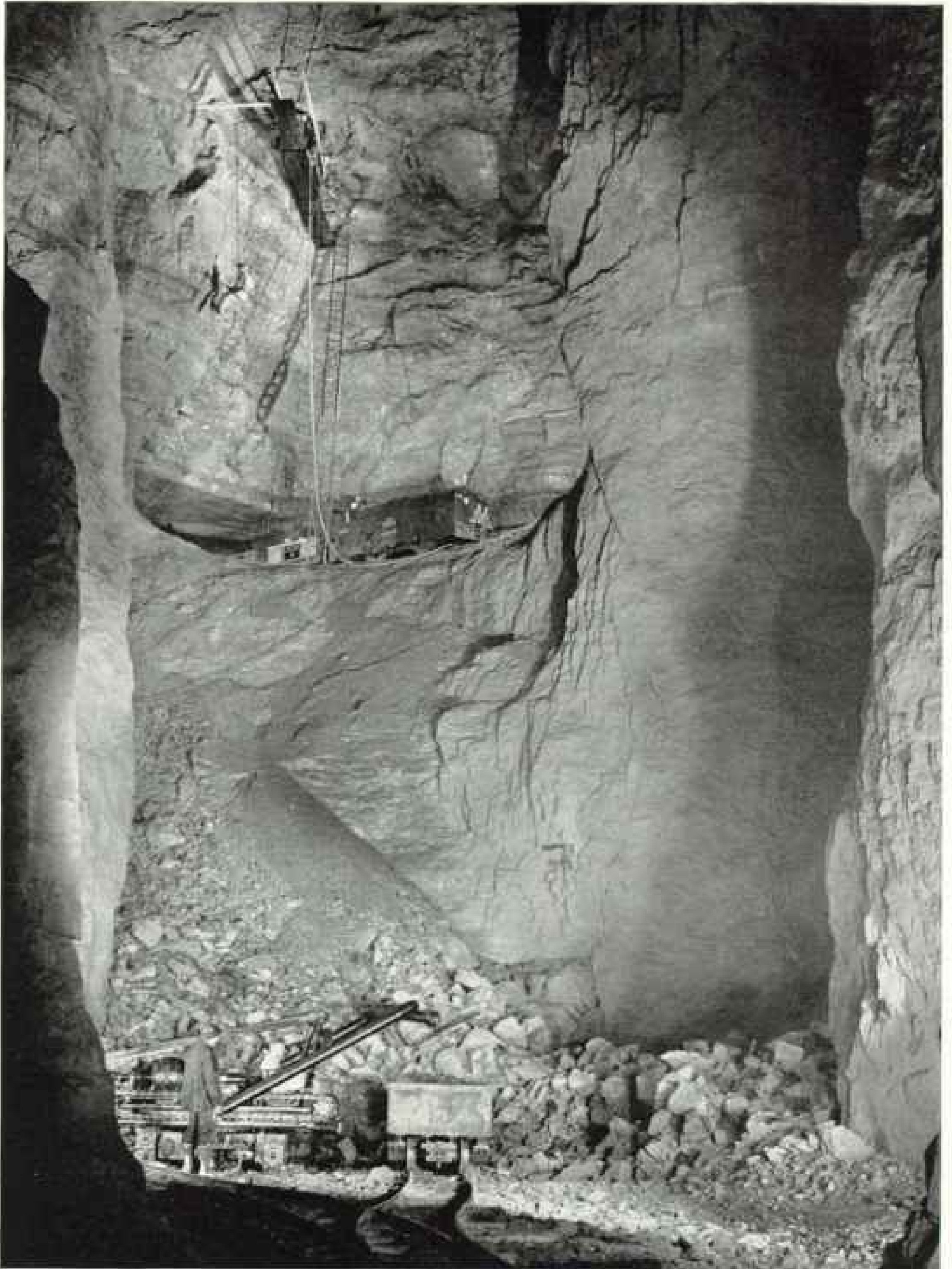
To some it suggests the rice terraces of the Philippines. Actually it is a triumph of mass production, for large-scale methods have produced fabulous quantities of copper—plus gold, silver, and molybdenum as by-products—from 1 percent ore, so lean that some considered it worthless (page 489). Along the terraces crawl ore trains, often as many as 24. In the foreground is the town of Copperfield, squeezed between mountain walls.



Staff Photographer Willard B. Fisher

Montana Miners Head for Work—Half a Mile Straight Down

With battery-powered lights on their caps, they board a three-deck cage for the swift descent into Anaconda's Leonard Mine at Butte. In the deepest of these remarkable mines, men are at work nearly a mile beneath the feet of people walking the city's streets (page 484).



Bl. Joseph Lead Co.

Lead Mining Has Thrills for the Daring Young Man on the Dangling Trapeze

He's a "roof miner" in a lead mine in southeastern Missouri. As he swings in his "bosun's chair" near the top of this 80-foot-high stope, or artificial cave, he mines down loose rock from the roof and walls with an iron bar. The scaffolding itself is suspended from the solid-rock ceiling by iron rods.



William M. Bitton

With a Gargantuan Spoon He Skims the Pot in a Lead Refinery

Impurities are removed with the 9-foot iron drossing-paddle and the 12-foot wooden rake. Lead, an important metal of Mars, goes into bullets and storage batteries; also paint, cable covering, containers for chemicals, foil, solder, type metal, and bearings.

year. Drainage water from the mines carries blue vitriol, or copper sulphate, in solution. Copper atoms come drifting downstream arm in arm with the sulphate, but when this water flows over iron the eternal triangle rears its head. The sulphate reacts to an iron atom as to a red-haired siren. It drops its copper first love, grabs the iron, and off they go together down Silver Bow Creek. The copper atoms, deserted, sink to the bottom as a reddish sludge which is almost pure copper.

Tons of scrap iron are thus consumed—steel rails, rusty chains, old pieces of automobiles. A heavy steel rail is wholly eaten away in two weeks to a month—1½ to 2 pounds of iron for every pound of copper (page 485).

The process is ancient. Says a worm-eaten tome published in London in 1671: "Divers Vitriolate Waters do Change Iron put into them into Copper."

Man-made Thunder among the Peaks

Some copper ores are brilliantly blue or green, but the kind being mined by the Utah Copper Company at Bingham Canyon near Salt Lake City is about as colorful as the cornerstone of any First National Bank. The ore is only about 1 percent copper, but mod-

ern scientific concentrating methods and the vast scale of the enterprise make this mine a mighty producer (page 486).

I saw it in midafternoon when the blasting is done. Explosions echoed among the peaks, and white smoke plumed up from the tiers of the giant bowl. Long trains bear the ore 18 miles to the big concentrating mills overlooking Great Salt Lake.

But even Montana and Utah with these famed mines are outstripped in copper production by Arizona. That State's output is being further increased by the great Morenci Mine of Phelps Dodge. A whole mountain has been beheaded to get at the ore for open-pit operations like those at Bingham.

Along the shore of Lake Superior long before the coming of the white man, copper-colored savages hammered arrowheads out of a strangely malleable "rock" the same hue as their skins. Michigan still produces much copper, but its volume has been far surpassed by that obtained from the low-grade ores of the West and Southwest. Native copper, solid metal, is hard to mine cheaply: if it occurs in big masses, for it cannot readily be broken up even with blasting powder. Such copper is too pure!



Staff Photographer Willard H. Carter

Pouring Zinc, Which May Wind up in a Cartridge or a Zipper

While one workman tilts the long-handled ladle to pour the molten metal into slabs for shipping, another, goggled against the glare, skims the slag from each mold. Scene is Anaconda, Montana. The United States produces and consumes more zinc than any other nation—for galvanizing steel, for cartridge brass, for typewriters, telephones, etc. Most automobile hardware is zinc alloy plated with nickel or chromium.

Rivaling copper in importance in peace or war are two other major metals, lead and zinc. In production of all three the United States far outstrips every other country in the world; but so vast are the demands of our campaign for victory that every bit our mines can yield is promptly swallowed up.

Lead goes into bullets, shot, shrapnel. Without it there could be no storage batteries to drive submarines and spark our gasoline-driven world. Lead is needed also in type metal for printing and for alloying with brasses or bronzes to make them easier to machine (pages 488-9).

Zinc Lays Down its Life for Steel

Zinc is essential for cartridge brass, which is 30 percent zinc and 70 percent copper; for galvanizing and anticorrosion paint; and for zinc plates on the hulls and boilers of ships to save their steel plates from corrosion. Zinc is a self-sacrificing metal which will give up its own life to save steel. Electrochemical corrosive forces prefer zinc and attack it first.

Far less encouraging is the outlook for tin.*

This country uses more tin than any other nation, but produces almost none—about four one-hundredths of one percent of its total consumption. Most of it goes into "tin" cans, really 98½ or 98¾ percent steel (page 476). Other uses for tin are in bronzes, in bearings for machines, in solder and printing type metal.

Our Government, long before the coming of war, began stock-piling tin and sought to reduce our dependence upon mines of Malaya and the Netherlands Indies across the precarious Pacific. A big smelter is being built in Texas, primarily to handle ores from Bolivia, chief Western Hemisphere source. The Bureau of Mines has combed the country for tin ore deposits, but found none of major importance. Plans are ready for "detinning" used cans if a shortage should become severe.

Also from Asia in ordinary times comes most of our antimony (page 473). This metal, little known to the layman, triples the strength and hardness of lead. It is used in shrapnel and

* See "Tin, the Cinderella Metal," by Alicia O'Reardon Overbeck, NATIONAL GEOGRAPHIC MAGAZINE, November, 1940.



AP Photo Association, Inc.

Here a Hoedown Isn't a Dance, but a Way of Purifying Mercury

At a plant in California, a workman mixes newly extracted mercury with quicklime and hoos the mixture vigorously. The liquid metal, purified by the process, trickles out in small globules into the silvery pool at lower center. It is shipped in iron flasks. California is the country's chief producer of mercury, which, as mercury fulminate, touches off shells and bombs.

other ammunition, in storage battery grids, and in type and bearing metals.

Farsighted action has assured the United States ample supplies of antimony, largely from Mexico, our West, and Arkansas. A huge smelter just inside our Texas border refines Mexican ores.

Mercury Has a Dual Personality

Somewhat similar is the story of mercury, chief producers of which are Italy and Spain, with the United States third. For months we have been buying the entire output of Mexico and stepping up mining in the Western States. California is our leading producer. The ore is cinnabar, a deep-red mineral once used by Indians for painting their faces.

Mild-looking mercury, or quicksilver, the silvery, elusive, cold-molten metal which most of us have tried to hold in our hands or have studied in fever thermometers—what does this have to do with war? Plenty. As mercury fulminate in shells and bombs, it touches off the thunder of high explosives and the flaring fury of incendiaries. Mercury goes into anti-

fouling paint which keeps barnacles off ships' bottoms. As mercury vapor it operates boilers and helps provide fluorescent lighting in windowless blackout plants.

There are many other highly useful metals—even silver and platinum have their industrial-military roles—but those described are perhaps the most important. To sum up:

Though short in some metals such as manganese and chromium, nickel and vanadium, tin and tungsten, the United States is wonderfully endowed with most of the metal sinews of strength. Our possession of the earth's richest resources of such all-important metals as iron, copper, lead, and zinc has helped to make us the world's leading industrial nation, and also a potent military power.

Look again at that Liberator bomber. In its thews are the iron of Minnesota, magnesium from the Gulf of Mexico, copper, lead, zinc, tungsten, molybdenum, and other metals from our far-flung mines, from our rocks and templed hills. Here is America rising to the fight, and, in the President's solemn words, "the inevitable triumph."

California Says It with Wild Flowers

BY FRANCIS WOODWORTH

IT IS a Sunday morning in spring. The scene: a typical California home. The head of the house is reading to the family from a communiqué in the Sunday paper:

"Coreopsis is running down hillsides in Red-rock Canyon. . . . Stretches of lupine with harvest brodiaea are showing on White Wolf Grade. . . . A blue sea of lupine still good below Grapevine. . . . Ithuriel's spear seen at Bena. . . ."

The odd dispatch is datelined Bakersfield, in Kern County. The paper carries similar news releases from other wild-flower fronts in different parts of the State.

To the popular Kern County fields as many as 500,000 people have traveled in a single season from late February to late April.

The first flower festival was held there, at Arvin, in 1927. Since then aerial reconnaissance flights have been made each season to spy out the massed floral legions, and bulletins on the whereabouts of poppies, lupine, and other favorites have been publicized daily.

Favored by an ideal soil-and-climate combination, California is a nursery stocking more than 4,000 species of wild plants. Many have several varieties differing greatly in color and appearance. More than 3,700 species are native to the State; of these about 40 percent are found only in this area.

A mere 292 members of the plant population are aliens. Some of these immigrants, such as the black mustard (*Brassica nigra*), reputedly introduced from Europe by the Spanish mission fathers, and the yellow mustard, or bird rape (*Brassica campestris*), have spread and dispossessed native species.

Many of the wildings grow in virtually all parts of the State. Others are restricted to certain localities, in some cases to a single canyon or an island off the coast.

Kern County, nearly as big as Massachusetts in area, today has an exceptionally profuse and varied floral display. It shows how the rest of the land looked before the plowman, the cattleman, the shepherd, and the subdivider wiped much of the natural color from the face of the Golden State.

When white men first saw it, California was a vast botanical wonderland. The riverside site of Los Angeles was covered with "an infinity of rosebushes in full bloom," according to the Franciscan missionary Juan Crespi, who accompanied the first Spanish land expedition here in 1769. Crespi's diary makes much of these "rosas de Castilla," as he called them, and as they still are known by Spanish-speak-

ing native sons, though botanists term the species *Rosa californica*.

So abundant were wild flowers in the days of the pioneer padres that the poppy fields on the foothills of the Sierra Madre Mountains, back of present-day Los Angeles, appeared as a golden landmark to sailors off the coast more than 20 miles away.

Tradition says the mariners dubbed this flaming flowerscape "la sabanilla de San Pascual" (the altar cloth of Holy Easter—or of Saint Pascal, as some prefer to translate it). Clustering homes of Altadena have long since crowded out all but tiny scattered patches.

California's fame as a flowery paradise spread rapidly after the Spanish colonized the country. The pioneer trained naturalist to collect specimens and carry the news about this garden land back to the Old World was Archibald Menzies, surgeon-botanist of Vancouver's expedition of 1792-4.

Menzies took seeds of several plants home to the Royal Botanic Gardens at Kew, among them the California holly, Christmasberry, or toyon (*Photinia arbutifolia*), an evergreen shrub with bright-red berries, known in England ever since as "California maybush."

Another botanist, Adelbert von Chamisso, arrived in 1816 with the explorer Otto von Kotzebue, saw the California-poppy, which is now the State's official flower (Plate II), and named it *Eschscholtzia californica* in honor of the expedition's surgeon, Dr. J. F. Eschscholtz. Chamisso introduced into Europe this brilliant little flower, which old-time Californians called *la dormidera* (the drowsy one) because its petals fold at night.

Floral Gold for England

To gather California's floral gold for English gardens came, in 1830, David Douglas, sent by the Royal Horticultural Society of London. Douglas shipped home during his two-year visit the seeds of many plants, such as the babyblue-eyes (*Nemophila menziesii*), the farewell-to-spring (*Godetia amoena*), Chinese houses, or pagoda collinsia (*Collinsia bicolor*), the blazingstar (*Mentzelia lindleyi*), and the California-poppy, which became pampered favorites in Europe while in their native land they were regarded as weeds.

A vivid picture of California's unspoiled charm is found, of all places, in the swash-buckling memoirs of John C. Frémont, the celebrated Pathfinder. Describing the San Joaquin Valley of 1844, he wrote: "A showy *lupinus* of extraordinary beauty . . . adorned

California Says It with Wild Flowers



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Kodachrome by R. Anthony Stewart

Lavender Blooms of Ithuriel's Spear Thrive on Grassy Slopes

The flower's name is derived from the fanciful likeness of its straight, slim stem to the spear borne by the Angel Ithuriel in Milton's *Paradise Lost*. This member of the lily family blossoms in early summer from central California north through Oregon and Washington. Indians roast and eat its bulbs. Bena, Kern County.



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Illustrations by B. Arthur Bennett

Orange-red Blossoms of the California-poppy Contrast with Blue Lupine in the Background—Near Benn

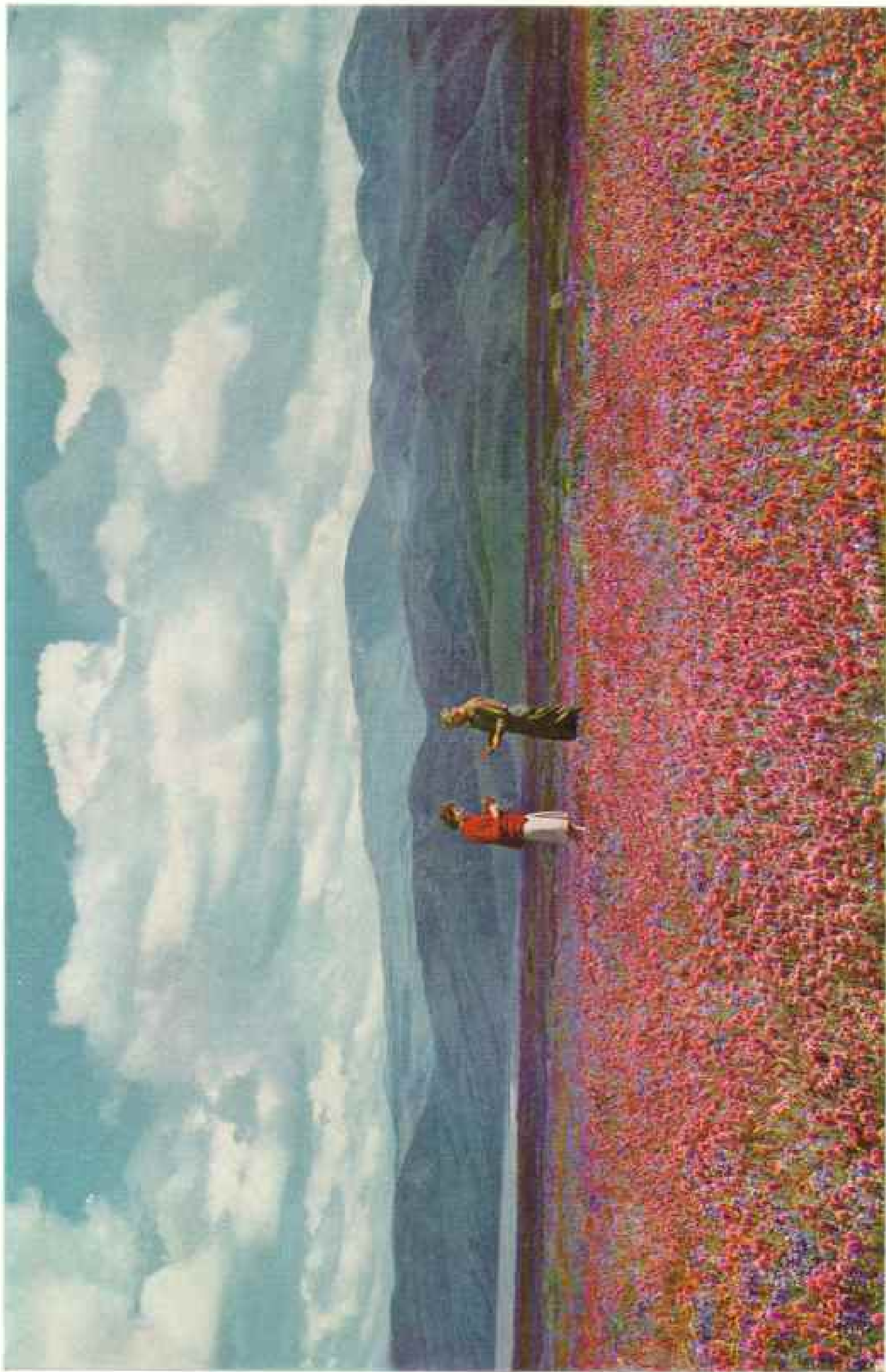


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Reproduction by H. Anthony Houff

Motoring from Los Angeles to Bakersfield, Route 99, You Pass Floral Blankets of Velvet-red Owlclover and Blue Lupine.

These rich fields of color in the San Joaquin Valley may be seen in wet years for about two weeks in early spring (Plate IV). If there is little rain the flowers bloom scantily. Wheeler Ridge in the background.



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Reproduction by E. Anthony Bennett

Like a Carpet for Royalty Is This Lush Field of Owlclover and Lupine Before a Mountain Backdrop

Since it is not a member of the clover family, some botanists prefer to call it "owlflower." The shape and markings of its round-headed blossom have been likened to an owl's hooked beak and unblinking eyes. The plant, only a few inches high, flowers in April and May (Plate III).

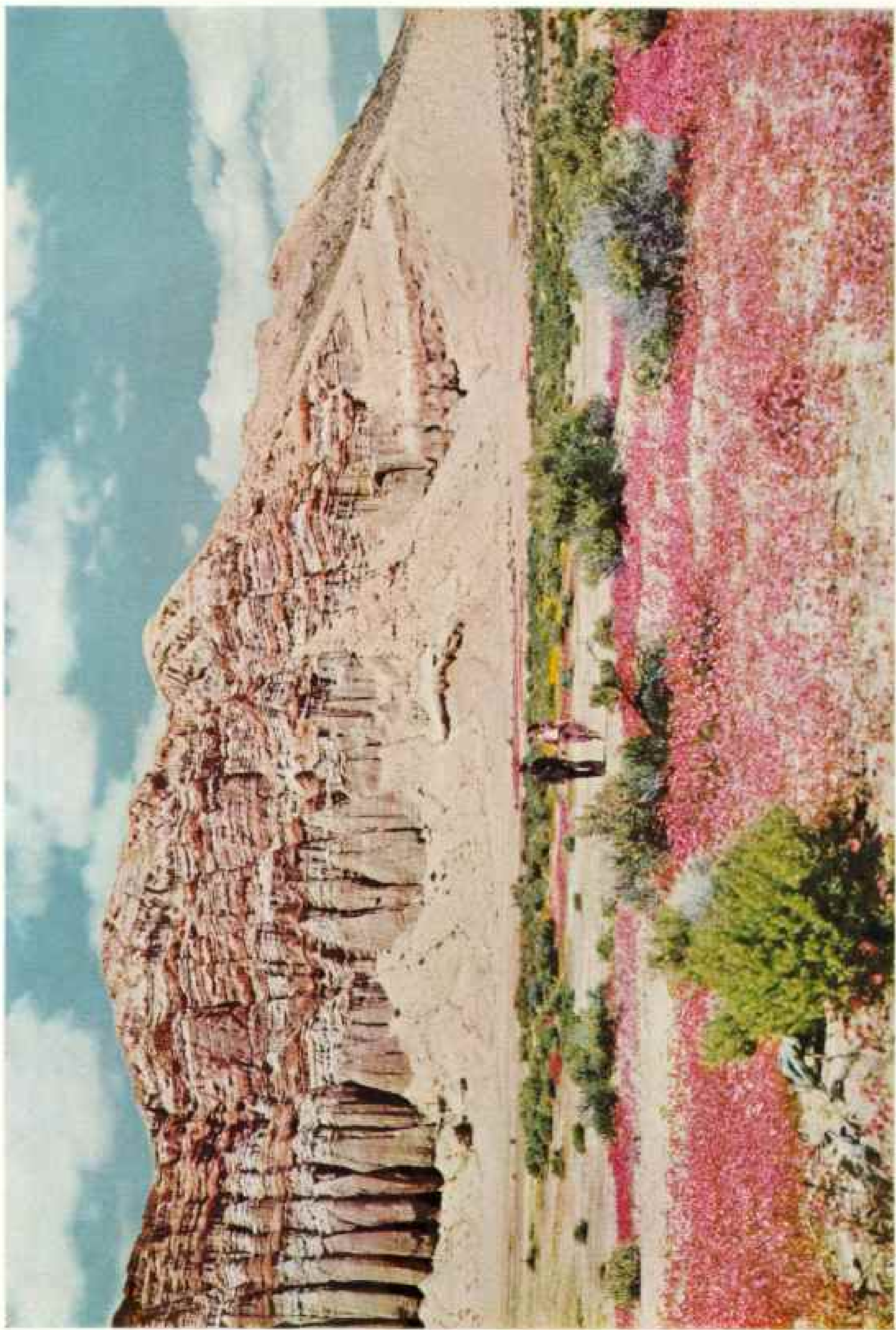


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Photograph by E. Arthur Sisson

Yellow Desert Dandelions Run Riot Where Lavender Sandverbena Grew in Profusion the Year Before

Two kinds of flowers may grow on the same spot in the Borego Desert northeast of San Diego, blooming at different times. Both lie dormant together, each responding to a different set of growing conditions. Santa Rosa Mountains in background.



© National Geographic Society

Illustration by B. Anthony Stewart

Delicate, Colorful Pink Monkeyflowers Surpass in Beauty Even the Walls of Redrock Canyon, Kern County



© National Geographic Society

Yellow Monkeyflowers in a Natural Rock Garden

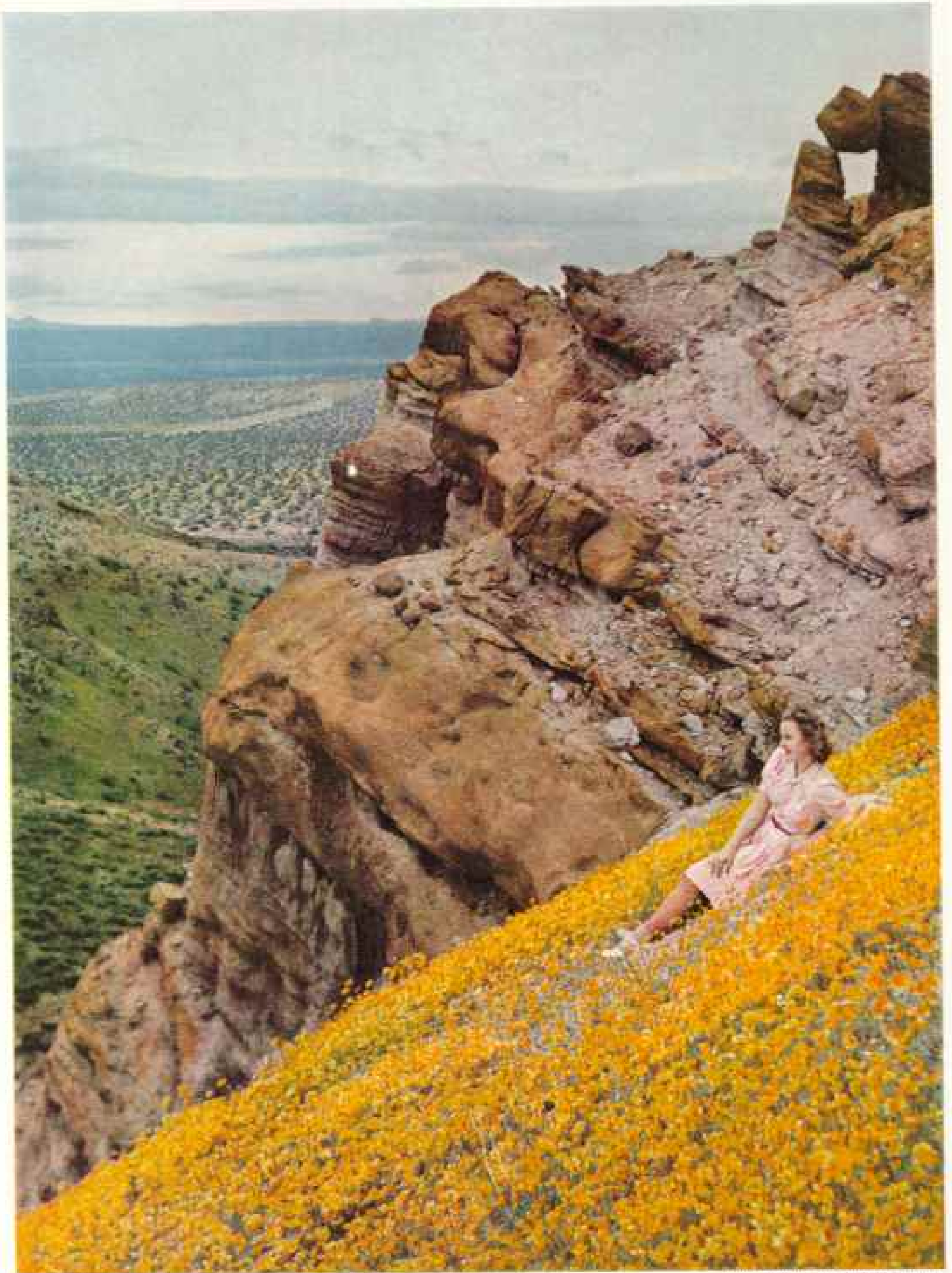
This species is closely related to the pink monkeyflower (right and Plate VI). Both types thrive on washes under canyon walls, where soil and rock have accumulated from the cliffs above.



Illustrations by H. Anthony Bryant

Water Brings Forth a Riot of Pink Monkeyflowers

Here are shown in greater detail the same delicate blossoms as in Plate VI. They grow profusely where moisture trickles down at the bases of canyon walls, and are related to the yellow type (left).



© National Geographic Society

Kodachrome by H. Anthony Stewart

Yellow Coreopsis Spreads a Blanket of Gold on Steep Canyon Slopes

The desert coreopsis has golden rays and orange centers. It seems to prefer regions on the borders of the desert. Seen from the cliffs of Redrock Canyon, the Mojave Desert stretches to the horizon. Rainfall in this arid region in southern California is only about five inches per year.

the banks of the river and filled the air with a light and grateful perfume. The hills were purple and orange, with unbroken beds, into which each color was separately gathered."

The flower-loving soldier collected plant specimens on all his western expeditions and sent them to the noted botanist Dr. John Torrey, of New York, for identification. More than a score of California plants today bear Frémont's name, among them the golden-blossomed *Fremontia californica*, or flannel bush, named by Torrey for its discoverer.

When John Muir roamed California the plow and the sheep ("hoofed locusts," he called them) had already blacked out vast acreages of color. In the ensuing decades the spread of cities, farms, and highways pushed back the floral frontiers. As the population swelled, a new enemy of natural beauty appeared—the vandals who swarmed over the few remaining areas each spring, trampling the plants, uprooting them, and filling their cars with the harvest of whole acres.

So fast were the wild flowers vanishing by the 1920's that many California counties began passing laws to protect certain species in peril of extinction. Not until 1933, however, was protection given to wild plants of all kinds the length and breadth of the State. Sponsored by the Garden Clubs of America, the 1933 statute makes it unlawful to cut, destroy, mutilate, or remove any native tree, shrub, fern, herb, bulb, cactus, or flower from public lands or from private lands without written permission from the owner.

Public education helped save what remains of the State's floral heritage. Law or no law, a Sunday marauder seen nowadays despoiling a field of yellowdaisy tidytops (*Layia platyglossa*), or owlclover (*Orthocarpus purpurascens*—Plate IV) would probably be taken to task by outraged passers-by.

The change in people's attitude has been achieved through the educational efforts of garden clubs, civic organizations, individual flower enthusiasts, and even private corporations. The Kern County Chamber of Commerce, for instance, has popularized the wild-flower slogan: "Enjoy—do not destroy."

A similar plea has been made for ten years by a western oil company which distributes annually some 600,000 booklets depicting the better-known wild flowers in color.

Of individual efforts to show Californians the value of their native plant resources, perhaps none has been more effective than the labors of an English nurseryman, Theodore Payne, who came to California in 1893.

In England Payne had known California flowers as the exotic darlings of high-priced

gardens. Here in their native place he found that people looked on them as lowly roadside things, to be picked and thrown away.

The young immigrant became a crusader on behalf of the forgotten plants. Forty years ago he bought out a nursery in Los Angeles and began building up a stock of California flowers, shrubs, and trees. From the start he did a thriving export business, shipping seeds and plants to England, France, and Germany. It took years of writing, lecturing, and staging exhibits of native flora to create a demand from local customers. Today he has some 400 California wildings under cultivation, and the produce of his ten-acre nursery graces the gardens of many an Angeleno.

The Return of a Native

Payne exported to England some years ago the white eveningprimrose (*Oenothera californica*), a wild flower of the desert. Recently a prominent Los Angeles attorney invited the nurseryman to his home to inspect some new additions to his garden.

"Look at this little beauty," said the attorney, proudly pointing to a white-flowered plant with ashy-gray foliage.

"Yes, desert eveningprimrose," Payne remarked.

"Oh, no, I just imported it from England," the attorney protested. He was even prouder of the plant when Payne explained that this was a case of the return of the native. Increasing devotion on the part of Californians toward their flora has resulted in establishment of several native plant institutions.

In Orange County the 225-acre Rancho Santa Ana Botanic Garden, founded in 1927, has the largest collection of California plants assembled in one place. In Mission Canyon, at Santa Barbara, is the Santa Barbara Botanic Garden, noted for its springtime blooms of California lilac or blueblossom (*Ceanothus thyrsiflorus*).

A more formal native garden is that of the California Institute of Technology, at Pasadena, comprising 180 species of shrubs and perennial plants.

In public planting, too, the natives are coming into their own. The right-of-way on either side of the Arroyo Seco Parkway, new high-speed freeway between Los Angeles and Pasadena, is bright with 47 species of plants. Forty-two of these are natives, selected to line the route with color throughout the year.

Many communities have taken to sowing wild flowers in the parkways along their streets, as in San Marino, near Los Angeles, where poppies and coreopsis (Plates II and VIII) blaze the main thoroughfare.



G. H. Johnson

British Tank Corps Men on the Ibn Tulun Mosque View Cairo and Its Citadel

The domed and minareted structure is the Mosque of Mohammed Ali erected within the walled stronghold where in 1811 the Mameluke boys were massacred (page 520). Of 470 men invited to a celebration by the "George Washington of Egypt" only one escaped the ambush.

War Meets Peace in Egypt

BY GRANT PARR AND G. E. JANSSEN

THE land of Egypt, over which so many wars have swept, occupies a place in world affairs today which is unique for our time. There have been few similar instances in history.

Egypt has a war within her borders. But Egypt is at peace.

Along the yellow-gray waters of the Nile the fellahin still till the fields of cotton, corn, and sugar cane in primitive fashion. They are only mildly curious as new bombers roar overhead down the Nile (map, page 507).

Within a few miles of Alexandria, where Britain's powerful warships lie in wait for unwary Italian men-of-war, the Egyptian boatman happily sails his felucca up and down the Nile just as did his father and grandfather, indeed all his ancestors back in the beginning of civilization.*

The same single giant sails, tilted precariously upward from a short mast, propel the same blunt-nosed hulls along the river and canals.

The Egyptian Government, for the most part, carries on its business as usual. The Egyptian Army remains noncombatant, although it is in charge of the antiaircraft defenses around Cairo and in parts of Alexandria and the Suez Canal areas.

Some citizens of Alexandria and the Canal area have moved to the country in search of safety from frequent Axis bombing raids. Early last June more than 400 Alexandria people were killed in a single horrible night; but training and experience have substantially reduced the death tolls despite the continued intensity of the raids.

Cairo Hub of Four War Fronts

The Cairo blackout is only partial. Although there have been minor air raids in the vicinity, the city is virtually undamaged. The war and the effects of war seem far away. Yet Cairo has been the hub of four fronts—East Africa, Greece, Syria, and the Western Desert. It may become so again.

All these signs of peace and minor signs of war do not tell the true story.

In Egypt's Western Desert and on the seas which wash her shores, a battle rages which may be the key to victory in this war, and one which may substantially affect the fate of the world, not excepting that of the United States.

Both sides have their opponents well sized up. Everything depends on supplies, and that

is another way of saying that much depends on the United States.

The United States is making and transporting supplies and equipment for Britain's Middle East services—tanks, armored cars, trucks, airplanes, food. It must ship more of them to Egypt than Germany is able to ship to Axis forces in Libya. American ships must sail halfway round the world; Axis ships must sail about 300 miles.

American Supplies Arriving

American supplies have been arriving in Egyptian ports at an unprecedented rate, and the balance of power in this race for equipment seems to be swinging to the British side. Credit for this must go to the Royal Air Force and the Royal Navy for making it extremely difficult for Germany or Italy to use the Mediterranean; and to the American and British merchant seamen who have risked their lives to bring shipload after shipload of war materials around the Cape and up through the Red Sea to their destination.

The dangers these men faced were brought home on September 5, 1941, when an Axis plane dropped two bombs, or torpedoes, alongside the American freighter *Steel Seafarer* in the Red Sea. The prompt action of the crew members saved their lives; but the *Seafarer* sank within twenty minutes.

Despite Axis bombing and the adoption of the Cape route, the Suez Canal remains the eastern key to the Mediterranean. As long as Britain holds it and Gibraltar, the Nazis and Fascists will remain locked within this ancient sea of many battles.

Establishment of the new Pan American Airways ferry service across Africa now links Egypt far more closely with America, and means much to Americans still resident in the Middle East.

The foreigner in Egypt often feels isolated from the rest of the world. He has the latest international news, but this seldom includes the details about American life upon which he once feasted when American newspapers and magazines arrived promptly. These are slow in coming now, and some are censored.

Supply remains the chief problem, the essential strategy, of war in this theater. Yet the onlooker finds the human side of war far more fascinating. This may be observed

* See "Daily Life in Ancient Egypt," by William C. Hayes, and 32 paintings, "Life, Culture, and History of the Egyptians," by H. M. Hoger, NATIONAL GEOGRAPHIC MAGAZINE, October, 1941.



Official War Photograph

Indians Hear the Story of the Sphinx from a Scion of the Builders

Dragomans such as the robed man make a good living, by Egyptian standards. Conversation has to be in English. If the three soldiers were at home, they would be many hundreds of miles apart. At the left is a Madrasai from the extreme south of India, at the right a Punjabi Mussulman from northern India, and in the center a Pathan from the Northwest Frontier Province (page 518).

within the green, palm-shaded Nile Valley, along the streets of Cairo, and in the front-line camp.

The Crusaders took many of the methods and ideas and much art of Eastern civilization back from Egypt and other parts of the Levant to western Europe. The Australians, though hardly a sentimental people, found Egypt interesting enough in World War I to send their sons back with the admonition, "You'll have a great time" (page 509).

The Melting Pot of War

Into Alexandria and the Suez Canal ports have poured for the last three years a steady and constantly growing stream of British fighting men, drawn from the crack regiments of the mother countries—England, Scotland, Wales; from the Dominions, from the colonies. County battalions, kilted Highlanders, exclusive Guards regiments, and, most numerous of all, Australians, New Zealanders, British Indians, and South Africans (page 516).

With the New Zealanders came the Maoris, descendants of the aborigines of that South Sea Dominion, and with the South Africans came Negro volunteers from the Basuto,

Swazi, Xosa, Zulu, and many other tribes.

Indians can be divided ad infinitum into Sikhs, Gurkhas, Punjabis, Rajputs, Gahrwalis, and many others. Add to these the handsome black boys of the Sudan defense force. Mix in the native population of Egypt with its own admixtures of Turkish, Caucasian, and Arab blood. Stir well with the merchant races of the Levant—Greeks, Syrians, and Hebrews.

Season with interned Germans and Italians whose women may still be seen in Cairo streets. Sift in refugees from Poland, Yugoslavia, Romania, and Greece, and the heroic expatriate warriors—Czechs, Greeks, Poles, and Free French.

The foreign ingredients seem scarcely to fuse at all. They bring and retain their own cultures, habits, and desires, even their own games. English residents played cricket regularly at Cairo clubs long before the Army came (page 522). Greek oarsmen have helped to pioneer the sport of rowing on the Nile.

Modern West Meets Ancient East

But the Army men, particularly the British and Dominions troops, introduce a modern, Western culture—fast-moving, careless-talk-



Air Ministry official.

The Modern Soldier Finds Time to Study Handicraft of Ancient Days

An R. A. F. corporal examines the tool with which an Egyptian metalworker inlays the fine silver wire lying on the work table into copper trays, dishes, and vases. Used to dealing with travelers from many lands, the bazaar merchant speaks English when necessary.

ing, driving, do-or-die Western tactics—into a land whose strength is the wisdom of the ages; among a people whose leaders are the products of Western education, but whose citizens live, for the most part, as their ancestors did when Khufu (Cheops) built the Great Pyramid at Giza 4,000 years ago. The contrasts are frequent and sharp.

Wherever man goes he must have a home of some sort, whether it be a cave or a palace. In some countries an army would have to acquire land at a fancy price. But in Egypt there is a vast area free for the asking—the desert (page 513).

Nile Valley a Narrow Strip

Outside the Delta, the Nile Valley, which in fact is Egypt, is seldom more than ten or twelve miles wide.* At Cairo one may look across this green and blue sandwich from the Muqattam Hills on the rim of the eastern desert to the Pyramids in the ancients' "Abode of the Dead," the Western Desert.

There seems now a curious aspect of prophecy in the belief that souls passed from the realm of life by journeying into the West-

* See "Land of Egypt," by Alfred Pearce Dennis, NATIONAL GEOGRAPHIC MAGAZINE, March, 1926.

ern Desert. The idea has carried over into our own language in the phrase "gone west."

The British Army has found it easy and wise to build its training camps upon the rocky plateaus of arid soil that bound the great green valley. In the desert they have taught men how to fight; but more important by far, they have taught them how to live in the desert.

When the Italians rolled their "hedgehog" formations of tanks and trucks into Sidi Barrani on September 17, 1940, they lost little time in "civilizing" the desert.

They built a good motor road for their lorries and a pipe line to carry water; moved up furniture, radios, wine shelves, and every sort of portable convenience. They built high stone walls and lived behind them in comfort—for a time.

Because the Italians stayed so close to home, the British, by then adept at desert warfare, were able to stalk them unobserved. Soon the Axis warriors were turned out of their fine homes, and then they discovered that they knew little about life in the raw desert.

The Germans are said to have taught their troops about desert fighting in specially designed hothouses—a bit artificial, but certainly



Official War Photograph

A Dodge Truck Comes Out of Its Wooden Chrysalis

This machine will be ready to drive as soon as its wheels are attached. Experience has shown that it is best to do as much assembly work as possible before the vehicles are shipped.

better than nothing. Britain has trained her troops for desert warfare in the desert.

Near Cairo, and at other scattered points, there now exist dozens of rest and training camps for troops not yet ready for the front or for those on leave. On crudely built plank tables they must eat food cooked in portable kitchens. They must use temporary sanitary conveniences; sleep in tents or temporary board barracks; endure sun and heat in the summer and chilblains in the winter. For the desert can be one of the coldest places imaginable.

Army's First Conquest, the Common Fly

Moreover, the Egyptian climate, though idyllic in so far as absence of stormy weather is concerned, is not wholly suitable for all Europeans. Despite this and the obvious dangers of desert life, the health of the British troops has been maintained at a peacetime level. Dysentery, now expanded by medical definition to include the almost universal

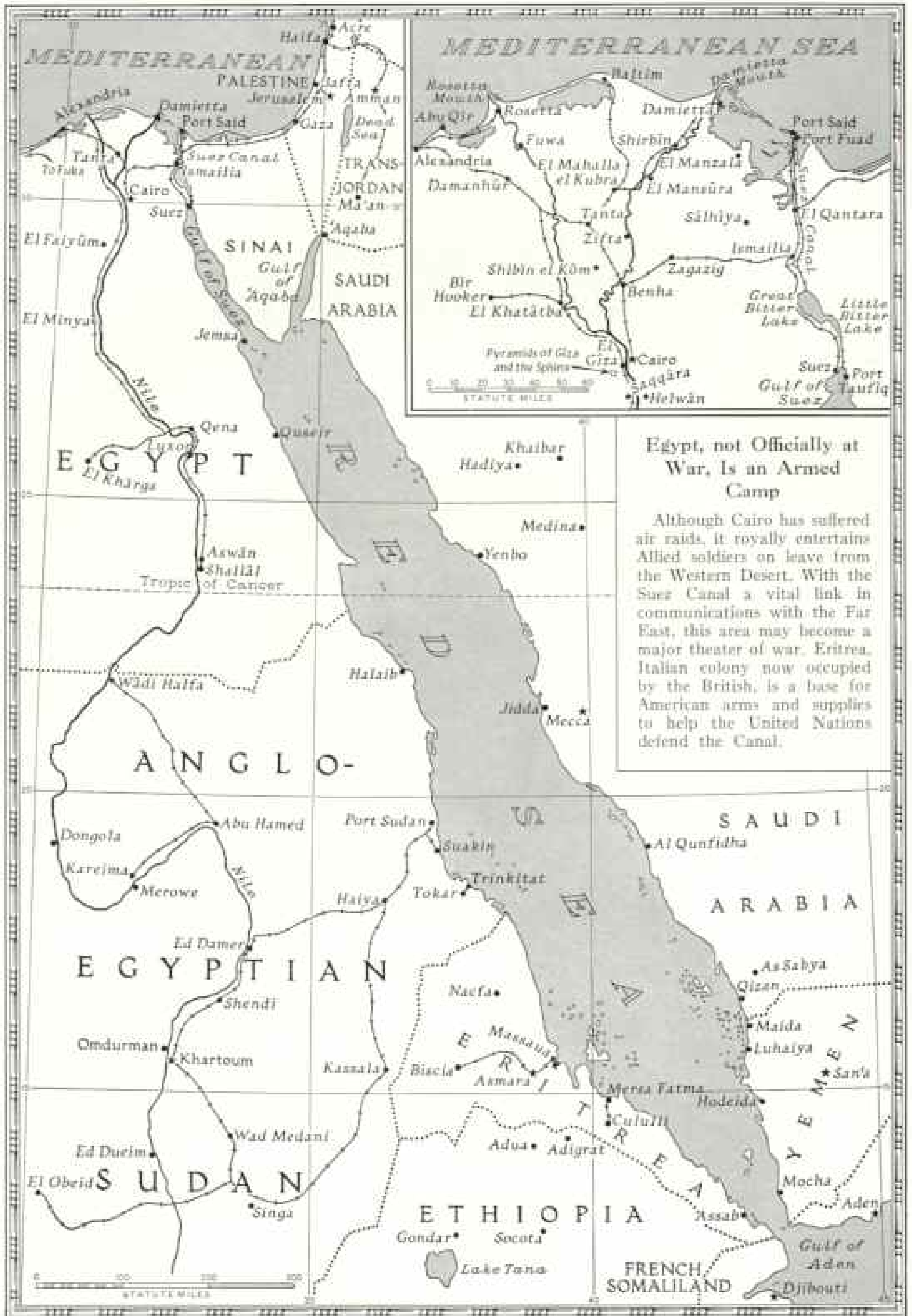
visitors' ailment known as "gyppy tummy," has been reduced to half the incidence of the last war. Typhoid and the other enteric fevers, and malaria have been held in check.

Much of this success in health matters has been due to a drive against the common fly, found to be the source of almost all intestinal disease afflicting the troops. Besides using all manner of fly-catching and destroying devices, Army health authorities launched a publicity campaign to interest the individual soldier in the business of fly extermination (page 514).

This campaign, consistently enough, had a military flavor and was based on a "declaration of war and subsequent blitzkrieg on the armies of Flybia."

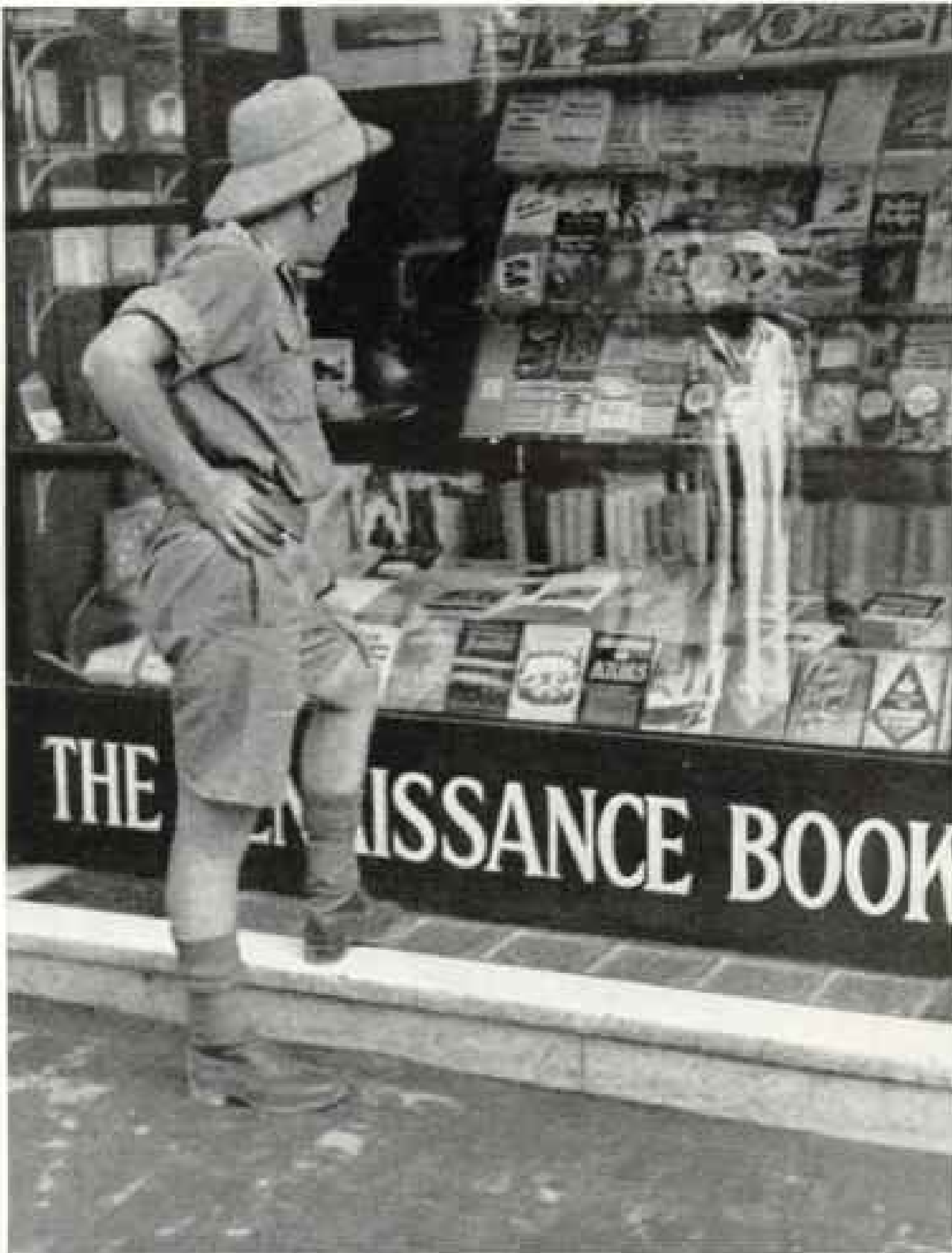
So successful was this propaganda that it even infected one group of Italian internees. They were trained by medical officers and allowed to start a fly-catching clinic, called "Flies Limited."

They caught thousands every day and either counted them or pretended to count them. In



Egypt, not Officially at War, Is an Armed Camp

Although Cairo has suffered air raids, it royally entertains Allied soldiers on leave from the Western Desert. With the Suez Canal a vital link in communications with the Far East, this area may become a major theater of war. Eritrea, Italian colony now occupied by the British, is a base for American arms and supplies to help the United Nations defend the Canal.



From Great Pitt and G. E. Janson

To Fighting Men Something to Read Is a Real Prize

American magazines, though usually months old, command a fancy price. Almost equally popular are Penguin books and other British offerings which feature fiction and political essays. Imitation French publications and cheap pulp thrillers are sold, but the demand for them is light.

any event they posted each day in front of their "clinic" a Flybian casualty list. This proved popular with British tommies and New Zealanders, who found the list a good subject for wagers.

Interesting as camp life in Egypt may be, the British soldier, whether he be Scottish, Anzac, or Indian, lives for the day or hours when he can get to town. Town usually means Cairo for the Army lad. Men of the Navy spend their shore time in Alexandria if they are lucky; in the Canal area if they are not.

Cairo business, restaurant, hotel, and theater men, and all types of native tradespeople look upon the soldiers as akin to manna from

heaven. Certainly the business class was on the verge of starving in the wilderness when the military customers arrived. The travel trade, which once made Cairo entertainment centers, curio shops, and bazaars such lucrative enterprises, dropped to practically zero when the war began.

Cairo is booming again, now, and though it may be a short ride she intends to make it a merry one. Anzac bars have mushroomed on almost every street corner, and the magic name has also been applied to curio booths, barber shops, and even shoeshine shops. Now that the South Africans are here, they may be similarly honored.

Night Clubs and Cinemas Abound

Theaters are filled to overflowing with audiences predominantly in khaki; restaurants and bars are multiplying like bacteria, yet cannot keep up with the demand. At least two new elite night clubs have been opened to accommodate G. H. Q. staff officers, officers in training, and officers on

leave. Indian tailors are working overtime making uniforms.

In summer the Cairo cinema (never called movie here) is an institution in itself. Although Cairo has one modern theater, built by Metro-Goldwyn-Mayer in the latest style and completely air-conditioned, most summer cinemas are open-air affairs, consisting basically of a screen platform—often profusely decorated along the margins with cartoons of American stars or somewhat doubtful murals of palaces and South Sea islands—and a projection booth.

The audience sits in rattan chairs nailed together in long rows, usually with a rattan table woven in between each pair of seats.



Official War Photograph

The American Light Tank Has Won Its Spurs in Egypt

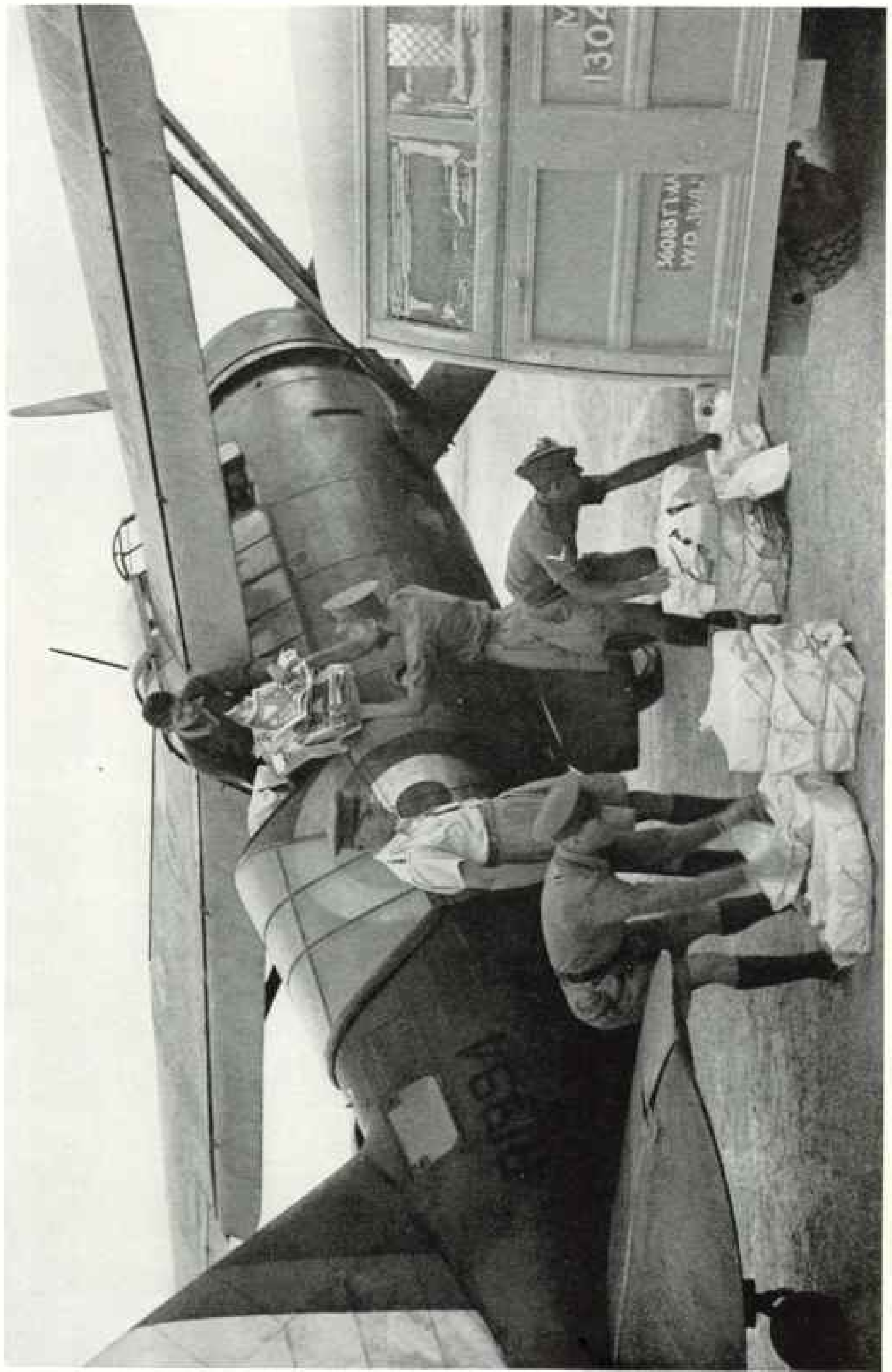
Weighing only 13½ tons and mounting a 57-mm. cannon, this armored vehicle, powered with an airplane engine, is much faster than anything used in Europe. It is being unloaded in an Egyptian port.



Bela Zala, courtesy of Middle-East Parade

There's No Downing These Australians

Even the South Africans have failed to rival the boys from down under in their daring way of living. This group in town for the evening finds the billiard cue a suitable microphone for close harmonizing.



Newsletters and Magazines from Cairo Arrive in the Western Desert

Army Air Corps plane lands daily laden with the same day's issue of papers. This keeps men in touch with the world when they are far out in the vast waste of sand.

Official War Photograph



"Don't You Just Love to Watch People Dance?"

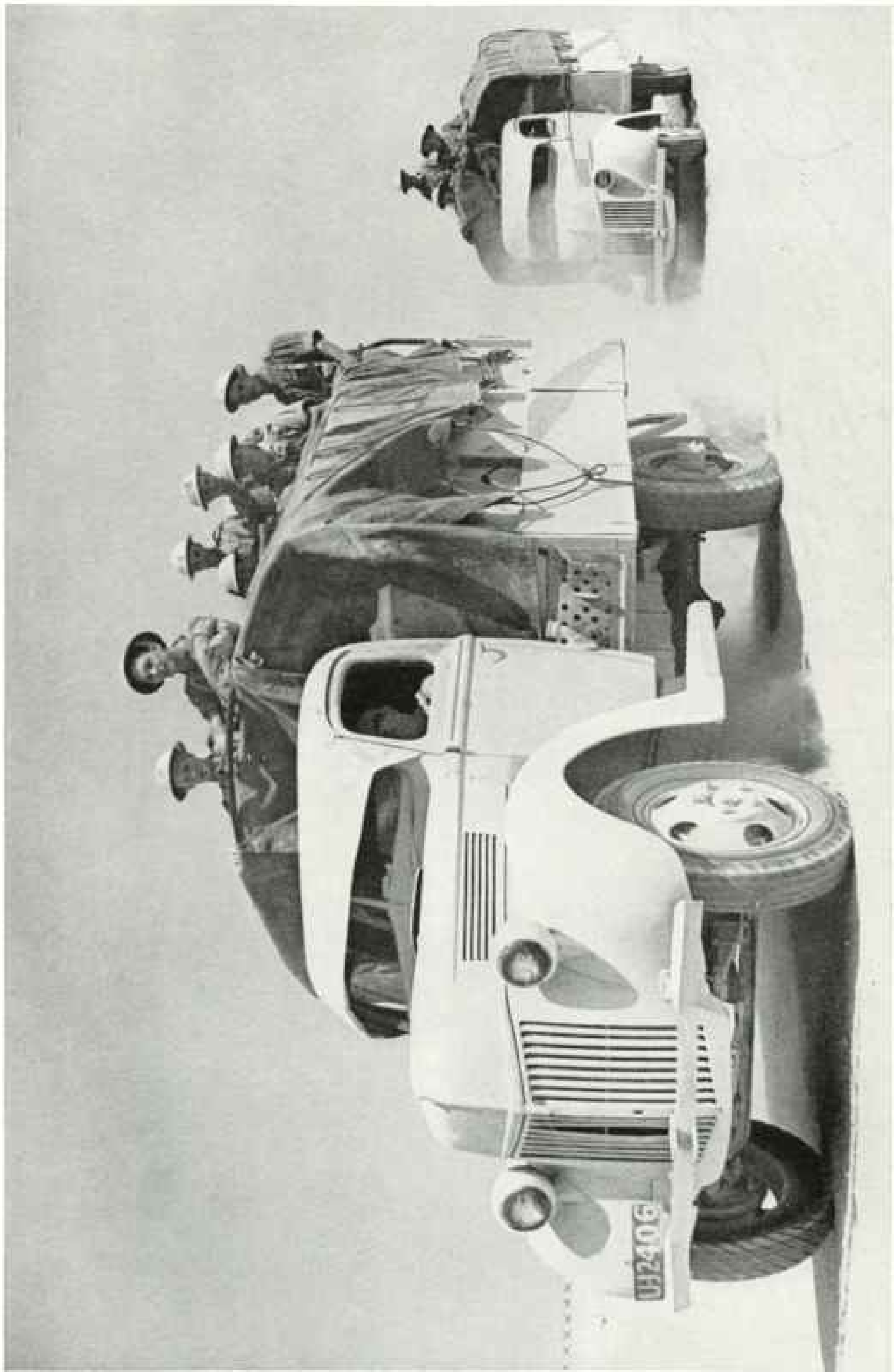
This stand-by of polite conversation takes on new meaning at an Empire Services Club where ballroom steps and customs from all corners of the world get an airing on the same floor at the same time. The intelligence and comeliness of Levantine girls are a revelation to many Englishmen (page 517).



Bela Zala, entertainer Middle-East Parade

Rhythm of the Nile Retains Its Witchery

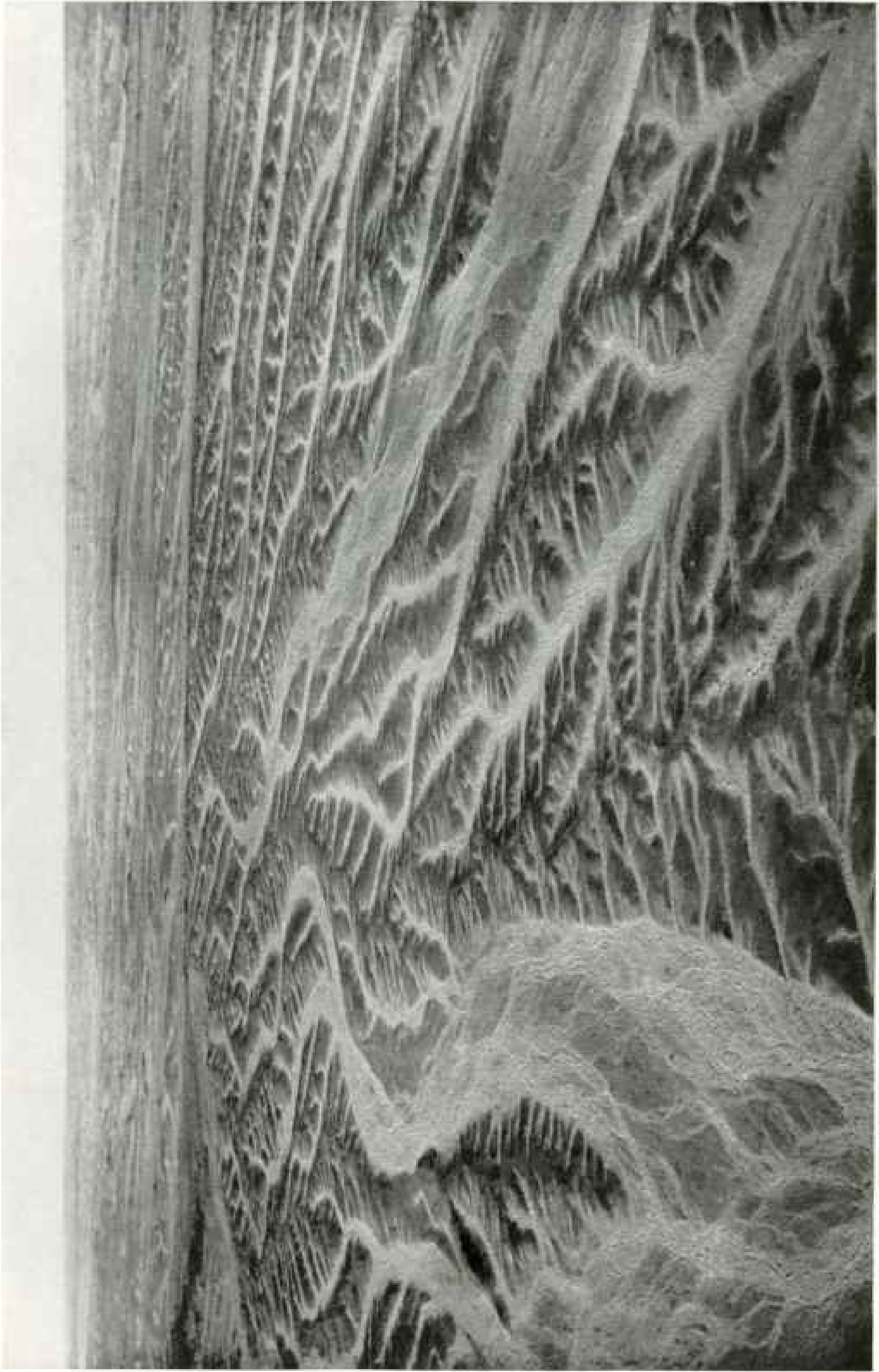
With flashing smile a Cairo night club beauty entertains Anzacs and British tomnies by gliding through voluptuous routines such as delighted Mark Antony at the court of Cleopatra. The soldiers applaud stage performances like this, but for their own dancing prefer American "swing" (page 523).



Official War Photograph

The Desert Army Rides in American Trucks—Sunshades Protect the Drivers' Eyes from the Intense Glare

Equipment from the "arsenal of democracy" is becoming increasingly important in the Middle East. Beneath the wheels the fine sand of Egypt rises in clouds. It gets into motors, food, and eyes.



Libylian Desert. Air Force

On Such Desert Wastes Vast Armies Are Fighting Human Foes and Hostile Nature

When asked whether Italian and German advances in Libya were alarming, a British officer replied, "We'll stop them when we get ready; meantime they'll get their stomachs full of sand." When mechanized forces bivouac for the night they place tanks in a circle around their camp, guns pointed outward. The method is similar to that used in American pioneer days by the prairie schooner trains when crossing Indian country.



Official War Photograph

Dangerous Foe of the Armies in Egypt Is the Fly

All manner of traps are in use to rid the encampments of the insects which menace health by spreading germs of dysentery and other diseases. Even interned prisoners take part in the campaign against these pests (page 506).

These are for refreshments, which may be taken either during the show or at the long intermission, a custom borrowed from Europe.

Though the impatient American wants to get on with the show, no theater has been able to wean the Cairene from his ten-minute rest period. During the break he buys beverages from the theater waiters, or patronizes ice cream bars, cigarette and candy stands. It is most like the period before the Wild West show in Barnum and Bailey's Circus, and about as noisy.

Movie Palaces of Babel

The Levantine, most noisily talkative of the world's peoples, is awed but slightly during the showing of the picture and takes pleasure in translating for his sister or girl friend beside him who, educated at a French school, knows no English, the words of the actors on the screen. This goes on in spite of the fact that titles are projected

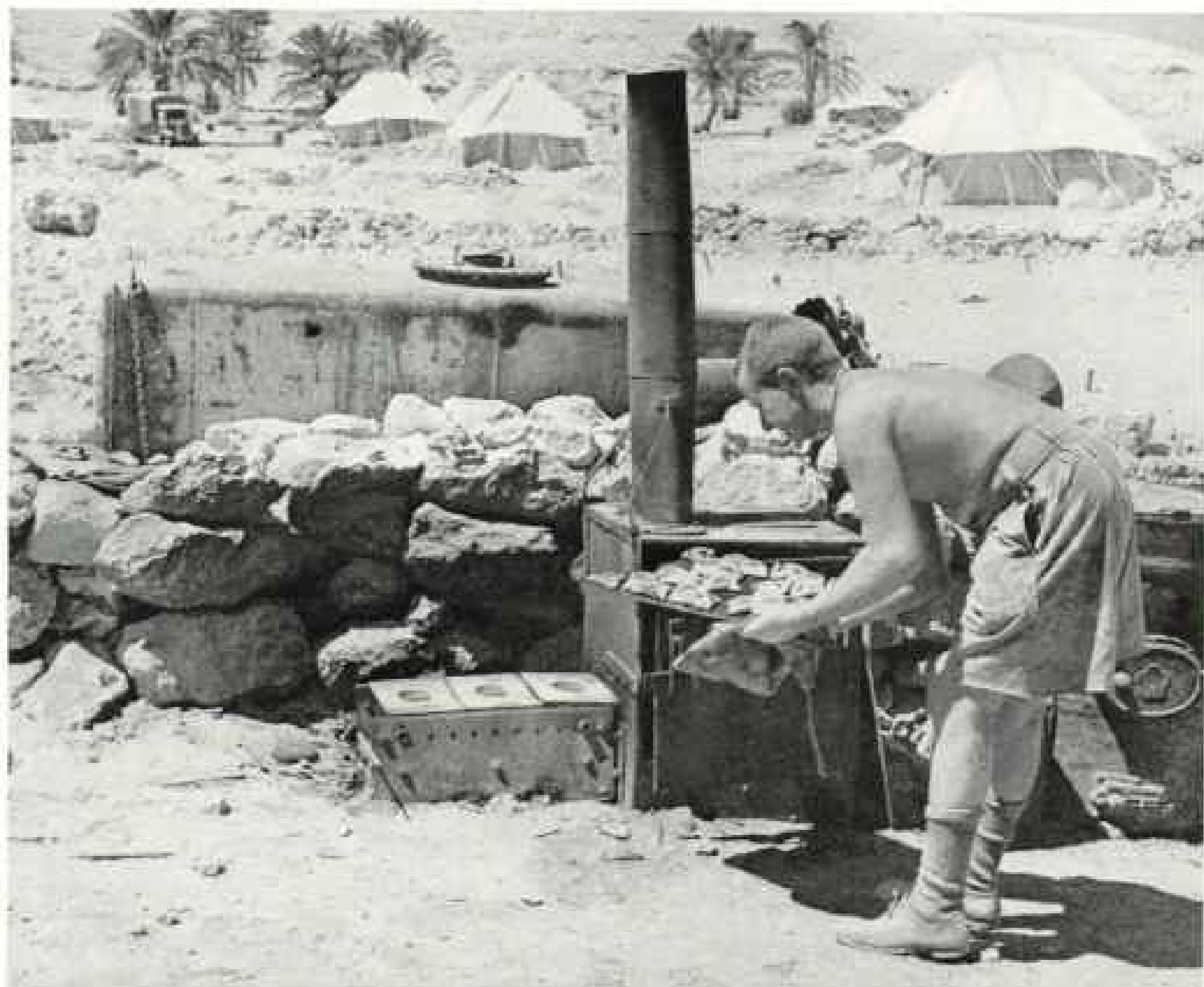
beside the film in Arabic, French, and Greek.

Even the American, once he gets the Cairo spirit in his blood, enjoys the long hours in the palm-shaded gardens under open, star-spotted skies.

He learns to think less of the plot and quality of the double-feature program than of the quality of the drink in his glass, and the pleasure of a cigarette, the joy of munching peanuts and pistachio nuts and throwing the shells on the ground—all forbidden pleasures to the well-bred American theatergoer.

Down in the native section, behind the Ezbekiya Garden; in old Cairo with its winding narrow streets and glassless windows blank and gray like blind, slate-black eyes; along the base of Salah ed Din's (we call him Saladin) Citadel (page 502) as far as the City of the Dead—in these and other small sections throughout the city are the tiny native cafes, mere stalls with open fronts.

There the fellah and his city cousin gather



Official War Photograph

Baked under Difficulty, Pastry Is a Luxurious Treat

This Army cook has used a makeshift outdoor stove to turn out a panful of tarts for soldiers of his King and Queen. Because they have received their combat training in the barren regions of Africa, the British have become inured to life in the desert (page 505).

to chat, sip tiny cups of bittersweet Turkish coffee, smoke the hubble-bubble pipe, and listen to weird Egyptian music sung by local favorites over the Egyptian State Broadcasting Company's Cairo station.

Dancing Far from Swing Band Style

Toward evening the day-long monotony is sometimes broken by dancers. These are always young men, never girls. They are usually Nubians, and their dance consists of clever intricacies of footwork, like the Hungarian swineherd's dance, but much slower. The boys sometimes place a small cane on the floor and leap across it; sometimes they carry it and use it to emphasize gestures.

The dance itself can develop no audible rhythm, for the boys are barefoot or shod in soft sandals, but the onlookers make up for this by clapping their hands in unison.

The monotonous drone of the music, produced by small, yellowish reed pipes and

tom-toms, or perhaps a guitar, together with the weird, flickering lights of crude kerosene lamps, the even beat of the many hand-clappers, all combine to produce a hypnotic effect. Soon it appears that the dancer has been thus affected, for his movements become a series of body shudders and twists, seemingly arrested prematurely in midpassage.

Finally the body may give way to spasmodic jerks. It is showmanship, of course, and the effect is to increase the audience's enjoyment of its own lethargy rather than to arouse it to violent action, in contrast to the American swing band.

Even the confirmed occidental finds some pleasure in these Arabic dances, but circumstances have put them and other purely native pleasures beyond the reach of the men in uniform. The visitor may walk and gaze and, if he keeps his mouth shut, occasion no particular notice. The cafe life goes on as usual, and he may look his fill.



Official War Photograph

His Britannic Majesty's Forces Go Sight-seeing—Arm in Arm

Four Indian soldiers accompany a South African (in sun helmet) and New Zealander (in overseas cap) through Cairo streets. These men have gone into battle in the same fraternal spirit (page 504).

But the man in khaki is identified as a foreigner and in his presence the customers grow embarrassed and ill at ease; the dancers are discomfited, or spurred to new and unnatural efforts in the hope of baksheesh.

Hence a number of night clubs and cabarets have struck gold by bringing to the soldiers programs of Egyptian entertainment.

English appreciation of the Nubian dancer is at best limited, and hence the cabarets specialize in feminine routines which are more or less directly descended from the harem and lately have flourished under the patronage of wealthy Arabs on feast days and at weddings.

Slapstick comedy in Arabic helps to hold the local as well as foreign audience. The troops do not understand the words, but the meaning is seldom left in doubt.

Afterward the spectator may dance with the "artists" if he chooses, but then he must buy drinks. The girls get a percentage, and they can make a bottle of beer disappear like magic in an altogether modern manner.

Of the so-called European night clubs, the less said the better. A forgiving spirit may overlook programs given over to asthmatic tangos and rumbas, but not the vocalist who sings American songs through his nose in the supposedly French manner.

For songs and movies the Anzacs look to New York and not to London or Paris. Small wonder then that the two most popular night spots provide genuine American foxtrot rhythm with British and Viennese waltzes for variety (pages 511 and 523).

Recreation for Soldiers of Many Lands

The income of Tommy Atkins will not permit a round of gaiety, and so he sometimes finds the last days of that once glorious leave growing a bit tedious. He may rebel at the artificial nature of the usual night life. What many soldiers want most is a quiet place to read and chat. Even if they dance, they prefer to do it with a girl they can talk to.

Here the British and American communities have stepped in and, working through the military recreation committees and the Y. M. C. A., have undertaken to provide a place for the soldier to have a good time.

The results have been such establishments as the Empire Services Club, Gresham Court Y. M. C. A. tea garden, Hurricane House (for the R. A. F.), the New Zealand Club, and many others. These provide refreshments and sometimes a place to sleep; a place to relax when in town for the day; a quiet place to read; a place in which to write a letter home. The Empire Services and Y. M. C. A. also provide something more important—feminine companionship.

The emancipation of the Egyptian woman is a story in itself. Polygamy is not a thing of the past, but it is almost nonexistent in good families. The harem is dead. The veil is going rapidly. But Egyptian womanhood faces a long battle before all the shackles of custom and tradition will be broken.

The Egyptian woman does not have the franchise. Although she may and sometimes does hold responsible positions, even in government departments, the average girl still has only one career open to her—that of marriage.

Chaperons Still in Vogue

All this bothers the Egyptian girl very little; but the vestiges of another Eastern custom, that of seclusion, still cause her much difficulty if she has acquired Western ideas. It is still assumed that the well-bred Eastern girl must have very little to do with young men until she is safely married. Sometimes she is not allowed to go out at all except to entirely feminine gatherings and then only when she can be chaperoned by her mother or a married sister.

More liberal households permit the girls to go to dances and movies if their brothers

are members of the party. A few families allow their daughters to go out on what Americans call "double dates." Some specify three couples; others allow the girl to go to certain clubs, usually the most expensive ones, but not to others.

Few indeed are the Egyptian girls or European girls living in Cairo who normally get even a fraction of the freedom accorded their American sisters.

Yet most daughters of middle-class or wealthy families in Egypt have at least a partially European education. Many have obtained it in American or English mission schools. Others have attended the French or Greek Lycées, or a convent school. Fuad I University, Egypt's national institution of higher education, now admits women. So these girls, familiar as they are with the literature and cinemas of the West, strain at even the last vestiges of the fetters which bound their grandmothers.

Into this somewhat delicate period of social transition have suddenly been introduced thousands of fairly modern, completely Western, normally sociable young men. The results bid fair to be astounding. Girls who previously were not permitted out after dark without their brothers now go out with officers, and idle tongues do not wag quite as furiously as before.

"Wallflowers" vs. "Butterflies"

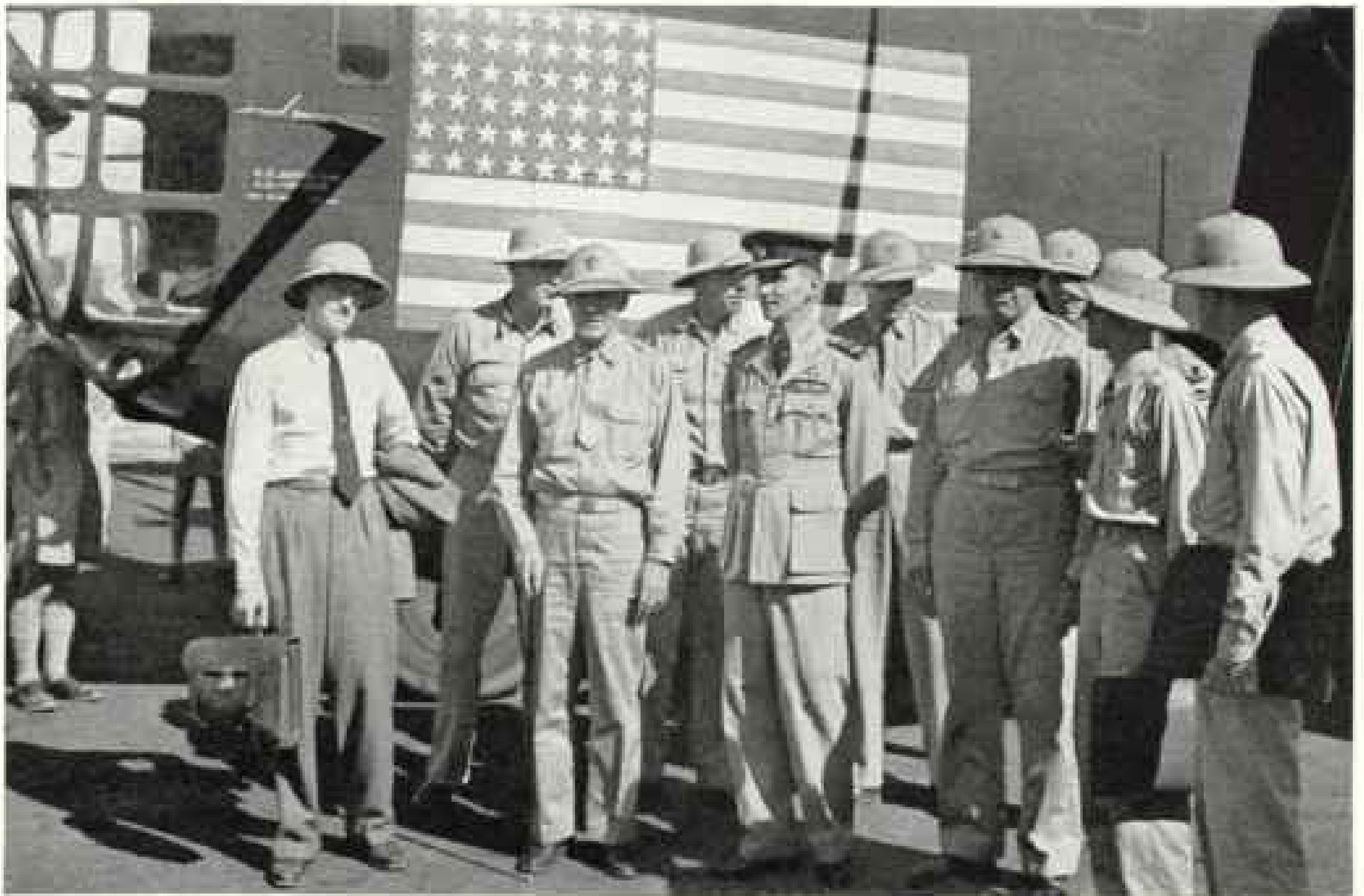
The truly modern girl once had a difficult time, for Eastern young men, essentially conservative as only young men can be, often chose the protected clinging vines. Perhaps they considered it the better part of valor. Now the modern girl finds herself at a premium.

One Syrian girl remarked: "All the wallflowers are having a wonderful time now. But some of the butterflies that once were most popular sit them out at the military dances. Strange people, these English."

But it is numerically unescapable that there are not enough girls to go round, and the officers naturally get first choice. The Y. M. C. A. particularly has tried to help the enlisted men in this respect.

The Y people realize that a man who has been working and fighting his heart out somewhere in the desert for months on end has an entirely legitimate yearning for feminine company. Hence the Y holds dances twice weekly at its Gresham Court tea garden.

It invites local girls of good family, who often give up dates with officers on those two nights to dance with the men. Many girls come who must be chaperoned both to and



Air Ministry Official

Chiefs of the U. S. Army Air Corps and the R. A. F. Meet in the Middle East

In October, 1941, this giant Consolidated Liberator landed at an airdrome near Cairo with Lieut. Gen. George H. Brett (front row, second from left) and a crew of experienced flyers. British Air Marshal A. W. Tedder (center) greeted the visitors. General Brett is now on the staff of the United Nations in the Far East. Wartime camouflage has blacked out the flags that identified this far-flying bomber.

from the party; but they do dance with the soldiers, talk to them in English, and listen with a sympathetic ear.

Older women, too, go to these parties. Some are technically chaperons, but they always find a crowd of boys who miss mother more than they know. Often it seems that it is these older women who are most popular. Within the limits of their time and means they invite soldiers to their homes for tea or lunch (page 520).

Treasures Returned to Tombs

The recreation sections of the Services, together with the Y, regularly take the fighting men on pilgrimages to those shrines of history with which Cairo abounds. Unhappily the treasures of the Egyptian Museum are now packed below ground lest an Axis bomb destroy any of these irreplaceable creations of the ancient artisans.

Some things have even been returned to the tombs. But there are still the Pyramids of Giza; the Step Pyramid and tombs of the Viziers and Apis bulls at Saqqâra; the great mosques of Cairo proper; the Citadel, the tombs and chapels of the City of the Dead;

the great Moslem university of El Azhar. More modern attractions include the oriental bazaars and the Zoo.

The most popular place is Giza where the three great pyramids stand guard and the Sphinx looks out with its chipped stone smile at the luscious valley of the Nile and the strange little men who come to gaze (p. 504).

Armies are nothing new to the Sphinx, for since King Khafre built this strange half-lion likeness of himself it has seen Hyksos, Assyrian, Persian, Arab, Crusader, Turk, French, and British hosts, to mention only a partial list. So the thoughtful Australian or New Zealander must feel a bit humble as he gazes at this statue, which developed a Mona Lisa quality so many years before Da Vinci.

The First or Great Pyramid was built by Khufu (Cheops) and, like the other two which came later, it was once faced smooth with white limestone. Truly it must have been breath-taking as it reflected the light from Egypt's matchless sun or the blue which never fades from Egyptian skies.

But now the facing is gone, stolen by the Arabs and others for their own buildings. It is an ill wind, they say, for although much



Heta Zola, courtesy *Middle-East Parade*

Arms of Other Wars Hang Above the Soldiers of Today

In Cairo collections of old weapons are often seen in private homes and public buildings. Martial decorations seem appropriate in this Tipperary Servicemen's Club. Among the firearms in the panel above the readers are North African rifles—once carried by Bedouin raiders.



Official War Photograph

Indian Fighting Men Enjoy an English Tea Party in Egypt

These Army guests, representing several units, were entertained in the garden of a gracious home. Cairo hostesses are most cordial in arranging social affairs for officers and men.

of the glory of the pyramids is over; the ambitious can now satisfy their desire to ascend.

We climbed to the top recently with some friends, but a resident finds Giza too close and too accessible for true appreciation. We saw it swarming with men in khaki. Exclusive restaurants may be "out of bounds" for privates and noncommissioned officers, but at historic spots democracy is the rule.

"Gee, what a bloody big pile of stone!" says one Australian.

"Almost as good as one of our mountains," replies the New Zealander.

There were some sailors riding camels, somewhat testy skippers aboard those ships of the desert. These were British lads, but later when some crew members of the ill-fated *Steel Seafarer* came to Cairo (page 503), they also visited the pyramids and tried their hand at camel piloting.

The older Step Pyramid at Saqqâra is also visited by troops, but being less famous and

farther off the beaten path it gets less military attention.

From within the masonry of Saladin's Citadel, which captive Crusaders helped to build in 1176 for Saladin, and which has constituted an important fortress ever since, rise the massive walls of the Mohammed Ali Mosque. Together with the great dome and the minarets which surmount them, they form the most outstanding landmark in Cairo, visible for miles from the flat valley below.

The "George Washington of Egypt"

In 1811 Mohammed Ali, often called the "George Washington of Egypt," invited the Mameluke beys to the Citadel as his guests. These men were all descendants of hired mercenaries taken from the slave marts of eastern Europe and western Asia to serve Egyptian rulers.

The Mamelukes had turned the tables on their masters and for hundreds of years a succession of them gave Egypt a reign of



Air Ministry Official

No Shark This, But a Tomahawk Warplane Decorated by an R. A. F. Artist

The pilot, wearing his oxygen mask, fearlessly sticks his head near the maw of the monster. But the bite of this death dealer is really in the round gun muzzles that form its dorsal fin, not in the harmless air intake which is its mouth. Built by Curtiss, this fast, maneuverable American-built fighter is important in Middle East air warfare.

cruelty, revolution, and bloodshed. Mohammed Ali knew they would never leave him in peace, so he had determined to be rid of them.

After the appointed festivities were over, he contrived to sandwich the Mamelukes into a procession with his own men leading and bringing up the rear. When the parade was halfway along the narrow, winding road that still leads down from the Citadel hilltop, the van and rear halted. The Mamelukes perforce halted, too.

Immediately Albanian sharpshooters, planted in the heights above the road, opened up. Those victims who tried to rush on down the road were cut to pieces by the soldiers ahead of them. Of 470 men, only one escaped. According to tradition, he jumped his horse through a gate overlooking a high precipice. The horse died, but the rider got away.

Perhaps to ease his conscience, Mohammed

Ali started to build his magnificent mosque in 1824. It was completed in 1857. Although not as famous as the Mosque of Ahmed I in Istanbul or the Mosque of Omar (Dome of the Rock) in Jerusalem, it is at least equally impressive to many visitors, including those military (page 502).

A Notable Monument of Mohammedan Egypt

Another favorite is the Ibn Tulun Mosque, the second oldest and one of the largest in Cairo. It was built about 879 A. D. by the Turkish ruler, Ahmad Ibn Tulun, and its architecture is especially noteworthy because it shows a very early use of the pointed arch.

The immensity and ornateness of the Ibn Tulun Mosque, the play of light and shadow along its cloistered corridors, fascinate the thoughtful soldier and make him return with his friends.



Official War Photograph

Wherever the British Go They Take a Bit of England with Them

Even in the desert these South Africans find time for a game of cricket. The spades make a satisfactory though overwide wicket, and there is no shortage of skilled players. The sports life of Egypt has been enhanced by the influx of Army men, many of whom were star athletes before the war.

Uniforms on the streets of Cairo are so numerous and varied as to require a catalogue as long as this article. All the wearers of uniforms once were men.

Nursing sisters—prim and unbending in gray dresses, square-collared in white and red, and shapeless gray felt hats—were taken as a matter of course. But when South African members of the Women's Army Auxiliary Service appeared, neatly togged in full military uniform, Cairo's sheltered hyperfeminine girls hardly knew what to make of it.

They could understand the A. T. S. (Auxiliary Territorial Service) who appeared about the same time, for the ATS are often modern amazons and proud of it; but attractive, winsome girls like the WAASIES, dressed like men, doing a job like men, looking after themselves like men—that was a bit beyond the Cairo ladies.

Then came the WAAFS, and that was a big event in Cairo all by itself. Their superbly neat uniforms, bright self-assured smiles, and the jaunty set of their caps, permitting a far more stylish coiffure than girls of the other services, set them apart from the first.

It remained for the Egyptian dragomans, those English-language-murdering, lovable

guides who show you the town and overcharge you for it, to give the WAAFS their new Egyptian name.

"Right this way! Show you pyramids, Sphinx, Citadel, Saqqâra, and Dead City. Only ten piasters, Mrs. Squadron Leader," says the beaming dragoman. Only a man illiterate in ten languages could coin that gem, and "Mrs. Squadron Leader" the Women's Auxiliary Air Force members will probably remain, as long as they stay in Egypt.

Uniformed Americans There, Too

There are uniformed Americans in Cairo, too, even an American girl who has driven an ambulance for the American Field Service unit. The Americans use the Legation as a headquarters, but they are only in and out.

General George H. Brett, formerly Chief of the United States Air Corps, was here (page 518); Capt. James Roosevelt stayed for a time as observer for the United States Marine Corps.

The contacts of many widely differing races must generate some friction, and this is true in Egypt as it would be in any other land.

The Egyptian is not given to travel; yet the world has come to him in his own country.



Air Ministry Official

Tired but Smiling WAAFS Arrive at Cairo from Britain

Although here dressed for roughing it, members of the Women's Auxiliary Air Force, unlike girls of some other British services, have natty uniforms which make them the envy of even the ladies in "civvies." An admiring Egyptian dragoman bestowed their popular title, "Mrs. Squadron Leader" (opposite page).



Bela Bolz, Reuters/Middle-East Press

Swing Is an International Language

Cairo girls like tangos and rumbas, but they soon learn the latest "jive" steps. They brighten the lives of lonely soldiers in from the desert for a few days' leave. This scene was snapped at a local club.



By MICHAEL OFFICER

With Such a Pretty Rider, Even a "Commissariat Cam-u-el" Becomes a Proud Steed

The comely member of the W. A. A. F. is enjoying her first camel ride at Giza, and the ugly beast evidently appreciates the honor of carrying her. To Kipling's Tommy Atkins, the *Ount* was a "devil an' a ostrich an' a orphan-child in one." Despite his weird physique, he is an efficient beast of burden.

Still he tends, as do the citizens of most lands, to be a bit suspicious of strangers. At the same time he must usually admit that the presence of British troops today is vital to the safety of Egypt.

The British Army has not only kept the Axis out—a boon which the Egyptians are gradually learning to appreciate as the difficulties of Nazi-dominated European peoples become apparent—but, as we have already mentioned, it has proved such a wonderful customer for Egyptian industry that a minor boom in trade has been generated.

Britain bought all of Egypt's 1940 cotton crop that was offered her, at what most neutral observers concede to have been a reasonable price; also half the 1941 crop.

Numerically, the largest merchant class in Egypt is composed of street vendors. They, too, have found the soldiers good customers. The vendor has in fact begun to expect all men in uniform to buy and is often so per-

sistent that angry words, few of which are understood on either side, sometimes result. But there is much amiable banter as well.

Common Cause Makes for Friendships

There are also many examples of growing friendships and understanding between the two peoples. Marriages are one phase of this; but perhaps more important is the interest which thoughtful soldiers are taking in the social, economic, and religious life of the East.

Many officers and men study Arabic at the American University's School of Oriental Studies. Others poke around in libraries and bookshops for books on Egypt (page 508). They thus correlate their own observations with the broader picture given by reading.

Several incidents have occurred which have tended toward friendly relations. Soldiers have saved Egyptians from drowning both at Alexandria beaches and in the Nile. Late one night we noticed Egyptian effendis gather-



Air Ministry Official

From "Ship of the Desert" to Ship of the Air

The R. A. F. pilot sits in the cockpit of an American-built Tomahawk fighter. Before he can take off, the wheel chocks must be removed. Mechanization is crowding out the camel in desert warfare.

ing up the personal belongings of a sick New Zealander, among them a well-filled wallet which he had dropped.

We stopped to see what was happening, but discovered that the men were really trying to be helpful, although they could as easily have robbed the foreigner.

One English officer wrote a letter to a Cairo English daily expressing appreciation for aid given him, when his car broke down, by an Egyptian, a total stranger. The Egyptian had spent the greater part of the night driving the officer around, taking home a young lady, going after a mechanic, returning to the car for some forgotten valuables, taking the officer home. He refused all compensation.

Egyptians will usually do anything within their power to help one who seeks their aid as a friend. They entertain lavishly. They are sincere in their welcomes.

Despite direct profits from the war, the Egyptian economic picture has been somewhat upset by the conflict. All imports have

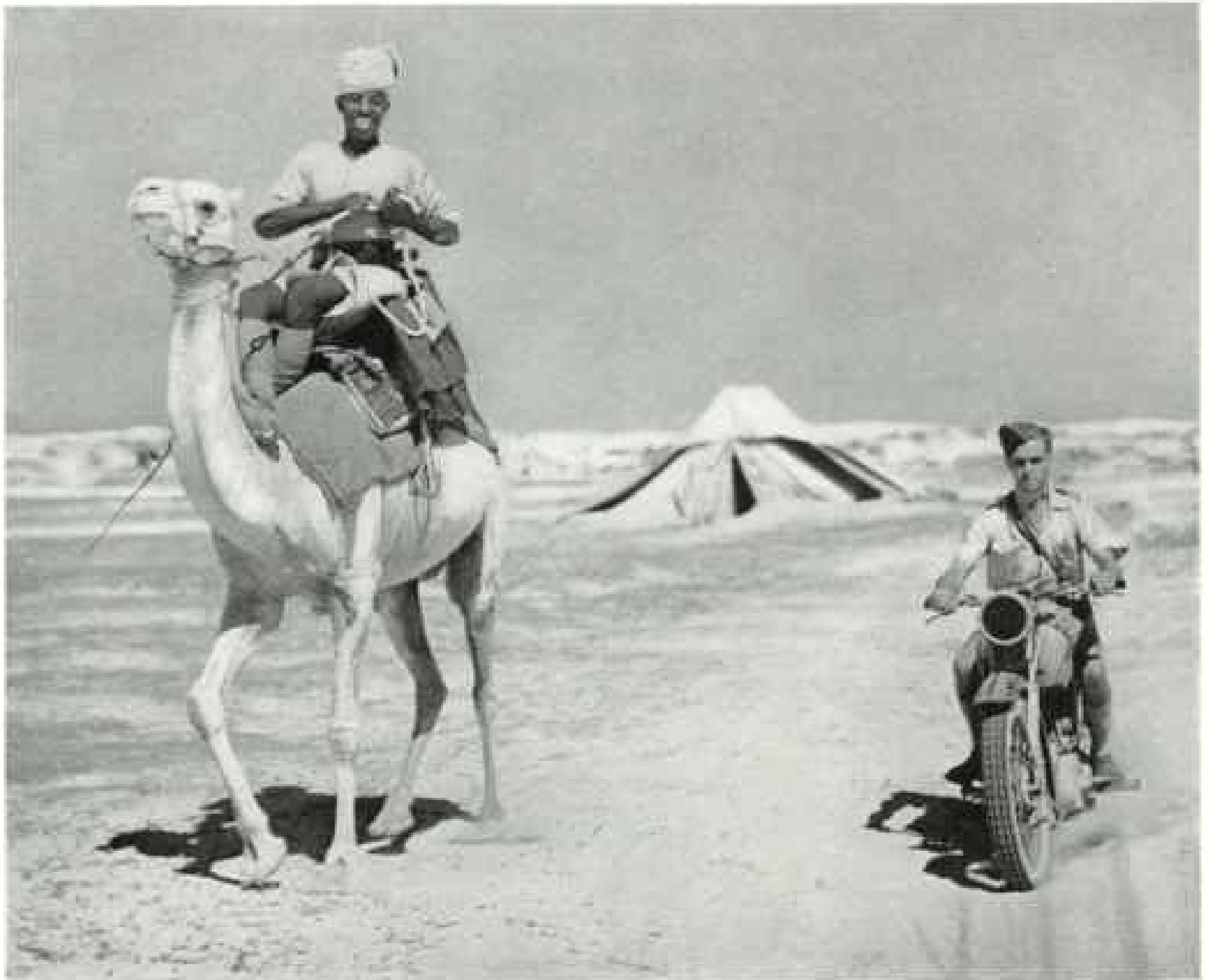
become difficult, and prices of commodities affected have soared in spite of government regulation.

Furthermore, much of Egypt's industrial capacity has been utilized by the Army, cutting down output when the demand is greatest. For example, most Egyptian cloth weavers are now engaged in tentmaking; yet the importation of cloth has been made more difficult.

Reduced Acreage for Cotton

As in the Old South, cotton has become king of Egyptian agriculture. Although this money crop for 1941 will be disposed of by the growers under the terms of the Anglo-Egyptian agreement before the end of the current season, the Government has passed a law reducing the acreage for 1942. This reduction may amount to 25 or 30 percent.

This measure has a dual purpose. First of all, the cotton market is uncertain and the production of further surpluses would proba-



Air Ministry Official

For Courier Duty the Motorcycle Is Replacing the Camel

The ungainly steed is no longer important in desert warfare, but in East Africa part of the Somaliland Camel Corps, a branch of the King's African Rifles, performed valuable reconnaissance and raiding.

bly depress it further. Moreover, transportation to export markets for Egyptian cotton is thus far insufficient.

Equally important is the fact that even in normal times Egypt has imported food. Since this has now become difficult and since there is a need for added food supplies, particularly grain, throughout the Levant, Egypt proposes to solve the problem by growing food instead of cotton.

Thus Egypt remains at peace, while her social, political, and economic life is permeated by the backwash of war. Yet she remains essentially Egypt. She has seen dozens of conquerors more worthy than Hitler come and go. She has weathered invasion after invasion and retained her identity.

Small wonder if this war fails to arouse her citizens, as it does the sons of the West.

The fighting man of Britain views Egypt with mixed emotions. Here he has come so many miles away from his own frontiers to fight for Britain, New Zealand, Australia, or South Africa. The danger to Britain is almost as vital in the Western Desert as it is along the Dover coast. Peaceful, drowsy, pleasant Egypt must be for many men a land of blood and sand, and even sweat and tears.

Yet Egypt has been a land of victory for Britain since Nelson destroyed the fleet of Napoleon in the Battle of the Nile. Egypt will remain a land of British victory if strength and fortitude and courage can keep her so.

The new 1941 Supplement to the Cumulative Index to the NATIONAL GEOGRAPHIC MAGAZINE may now be obtained from The Society's headquarters at 25¢ in the United States and Possessions; elsewhere, 50¢ in U. S. funds. The Cumulative Index, 1899 to 1940, complete with the new 1941 Supplement, is obtainable at \$1.75 in the United States and Possessions; elsewhere, \$2 in U. S. funds. Postage is prepaid in all cases.

Mediterranean Checkerboard

By FREDERICK SIMPICH

HOW war sweeps around and over the Mediterranean! Today nearly every one of its nineteen bordering countries is involved.

Cities famous since Bible times are smashed and fired.

In the wake of Huns, Goths, and Vandals come now the Nazi hordes, striking at Athens, Haifa, Alexandria, the island of Malta. From her bases in Egypt and elsewhere Britain strikes stubbornly back, aided by American fighters, mechanics, planes, tanks, and guns.

Across Libia, where once rumbled the war chariots of Greece and Rome, today's conflict has brought the roar of Axis and Allied tanks and fighting planes. As I write, they're gunning the storied coast where the American commanders Stephen Decatur, William Bainbridge, Edward Preble, and others came to punish Barbary pirates for preying on our merchantmen.

Down upon Crete, where earlier invaders landed from galleys, 1941 brought enemies from the sky in parachutes (page 544). They sink ships here now with torpedoes, and set them afire with aerial bombs, instead of ramming them or hauling alongside as in pirate days to throw flaming pitch pots upon their smoking decks.

Civilization itself began in Egypt and in other Bible lands east of the Mediterranean. Its long, slow march was westward, from Babylon and the Nile country to Greece, Rome, Carthage, France, England, America.

The World's Foremost Sea

Look at the map (pages 530-1), and you see this Mediterranean as a great body of island-spotted water, oddly indented and twisted by capes and vast peninsulas, separating Europe from Africa. By means of its far-flung eastern extensions, such as the Aegean Sea, and the Black Sea reached through the Dardanelles, it also helps form the frontier between Europe and Asia.

In magnitude, historical interest, and present-day significance, there is no other sea to compare with it.

Look how big it is. More than a million square miles are covered by the waters of the Mediterranean proper. It is 2,800 miles by water from Batumi, on its Black Sea extension, to Tangier in Spanish Morocco, at its west end; almost as far as from New York to Land's End, England.

From the Atlantic, on the west, you enter

this great sea through the narrow, shallow Strait of Gibraltar, guarded by Britain's gun-bristling Rock (pages 528-9).

It is more than 2,200 miles from this Strait to the Suez Canal, which connects the eastern Mediterranean with the Red Sea and the Indian Ocean.

Count the many countries that touch this gigantic sea and its extensions, beginning on the north shore of the Strait of Gibraltar and reading east: Spain, France, Monaco, Italy, Yugoslavia, Albania, Greece, and Turkey; then, if you go through the Dardanelles, the Marmara, and the Bosphorus and consider the Black Sea as a Mediterranean extension, you find also Bulgaria, Romania, and the disputed province of Bessarabia, the Russian Ukraine, the Crimean Peninsula, Georgia, and the north Turkish coast.

South of Turkey, still fronting on the Mediterranean, you find Syria (Levant States), Palestine, and Egypt. Returning westward to the Atlantic, still facing the sea, lie Libia (Cirenaica and Tripolitania), Tunisia, Algeria, and French and Spanish Morocco.

The Cradle of Western Religions

Think how many divergent races, religions, languages, and forms of culture are covered in that list of countries!

To 692 million Christians the Tomb of Christ in Jerusalem is the most holy spot in the world.

To 209 million Moslems the Dome of the Rock in Jerusalem, where Mohammed ascended into Heaven, is likewise a sacred place.

To 16 million Jews Palestine is the New Zion.

To 475 million Roman Catholics, the Vatican in Rome is the center of the Church's ecclesiastical authority.

Emperors, kings, dukes, dictators, sultans, and corsairs without end have struggled here for power.

Here rose and fell the glittering Roman Empire. For several hundred years the Turks bossed the Mediterranean.

As late as the start of this century nearly all of the great naval battles in history, except the defeat of the Spanish Armada, were fought in or near the Mediterranean.

Now frontiers change so fast, as armies ebb and flow, that map-makers can't keep pace. It has always been so about this big sea. Over and over war has changed the maps of Mediterranean lands.

Today the three larger nations with most



European

A British Fairey "Swordfish" Roars Over Gibraltar Bay

One of these biplanes scored a direct torpedo hit on the German battleship *Gneisenau* when, accompanied by her sister ship the *Scharnhorst* and the cruiser *Prinz Eugen*, she raced through the English Channel from Brest to Helgoland in February, 1942. Other Swordfish helped to destroy the *Bismarck* at sea on May 27, 1941, and played a leading role in the British naval victory at Taranto (page 550). Below lies part of the British Fleet, with destroyers nesting in their "pens" in the foreground.

direct interest in this sea are the British, the French, and the Italians.

Today, except for her islands, her claims to Albania and parts of Yugoslavia, Italy is about all that's left of the old Roman Empire.

Italy and Sicily Cut the Sea in Two

But her long peninsula, thrust far down into *Mare Nostrum*, plus the islands of Sicily and Sardinia, give her the longest coastlines and make her the most conspicuous of all Mediterranean lands. It is from airfields in Sicily and Italy that Axis bombers now take off to assail near-by Malta (pages 536, 541).

Modern Italy's chief export as affects the rest of the world has been Italians. Millions have moved to the United States, to Latin America, France, and Africa. They had to; she couldn't feed them all.

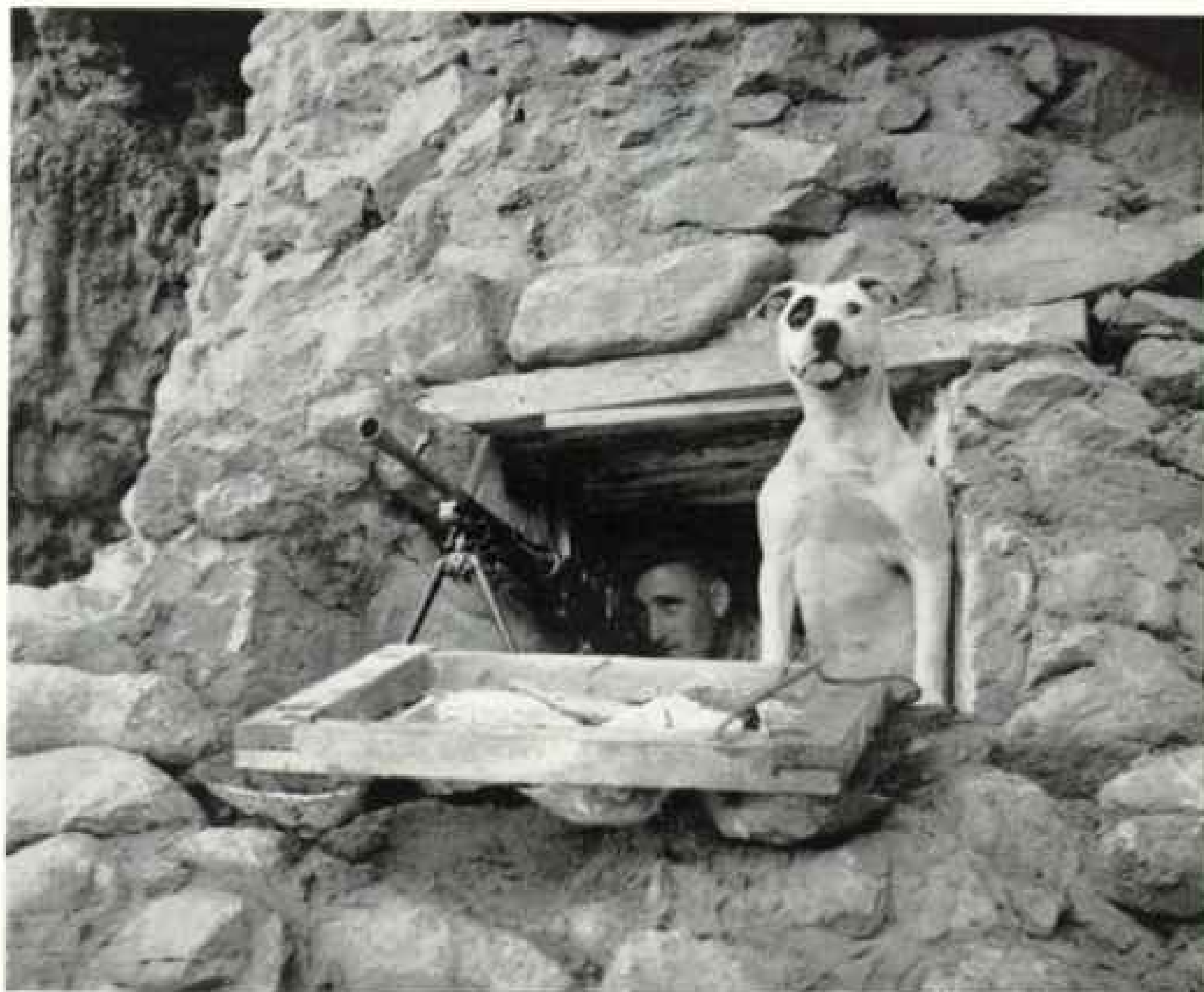
Italy has never produced quite enough food.

In World War I she would have starved but for huge imports of wheat from overseas. Now, with her ports blockaded, she can bring in only modest quantities of wheat by rail, as from Romania.

Today flour is mixed with corn and potatoes. All food, even nine months before Italy entered the war, was rigidly controlled. Now controls are stricter than ever.

Not only food, but clothing and coal are rationed. By agreement, Italy is supposed to get a million tons of coal a month from Germany. Since coal cars there are smaller than ours, this means about 60 or more 25-car railroad trains a day from Germany down into Italy. A tremendous movement, with armies also using the rails, so delivery is slackening.

No wonder persons escaping from Italy now say every house is cold; that it's illegal to



British Official

Patch-eyed, Like Pete of "Our Gang" Comedies, Grundy Is the Mascot of Gibraltar

He belongs to soldiers of Britain's famous Black Watch, who hold a strategic position on the Rock. When not barking at imaginary spies and landlubbers, he sleeps with one eye open behind the stone-covered door. When closed, it leaves its porthole completely camouflaged, looking like just another section of the stony hillside.

heat rooms hotter than 50° Fahrenheit, and that women wear long-legged underwear beneath their dinner gowns.

All Italian industry must import most of its raw materials. Now blockades halt these. Hence ever-rising prices, growing debt, threats of inflation.

Through the Suez Canal and past Gibraltar Britain ordinarily brings from 9 to 14 percent of all her imports (page 531).

For decades you've heard this sea route called the "life line" of the British sea trade.

But now it's cut, and still Britain's ships are running—albeit rerouted around the Cape of Good Hope. So, economically, the Mediterranean today means less to Britain. Politically, however, in this war it assumes tremendous importance.

Though Egypt remains neutral, Britain must protect her against German and Italian invasion. One big reason is that Egypt is

the door to British African possessions farther south. In Axis hands Egypt would be a strategic base for operations against Britain's rich Kenya colony, French Africa, the Belgian Congo, and also the Near East.

Based here, on the other hand, Britain can keep the Suez Canal open for naval and supply-ship use. She can defend Syria, Palestine, and the Iraq oil line to Haifa* and Tripoli, and better keep open air and sea lines to India, the Malayan waters, and Australia.

By building military bases in Eritrea, southeast of Suez, war can be waged from here against Axis drives into the Near East, either by way of Turkey or across the Black Sea or around its east coast.

Were the Axis to strike through Spain, Britain more than ever would need the eastern

* See "Bombs Over Bible Lands," NATIONAL GEOGRAPHIC MAGAZINE, AUGUST, 1941.



Christianity, Islam, Judaism, Civilization Itself, Grew up About the Mediterranean

Mediterranean as a field of operations. In this big sea she must stay at all costs.

To remain here, in safety, she seeks to hold the Strait of Gibraltar and to keep the Suez Canal open at least to her naval and supply ships.

Only 9 miles wide, this strait has been a crossing place between Africa and Europe since man first made boats. Hannibal crossed here. So did the Moors.

Ceuta, in Spanish Morocco, is a Spanish town. Near it is Tangier, a highly modernized port of 60,000 people, with dance halls, movies, tourist hotels, oil tanks, motorcar agencies, and billboards advertising beer and gasoline.

Gibraltar, once Spain's, dominates the north shore. This lion-shaped rock, honeycombed

with gun chambers, was taken from Spain by the British in 1704. Over and over it has been attacked—today with aerial bombers.

The great siege begun by French and Spaniards in 1779 lasted more than three years. Finally, using red-hot cannon shot, the British set fire to the enemy ships, though the Spanish batteries were oddly protected against these fiery balls with three layers of squared timber, within which ran a layer of wet sand and a line of cork. The British held their Rock.

Gibraltar has no trade importance. It produces nothing and must import all it uses. Physically, it's a grim, bulky thing steeped in myths and legends; with its Barbary apes, its odd African flora, its fevers, and remains of a Moorish castle, it seems no part of Europe.



Sprawling 2,300 Miles, Gibraltar to Palestine, the Big Sea Splits Europe from Africa

Strategically, however, along with the forts on Malta and at Aden, it has helped England keep the Mediterranean-Suez-Red Sea trade route open.*

Now vastly reinforced, its giant guns point both at Spain and across the channel to Africa. But today enemies, too, have bigger and better weapons. Advent of heavy aerial bombs, and enormous increase in the range of artillery, revive doubt as to the continued impregnability and strategic importance of Gibraltar. For years its guns sought to keep enemies from entering the Mediterranean from the Atlantic; but now these enemies sweep down from Europe and jump off from Italy, Sicily, and Greece, and fly to Africa—ignoring the Rock.

The Suez Canal is Britain's other Mediterranean gateway (page 543).

You've read how, in old times, camel caravans brought the treasures of Arabia and India—silk, myrrh, ivories, perfumes, pepper, and precious stones—to trade with those living around Mediterranean shores. It was that trade which led men to dig the Suez Canal. Two main desert routes brought this sea trade: one ran along the Red Sea to Egypt, the other from Mesopotamia to what is now Syria.†

Ezekiel, writing about 590 B. C., gave a graphic list of imported goods he saw in the

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Rock of Gibraltar," September, 1949; "Wanderers Awheel in Malta," August, 1940; and "Rock of Aden," December, 1935.

† See "Suez Canal: Short Cut to Empires," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, November, 1935.

markets at Tyre and told where each item came from. Except for the slaves he counted, today in Syrian and Palestine ports you see almost exactly the same staple merchandise the prophet listed so long ago—goods ranging from dyes, grain, and cloth to silver and livestock—plus sewing machines, radios, cameras, etc.

Tyre would be ruined, Ezekiel prophesied, and "fall into the sea." That may have been exactly what happened. Subsidence, some geologists say; anyway, I saw its beautiful old columns and building blocks lying offshore in many feet of clear sea water.

To move grain faster, with which to pay Arabs for oriental imports, Egypt even built a Suez canal 1,900 years before Christ.

About 1500 *B. C.* Queen Hatshepsut's fleet of five ships went to and from Punt through the Red Sea and the canal, laden with "fragrant woods of God's Country," and with live myrrh trees, ebony, ivory, gold, cinnamon, incense, eye cosmetics, natives, and their children. In fact, from 1900 *B. C.* to 767 *A. D.* seven different canals were dug—and then abandoned for various reasons.

Vasco da Gama put a crimp in the rich caravan trade when he found the sea road to India around the Cape of Good Hope.*

Closed Suez Canal Again Sends Ships Around Africa

War now closes the Mediterranean to most merchant ships. Again they take the Cape route. This includes many of our own, on long round-trip voyages carrying Lend-Lease supplies to the Red Sea, to India, the Netherlands Indies, and even to Iraq and Iran ports, for delivery to China, Russia, and elsewhere.

Some ships take road-making machinery, and even railway supplies, and crowds of American engineers and other technicians.

World travelers remember Suez town, at the Red Sea end of the Suez Canal, as a flat, hot, sleepy port on the edge of the desert, concerned only with clearing Canal steamers and handling cargo that normally flows by rail between here and lower Nile ports up to Cairo.

War makes Suez one of the busiest ports in the whole Middle East. Much freight that used to pass through the Strait of Gibraltar for Mediterranean ports now comes to Suez around the Cape of Good Hope. From here a few ships go on through the Suez to Port Said, Alexandria, and a very few venture up to Jaffa and Haifa. But most of them unload here at Suez.

*See "Pathfinder of the East," NATIONAL GEOGRAPHIC MAGAZINE, November, 1927.

Tanks, trucks, guns, munitions, timber for barracks, army and hospital supplies pour in here from scores of British and American ships. From America even tugs have been sent here to expedite the movement of ships at the port. Incredible tons of freight pile up on inadequate docks. Much of it is scattered out on the ground, awaiting removal. Big empty pine boxes, in which American automobiles arrived, are used as huts for Arab stevedores.

Dunes Provide Bomb Shelter

Delay is inevitable because of lack of port facilities. Air raids slow down work; some ships have been hit and hurt, or sunk. One American skipper reports that when bombs fell the natives quit handling cargo, ran ashore and hid in the desert sand dunes, and didn't show up again for days.

All ships entering the Red Sea must check in first with the British Navy at Aden, then with U. S. Maritime Commission agents at Suez. Printed instructions are handed to the skipper of every ship reaching an Egyptian port, telling him what to do in case of air attack, or fire aboard ship. Practically all of these merchant ships are now armed, many with anti-aircraft guns as well as guns to be used against submarines and surface raiders.

In peacetime more than 6,000 ships a year passed through the Suez Canal; about 60 per cent of the total tonnage was British.

Up to 1939, England, the Netherlands, Germany, France, the Scandinavian countries, all had freight and passenger boats running through the Suez Canal, trading with India, Australia, and the Far East. Italy (the second largest user), too, and Greece and Spain traded with the Orient and with the Americas. Marseille, on France's south coast, was one of the world's busiest seaports (opposite page).

Russian craft from Black Sea ports sailed in and out through the Dardanelles. Various United States lines enjoyed busy traffic here. From New York to Haifa, via way ports, plied the passenger and cargo boats of the American Export Lines. On through the Canal, to ports as far away as Basra in Iraq, went the ships of the Isthmian Steamship Company, owned by the U. S. Steel Corporation. Now they go around the Cape.

Except for warships and convoyed transports, about all the boats left on this big Mediterranean Sea are those of fishermen, who still venture out, as starving people must. Between ports on the Adriatic, the Black, and the Aegean Seas a few coastal traders still take a chance—also only because the people get hungrier and hungrier. But, commercially, war makes the Mediterranean now a dead sea.

French planes from Marseille shuttle back and forth to French possessions in Africa, and between Egypt and South Africa some British empire routes are still open. But no longer do the big flying boats of the British Overseas Airways, that once long line, tie the Mediterranean with London on one end and Australia on the other. War interrupted that.

Egypt has an air link with the Americas through Pan American Airways, which plies between Brazil and Africa and through connecting lines reaches Cairo. There it meets British planes that still fly to India and beyond.

France in the Mediterranean

France's first great Mediterranean adventure failed. That was under the Corsican Napoleon. With the first French army to sail from these southern shores since the Crusades, he invaded Egypt successfully; but his fleet lost the Battle of the Nile and when he got up into Syria the British beat him.

Later, along with Italy and England, France came to wield much influence, and to acquire possessions in Africa. These include Algeria, Tunisia, and Morocco, which face the Mediterranean. Hordes of French, mostly farmers and small tradesmen, have migrated here. Algeria alone shelters nearly a million Europeans, of whom some 850,000 are French.

From Africa, because of her own low birth-rate, peacetime France drew heavily for soldiers. The fezzes, gaudy uniforms, and shiny black faces of her Moroccan fighters were long a familiar sight about Paris and Marseille. She got recruits, too, from as far away as Senegal, French Guinea, and the Ivory Coast.

Marseille was the busiest airport on this



Van Beun-Atzelle

Bologna-shaped Sausages Figure in Festivals in the Balearics

At this slaughter feast on Iviza Island a fat pig is slain and pork sausage offered for the refreshment of departed souls. This mourner hangs his offering on the outside walls of a church before entering to pray.

sea. Besides French planes, those of many other nations frequented the port. Through here came the great flying boats of Imperial Airways, Ltd. (now British Overseas Airways), plying between London and South Africa, India, and Australia. French planes shot away southwest for Spain, east for Italy, for distant Indo-China, south to airports in French African lands, and even via Dakar to South America (page 539).

In the Suez Canal Company the British Government owns nearly half the stock, but French civilian staffs still administer its affairs—under the eagle eye now of British Army and Navy officers.

For years French bankers, engineers, teachers, and missionaries also exerted profound



British Official

American Planes and Tanks Prepare for Action on the Libian Desert

Here 15 Glenn Martin "Maryland" bombers and a fleet of American light tanks move over the African desert, as the British Army makes ready to strike at German and Italian forces. How swiftly mechanical monsters have multiplied man's fighting power since he fought afoot and hauled his guns with horses!



BRITISH OFFICIAL

British Soldiers, Aware of the Typhus Peril, Use Plenty of Soap and Hot Water

Filth breeds lice and lice spread the typhus germ, now reported in central Europe. Here tommyes pass from an undressing tent into the bath. This portable unit "somewhere in North Africa" accommodates sixty men an hour. Placed near a stream, it can be operating in 30 minutes with filtered, heated water.

influence in Syria and adjacent regions, even long before France was given the mandate over Syria. Beirut, with its French college, is still almost a French town; Damascus and Aleppo have Parisianlike cafes, shops, and newsstands.

At Tripoli in Syria and at Haifa in Palestine (page 547), French tankers, in peacetime, loaded much of the oil which France used; it flowed there through pipe lines from the Iraq fields. Her fleet was based at Toulon, on the Provence coast east of Marseille, and her officers mingled with American and English visitors at the resort hotels of near-by Cannes and Nice. Part of the fleet, too, would be seen at Casablanca, on the Moroccan west coast, and at Oran, Algeria, where British ships attacked it in July, 1940.

But this picture is all changed, and still changing.

Here now six nations own strategic islands—at least they *hold* them as this is written.

Britain has Malta and Cyprus. France has Corsica; Spain, the Balearics, a naval and air base; Italy owns Sardinia, Rhodes, the Italian Islands of the Aegean, Pantelleria, and Sicily, but shares them now with Germany. Greece owns a flock, including Crete and Corfu, now occupied by the Axis. Turkey owns Imbros

and Tenedos, at the mouth of the Dardanelles, and has fortified them.

Malta, Britain's heavily fortified islet, is only 60 miles south of Axis air bases on Sicily. Each island regularly bombs the other (page 536).

Halfway between Gibraltar and Suez this stronghold of Malta lies in the ship channel between Sicily and Africa. Like dogs fighting over a bone, first one Mediterranean power then another has snatched at this island, from Phoenicians, Carthaginians, Romans and Greeks, to Arabs, Normans, and Aragonese.

Napoleon seized Malta from the Knights of St. John in 1798. Then the Maltese revolted, and Britain annexed the island in 1814. Though only a barren, sunburnt rock of 95 square miles, Malta has been a useful British springboard in this war, and helps defend Alexandria. It has a colonial governor, is headquarters of the British Mediterranean fleet, and its base for fuel and repairs. No other place in the world has undergone so many air raids as has Malta during this war, and Malta planes have paid the Axis back in assaults from here against Axis-held Crete, Sicily, Naples, and other enemy ports.

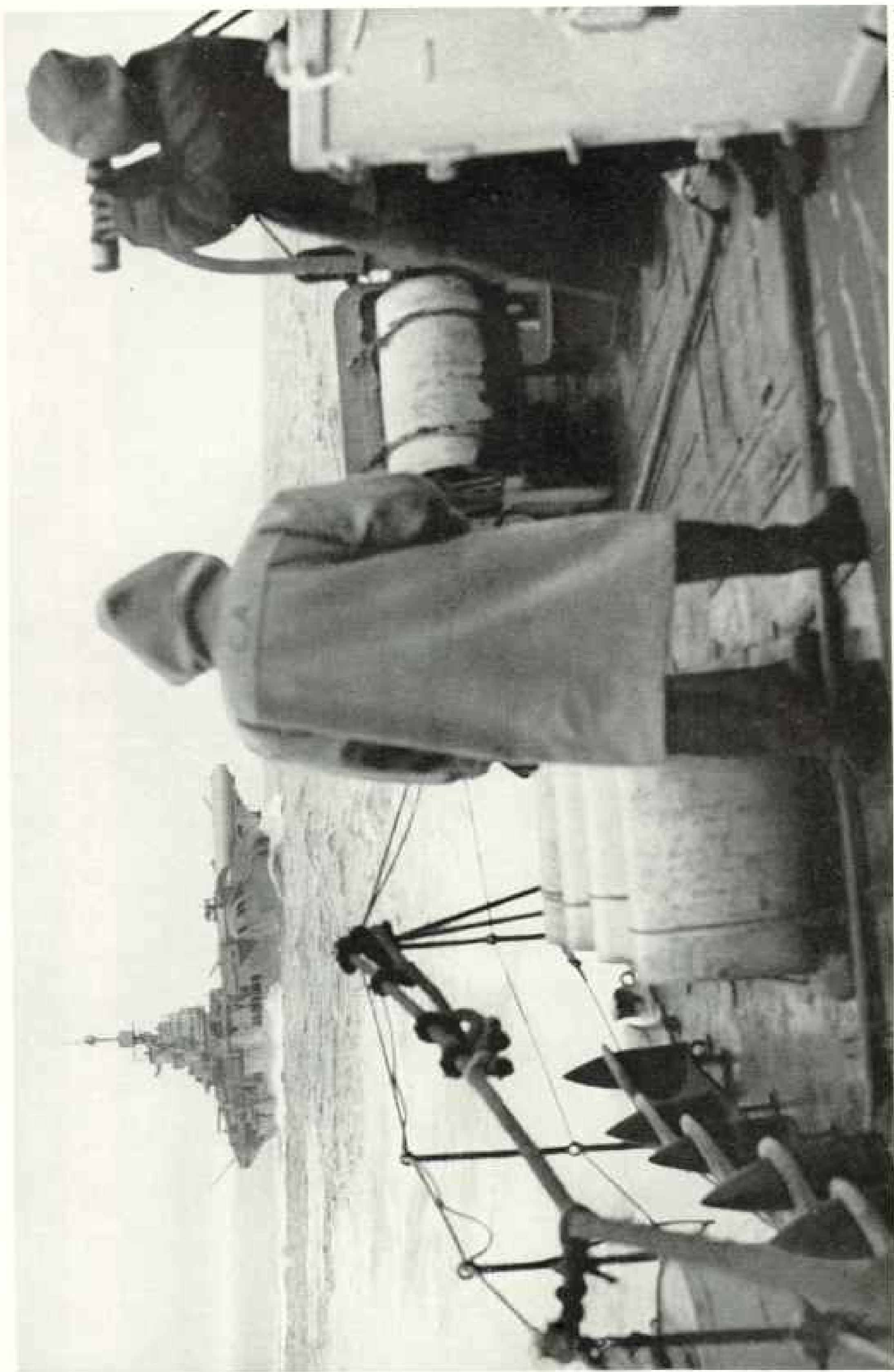
Cyprus is Britain's other chief fortified Mediterranean island (page 545). It lies 160 miles northwest of Haifa, Palestine.



© Mrs. Williams from Pix

The Veteran British Battleship *Queen Elizabeth* Rests at Malta After Maneuvers in the Mediterranean

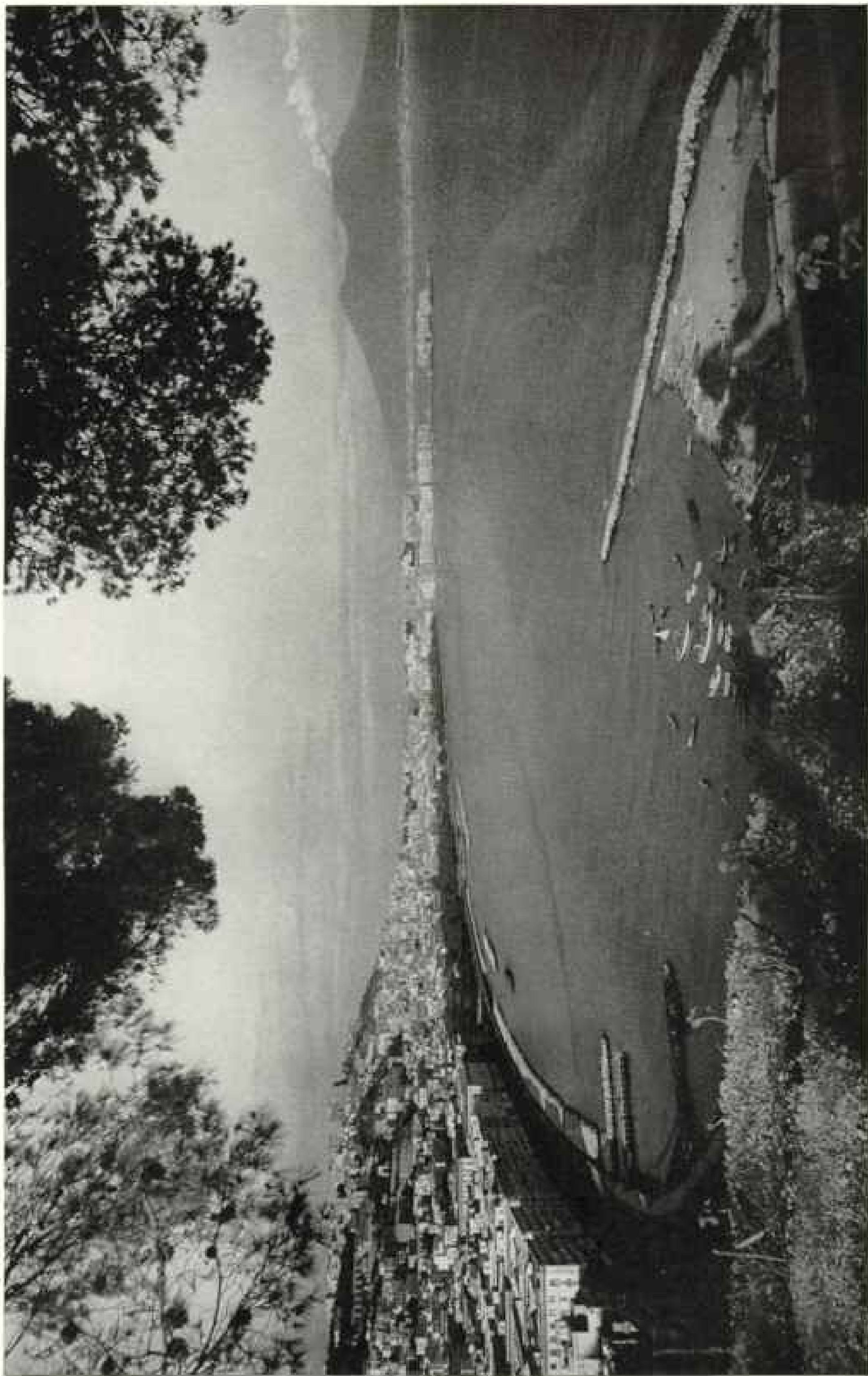
More than 2,000 times in this World War the Maltese have scurried for tunnel shelters during air raids and alarms. Bombers usually come from Italy or bases on the island of Sicily, 60 miles to the north (page 535). This fortress is important to the British because it protects the sea lanes between Gibraltar and the Suez Canal, and is a strategic defense point for the naval base at Alexandria.



British Destroyer

Sailors on a British Destroyer Take a Look at the Famous Aircraft Carrier *Victorious*

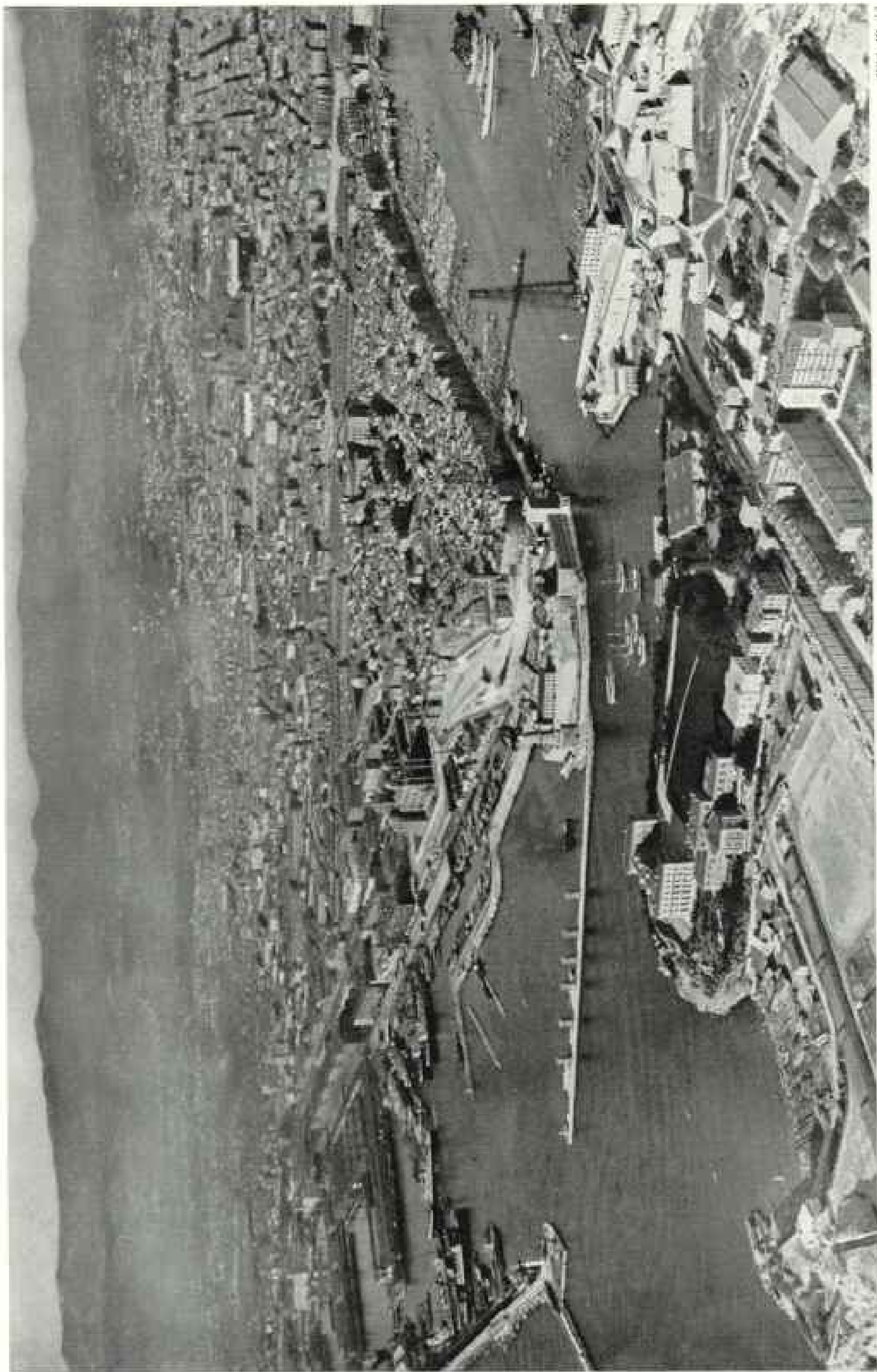
Ploughing through the wintry seas, the escorting destroyer stands ready to drop "ash cans," or depth charges, over any unheeded pig boat that may try to sneak up and sink the carrier. At left are shells hoisted in place, ready for instant use in the destroyer's stern gun.



Look from East

All the World Agrees There's No More Soul-stirring Eye-ful Than the Bay of Naples at Sunrise

Smoke plumes from Vesuvius. At its base, like stage settings in an Italian opera, are the villages of San Giovanni and Resina. Near by are the famous ruins of Herculaneum and Pompeii. Castel dell'Ovo, with its cafes and mandolin players, stands on the point of land (right center). On the far side of it lie the naval base and harbor docks, frequently bombed by the British. Curving to the left is Naples' symmetrical water front.



Through Marseille, on Her Mediterranean Coast, France in Normal Times Trades with the World by Sea and Air

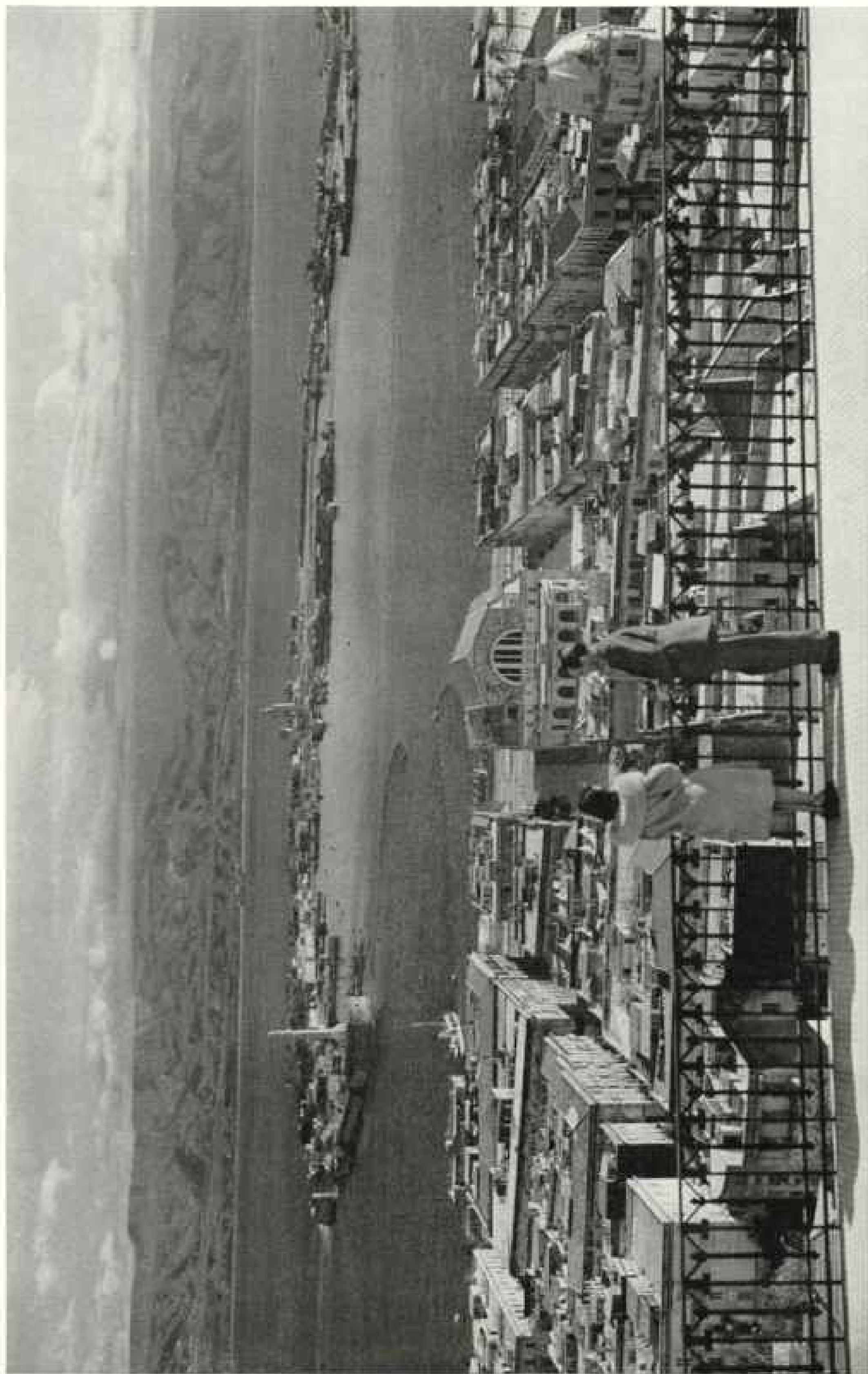
At the right is the old port, along whose shores ancient Phocæan, Greek, and Roman ships once moored. Long since outmoded by steam navigation, it has given way to miles of docking space stretching to the left behind protective sea walls. Near the center is Fort Saint-Jean, and beside it the Transporter Bridge. On the promontory in the foreground stands the School of Medicine and Pharmacy, once a chateau belonging to Empress Eugénie, wife of Napoleon III (page 133).



Polyglot Algiers Was Once a Lair of the Barbary Pirates

This busy, modern-looking city of more than a million people is the capital of France's African possession of Algeria. A landmark is the old Phare, or lighthouse, on the breakwater (left), relic of a Turkish fort erected in 1544.

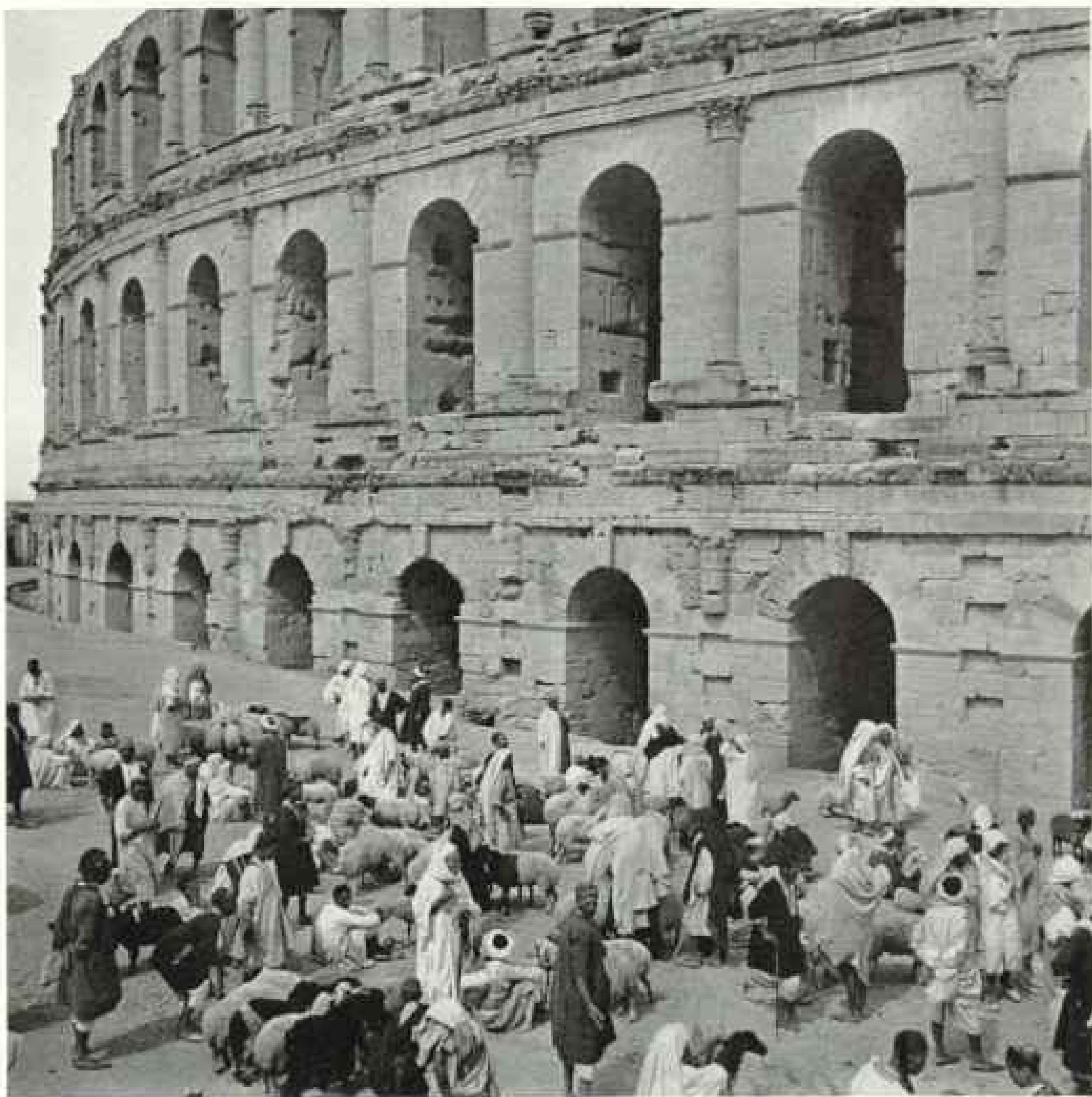
© H. Mitchell



Harold G. Wright

Greeks, Romans, and Crusaders Brought Their Ships Safely into the Smug Harbor of Messina in Ancient Days

Now Sicily serves as base for modern armies and air fleets. Lying less than 90 miles from Malta and Tunisia, the Italian-owned island affords a convenient jumping-off place from which German planes can attack the British and defend their own convoys bound for Africa. Mainland Italy is in the background, across the Strait of Messina. This ancient city was completely rebuilt after the earthquake of 1908, in which 84,000 lives were lost (page 528).



Plaza Yerani © U. Ankers & Co.

Arab Sheep Dealers Wrangle in the Shade of North Africa's Finest Roman Monument

This squalid Arab village of El Djem was once the proud city of Thysdrus, confluence of six ancient caravan roads. Its amphitheater is 163 by 133 yards in size, second only to the Colosseum in Rome. Today the town is only a tumble-down native hamlet, halfway between Sousse and Sfax, inland from the Mediterranean in France's African protectorate of Tunisia.

Turkey ruled it for more than three centuries; Britain annexed it during World War I, and now, like Malta, it is a crown colony, with defense works, airfields, and bombers. It, too, is being often attacked by Italians and Germans.

Russia, Turkey, and the Dardanelles

As so often, threats and rivalry over the Dardanelles again make war news.

This narrow strait, with the tiny Marmara Sea and the Bosphorus, forms the 185-mile waterway between the Mediterranean and the Black Sea. It is the only outlet

to warm salt water for Russia's important Black Sea ports of Odessa and Batumi.

To diplomats and war planners, it is as big a headache as the Suez Canal or Gibraltar. Because of its strategic location and geographic features, this strait has long made international friction.

Free use of it Russia's merchant ships simply must have; and, were it closed to her Navy, her Black Sea fleet would remain bottled up.

Russia has used this strait since 700 years before Christ to ship out Crimean wheat, Caucasus timber, and hides from the steppes. In modern times she has also used it to bring



© Per from Glider

What a Bold, Straight Line the Suez Canal Cuts Across the Sands of the Desert!

Connecting the Mediterranean with the Red Sea and the Indian Ocean, this canal in normal times forms part of the sea route from Britain to India, the Far East, and Australia. Now merchant ships sail south around the Cape of Good Hope (page 531). Despite many bombings, British defenders have kept the Canal open for warships and for a few vessels carrying supplies to Port Said and eastern Mediterranean ports.



Star Photographer Maynard Owen Williams

Lightning Warfare Ravaged This Candia Water Front When Axis Powers Besieged Crete

Many parachutists landed, or were shot down here on May 21 and 22, 1941. German planes now base on the island for assaults on Alexandria and Malta. In the background looms the historic Venetian fort, once long besieged by Turks. Wineskins are piled in the carts.

out various minerals, including petroleum products from Batumi, tied by pipe line with Baku oil fields on the Caspian.

More than once, even in ancient times, Crimean wheat saved Greece from starvation. On this Euxine, or Black Sea, in old days, Greece built trading cities as big and prosperous as modern Odessa. Another one, Theodosia (now Feodosiya) still survives and is figuring in the war news from the Crimea.

Cotton from Egypt, wines, cheese, Valencia oranges, raisins, dried fruits, and many other things go to Russia via this strait in normal times.

How unexpected, when you study them, are some map aspects of this eastern Mediterranean region. In the depths of winter, for example, you might start skating down the Don or the Dnieper from the frozen plains of Russia, or down the Danube from Germany's snow-clad Black Forest.

When you came to open water, you could

take a small sailboat and go on and on—through the Black Sea, the Dardanelles, down the coasts of the Aegean and the eastern Mediterranean to Port Said; then up and up and up the Nile, making a portage here and there, but finally reaching the heart of hot, tropical Africa.

But back to the Dardanelles. It cuts through that narrow neck of land that links southeast Europe with Asiatic Turkey. From Paris, in peacetime, that fast but stuffy, overcrowded Orient Express train rushes across Europe and over the north side of the strait to Istanbul, once capital of the old Ottoman Empire.

Ferried across the Bosphorus here, passengers may entrain again, on the famous Baghdad Railway, for Ankara, Aleppo, Mosul—even for faraway Basra, Iraq's busy oil port on the Persian Gulf.

Hellespont was the old Greeks' name for the Dardanelles, swum by Leander and Lord



© W. H. G. Peppercorne

Ancient Isle of Cyprus, So Often Fought for, Broods again in the Path of War

Though Cyprus has not suffered greatly from war's direct impact, as have Britain's other Mediterranean possessions of Malta and Gibraltar, its vulnerable position has put it on a wartime basis. Cyprus is the third largest Mediterranean island and has a population of 376,529. Boat harbor of Kyrenia lies below.

Byron, and since then by college boys and girls. Since time immemorial, nations have fought about whose warships might use this strategic strait.

German plans for invading the Near East include study of a route across the Dardanelles, or across the Black Sea or around its east coast. Hence the assault on Russia's naval base at Sevastopol, on the Crimean Peninsula.

Turkey owns both sides of the Dardanelles, and has fortified them. The strait is difficult to force; remember Gallipoli, in World War I. But treaty after treaty, designed to control the movements of ships through the strait, has been made, revised, and broken. Under the Convention of Montreux, in force as this is written, Turkey has the right to close the strait to warships, should she feel herself in danger. But could she? No wonder war planners of rival powers again glue their eyes on the strategic Dardanelles. This way Germany could come, against Suez, Iraq, India,

America, too, has Mediterranean business interests. We eat, drink, smoke, wear, and otherwise use many things from this diversified region when fighting permits.

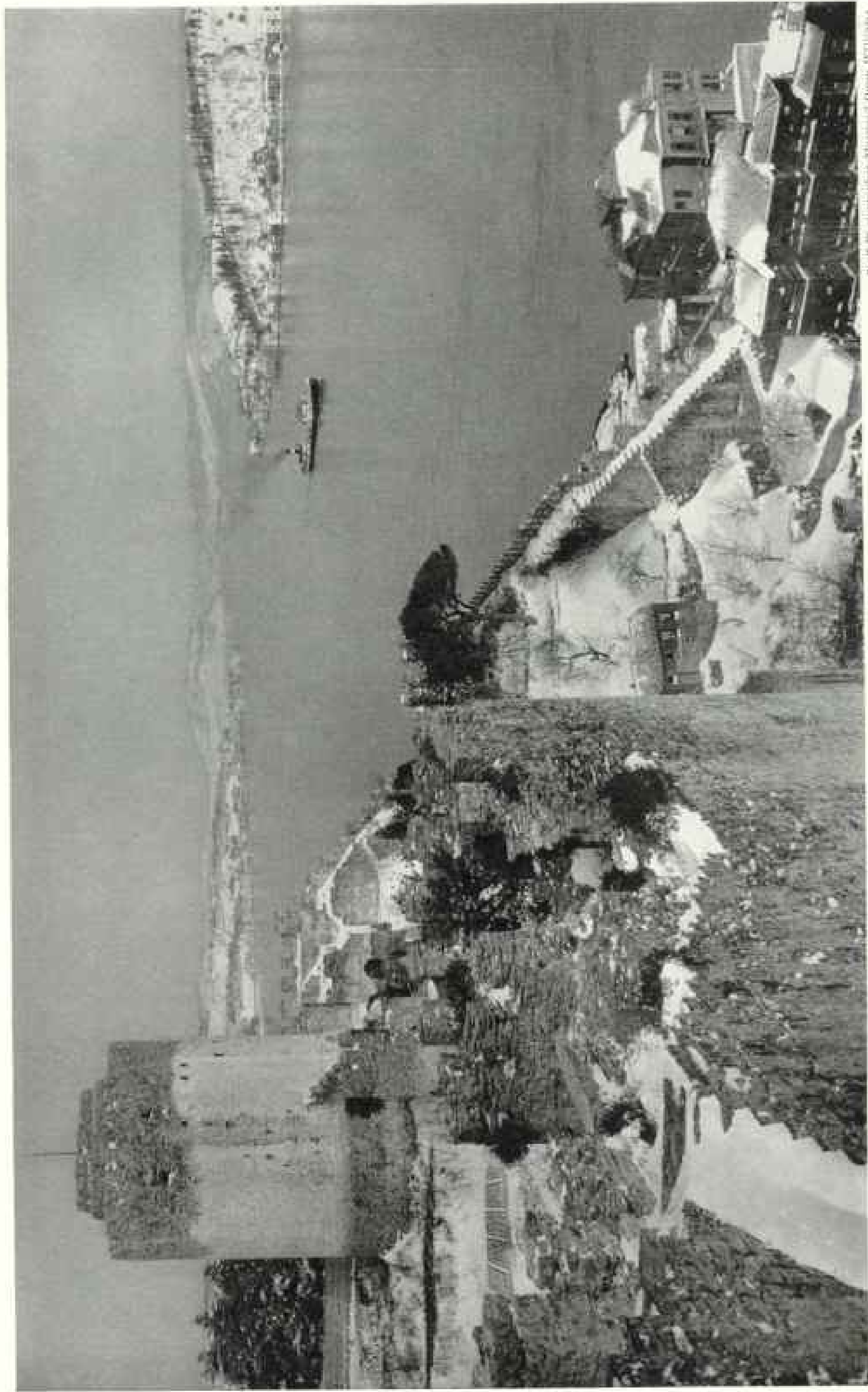
From Greece and Turkey come 90 percent of our leaf tobacco imports, for pipe and cigarette.

Nuts, Opium, and Linoleum

Olive oil, figs, filberts, pistachio nuts, currants, cheese, and Egyptian long-staple cotton all come from here.

So does some macaroni, spaghetti, Chianti and other wines. Though only seven percent of our imports reach us from the Mediterranean, many are most important in our national economy because we can't get enough of them anywhere else. This is particularly true of crude opium, quicksilver, gum arabic, chromite, and cork and cork waste (used in making linoleum).

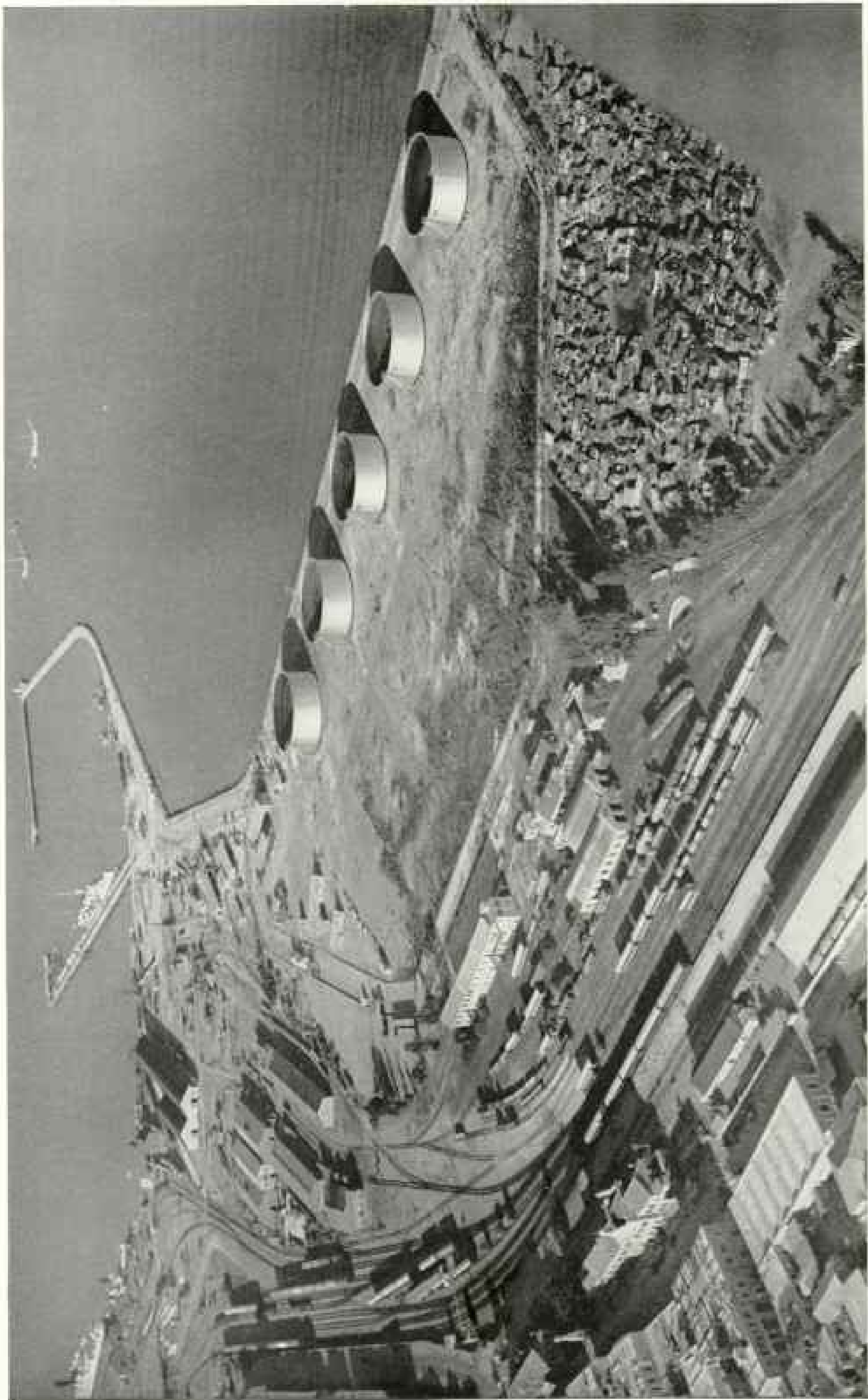
Other things from here which help fill our



Staff Photographer Maxime Dupeyron

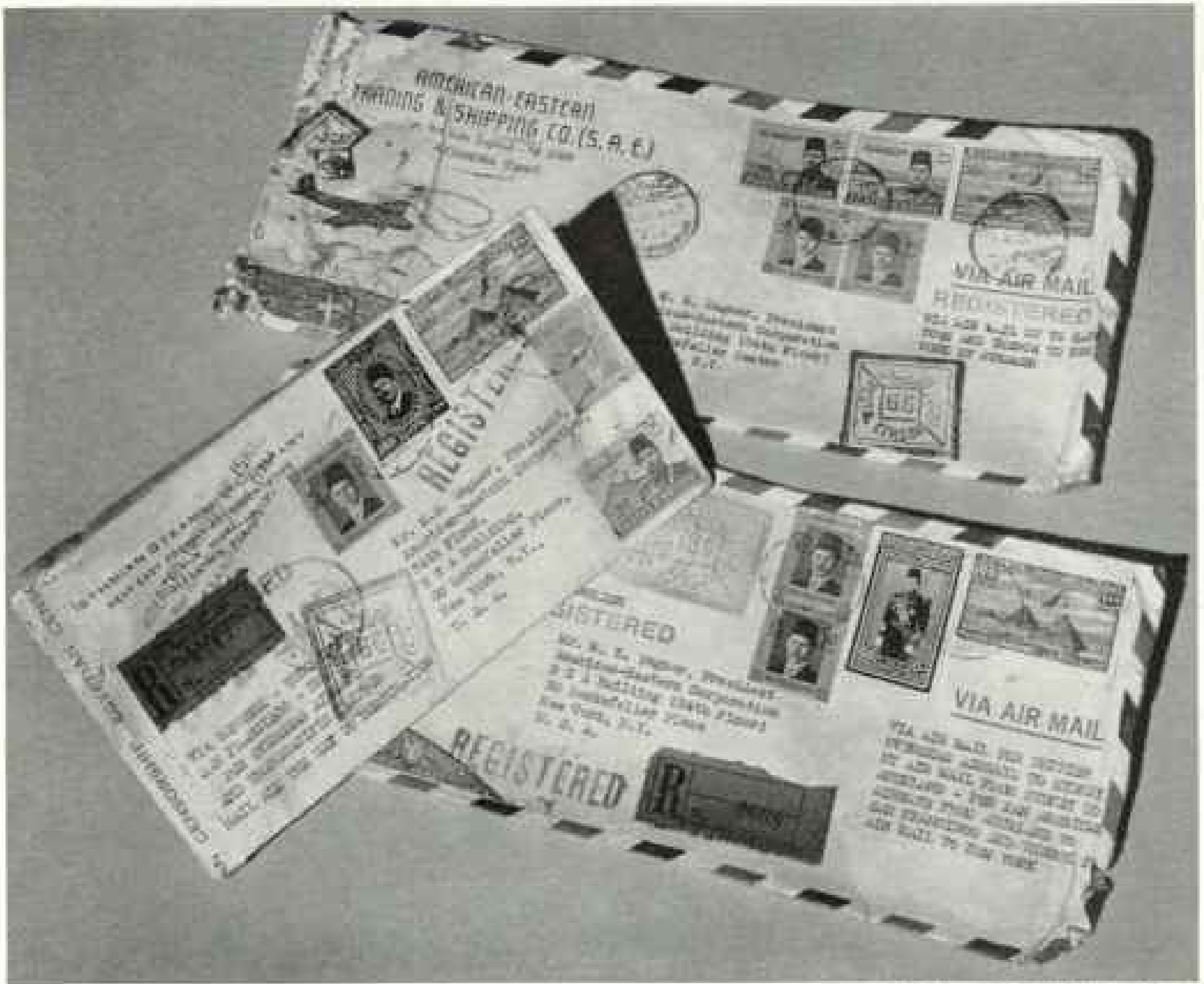
Fighting Men and Horses for Centuries Swam and Swarmed on Boat Bridges Across the Bosphorus Between Europe and Asia

Darius, Xenophon, the Ottoman warriors, and herds of other invaders have stormed over these restless waters just as Axis soldiers seek to do in 1942's war in the Middle East. These towers and walls of Rumeli Hisar were built by Mohammed II in 1457, after which he took Constantinople (now Istanbul), the capital of the Roman Empire in the East. One big gun, hauled by 50 oxen, was used by the Turks to fire giant solid shot at ships in the strait. The Bosphorus, with the Sea of Marmara and the Dardanelles, separates Asiatic Turkey from European Turkey, shown at the left (page 542).



Along Palestine's Ancient Coast, as Here at Haifa, Trade Normally Flourishes as in the Boom Days of the Merchants of Tyre

The historic Phoenician traders of near-by Tyre founded Mediterranean sea traffic and imported tin for distribution to every part of their little world for making bronze. Some of it may have come from beyond the Pillars of Hercules (Strait of Gibraltar). To big, busy Haifa comes oil by pipe line from Iraq. Axis planes have bombed it in the present war. Long strings of warehouses parallel the railway spurs on which stand trains of round-roofed cars (page 535).



Staff Photographer Willard S. Colver

What a Roundabout Route This Air Mail Took from Egypt to New York!

Mailed by the Isthmian Steamship Company in Alexandria, it took \$2.54 worth of Egyptian stamps to carry the letter at lower right to the 54th floor, RCA Building, New York City.

needs are valonia (used as tanning material), argols, tartar and wine lees, washed wool, mohair, licorice root, hops, pyrethrum flowers for making insecticides, and goatskins. For these and other items, in a busy year, we may pay around \$150,000,000.

That outlay is about balanced by what we sell. Italy, before the war, was a heavy buyer of raw cotton, oil, iron and steel scrap. We sent her machinery, too, and many chemicals.

Motorcars and parts, airplanes, sewing machines, lumber, chemicals, motion pictures, photographic goods, office supplies, apples, pears, even canned sardines, are all among the things we sell there when we can.

Today food is scarce in all Mediterranean lands.

Even in normal times, few lands fronting this big sea produce food enough to satisfy their hunger. That is why, from earliest times, Greece and Rome sent colonists to more fer-

tile regions, to grow grain and meat-bearing animals. That is why, in ancient days, Egypt could build up such a big sea-borne export grain trade. Heavy millet trade still flourishes along the Nile, and Syria is also a big wheat producer.

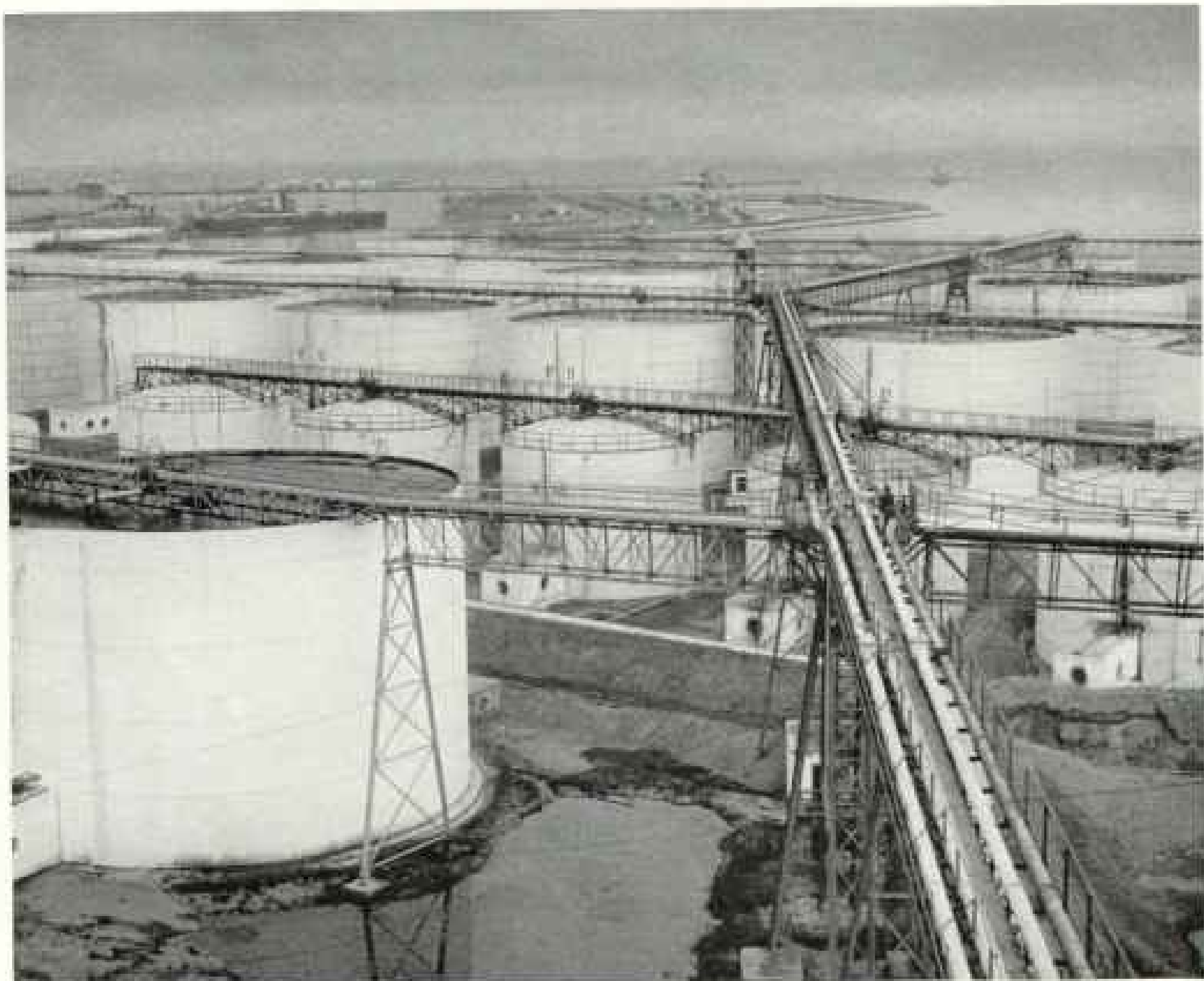
Ideas Have Been Our Most Valuable Mediterranean Import

But our most valuable "imports" from this big sea have been invisible gifts of the spirit. What sublime cultural debts we owe to civilizations that developed here!

Our whole sense of free scientific inquiry we drew from here. From Greek origins stemmed our knowledge of mathematics, medicine, politics, history, grammar, geography, zoology, philosophy, and psychology.

Greek sculpture is unsurpassed; in every art school in our land pupils copy its classic statuary.

Look at architecture. Even our modern pri-

John de Haas from *Three Views*

Through This Pipe Line Oil Flows from Romania to the Black Sea Port of Constanta

Ice-free even when the Danube is frozen over, Constanta in Dobruja provides a winter outlet for Romanian oil. Ownership of Dobruja has long been in controversy between Romania and Bulgaria. In September, 1940, Axis pressure forced Romania to cede most of this province to her Bulgarian neighbor, but she still holds Constanta.

vate homes, in the real estate man's latest subdivisions, still reflect Greek influence. The British Museum looks like the Parthenon at Athens. From Pretoria, South Africa, to Washington, D. C., public buildings copy Greek styles.

Our colleges build Greek theaters and stage Greek plays. Aristotle gave us the rules for writing dramas. Greek language and literature are a part of our education. Greek is the language of the New Testament. Look at the Greek words in everyday use: ecstasy, enthusiasm, graphic, alphabet, school, theology, athlete, olympic.

We revived Greece's old Olympic Games, and in many an American physician's office hangs a copy of the code of ethics for doctors written by Hippocrates.

What student has not sweated over Euclid's geometry?

Rome took much learning from Greece, who

borrowed some of hers from Egypt and Babylon. But look what we owe to Rome.

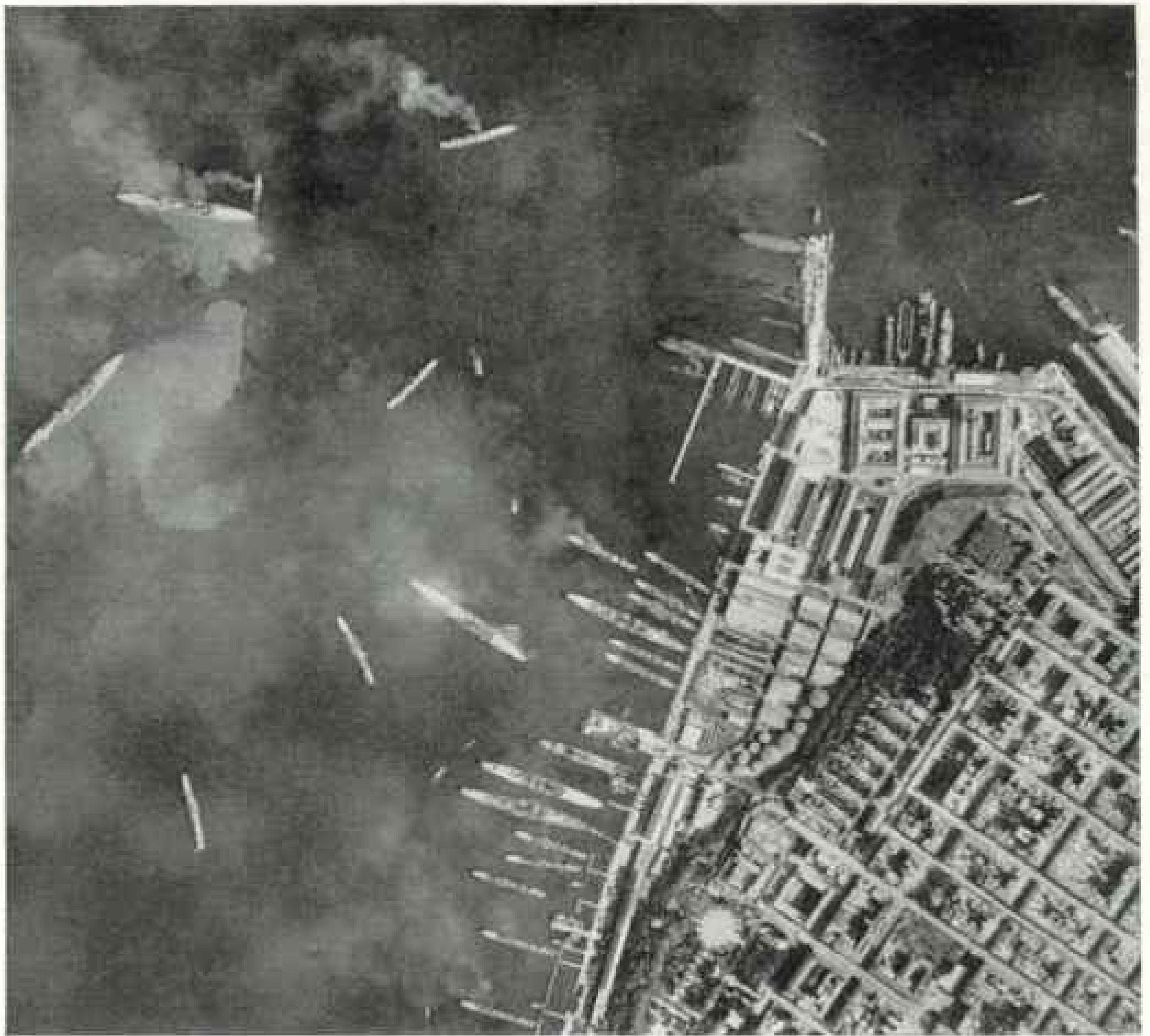
Modern hospitals, with their wards, private rooms, and corridors trace back to old Roman army hospitals. Excavations prove this.

Language Debt to Classic Rome

Half the nations of the civilized world today use the Romance languages—Italian, Spanish, Portuguese, and French. All these stem from Latin, a peasant dialect originally spoken in Latium, embracing part of what is now modern Italy.

Romance languages have been called our most direct and continuous heritage from these old lands. Forms of our poetry, epic, lyric, and dramatic, we owe to Rome. What high-school class orator, what stump-speaking politician, but tries to imitate Cicero?

Our Senate is much like Rome's was. Much of our law stems from Roman sources.



British Official

As at Pearl Harbor, Aircraft Carriers Struck Taranto, an Italian Naval Base

On the night of November 11, 1940, British aircraft carriers, the new *Illustrious* (sister ship of the *Victorious*, page 537), and the older *Eagle*, steamed within range of this snug harbor and launched torpedo planes, which sank or damaged three battleships, several cruisers, and auxiliary craft. Some days later, reconnaissance planes made this picture of the inner harbor, showing the naval dockyard on the north side of the city. Two damaged cruisers, upper left, are heeled over; surrounding water is discolored by fuel oil. Submarines, destroyers, cruisers, and auxiliaries are moored to the docks, some of the ships evidently hit.

By colonization from the Mediterranean, the Spanish and Portuguese languages now cover Latin America.

Every telephone or city directory, from Arizona and New Mexico to Patagonia, is full of family names similar to those current now in Spain, Portugal, and Italy. Place names from these old lands are given to hundreds of cities and towns in the Western Hemisphere.

Our highway system follows the pattern of Roman military roads. Rome had milestones, like our road markers; to this day we copy her viaducts and arched bridges. The new Memorial Bridge across the Potomac at Washington, D. C., looks much like the old

Roman bridge still standing at Mérida in Spain.

But it's not what used to happen in the big sea; it's what's happening there now, and what else *may* happen, that forces America to share in this Mediterranean conflict.

Decisive battles fought here could profoundly affect our destiny.

A century and a half ago Congress was voting big sums to buy off the Barbary pirates with annual ransoms.

Now it votes colossal sums to buy planes, tanks, and guns, and to send fighting men and ships to help England stop modern vandals who pillage, burn, and slay along these same historic shores, bringing savagery back to where civilization started.

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded, fifty-four years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,995 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 4,028 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.

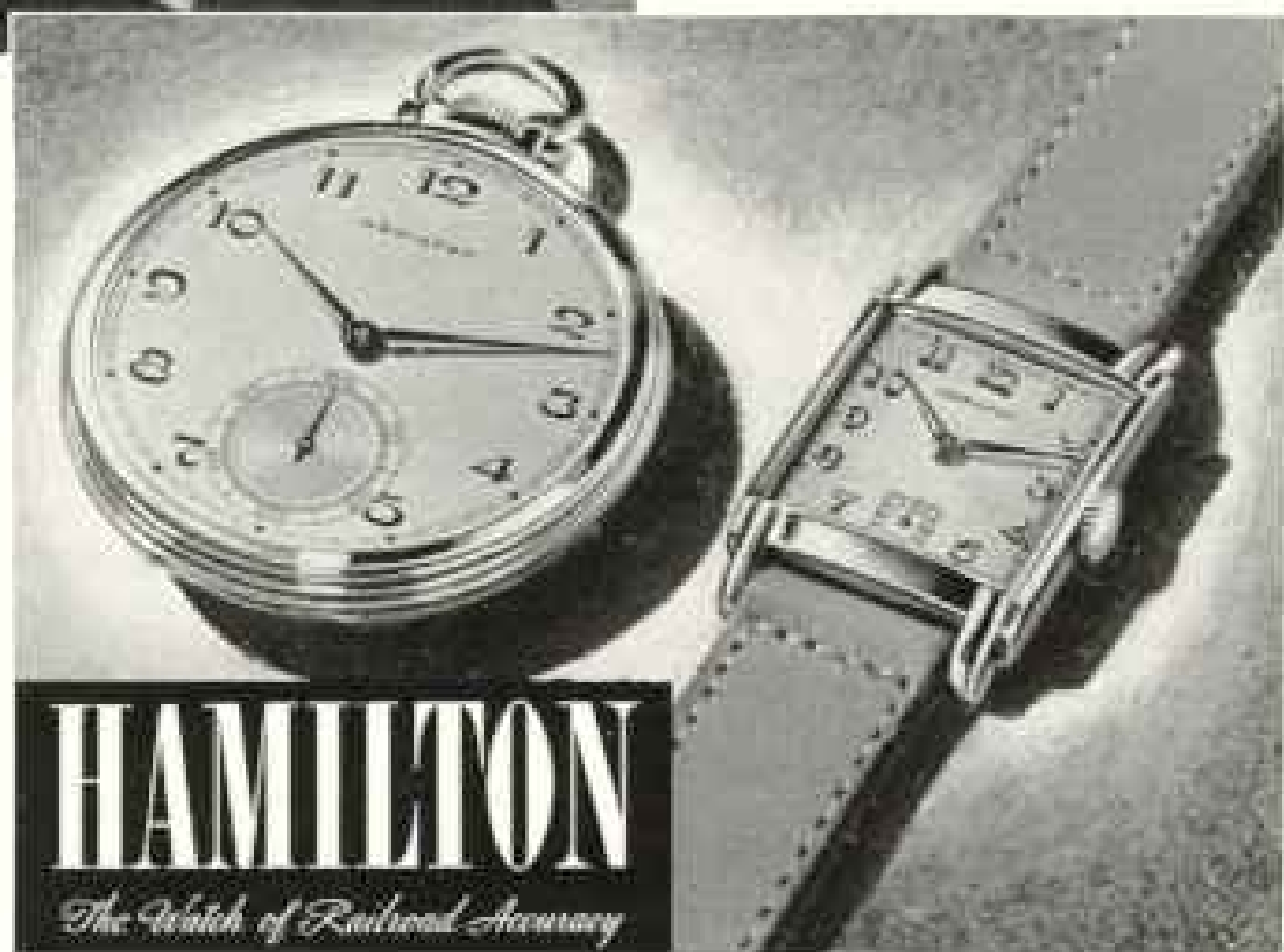
AMERICA MARCHES FORWARD ON TIME!

GUNS SHOOT BETWEEN the whirling propeller blades on America's fighter planes, mighty shadows of destruction. Realize that those blades roar around as fast as 3500 times a minute—and try to imagine the unbelievable precision required to fire between the blades. Hamilton is proud of the part its instruments play in this precision operation.



"UNIDENTIFIED PLANE at 7:27," notes Bill Todd, air-raid spotter, in his logbook. Hour after hour today, all over America, on quiet hillsides, deserted roof tops, gallant men and women are scanning the skies for your safety. As Bill Todd phones the nearest interceptor command, the Hamilton on his wrist becomes a vital cog in the wheel of American defense.

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TO DO THE MOST FOR YOUR BENEFICIARY



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4. It may be left with the company at interest, payable to your beneficiary each year. Withdrawal of principal may be arranged as desired.

Here are 3 things to remember when you plan a method of settlement: (1) Arrange the plan you would want if you should die tomorrow, considering Social Security or other income. (2) Keep it in line with your changing circumstances by reviewing it periodically with your agent. (3) Leave enough in cash to pay last expenses.



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Case No. 1—Edward Cooke . . . a young married man with \$3,000 of insurance. Until Mr. Cooke can afford more life insurance, the important thing he wants his present policies to do if he should die is tide his wife over until she can find a job.

So he has arranged his life insurance like this: \$500 would be paid Mrs. Cooke right away to take care of final expenses and unpaid bills. The remaining \$2,500 would be paid as an income of \$100 a month for 25 months, plus interest.

Case No. 2—Arthur Keenan . . . married and father of a ten-year-old boy. Mr. Keenan has \$40,000 life insurance. From time to time, he discusses the beneficiary arrangements in his policies with his agent—to make sure they are up to date.

His latest arrangement is as follows: At his death his wife will receive \$2,000 immediately to cover final expenses, unpaid

bills, and incidentals. She will also receive \$150 every month until her son reaches the age of 18. For the next four years, she will get \$250 a month, the extra \$100 a month being for her son's college education. Then, the balance of Mr. Keenan's insurance money will be paid to his wife as an income of approximately \$100 every month for the rest of her life.

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FIRST TIME! Zenith Famous Radiorgan Tone Device on a portable radio.

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This advertisement was prepared in February under the then existing war conditions in Canada.



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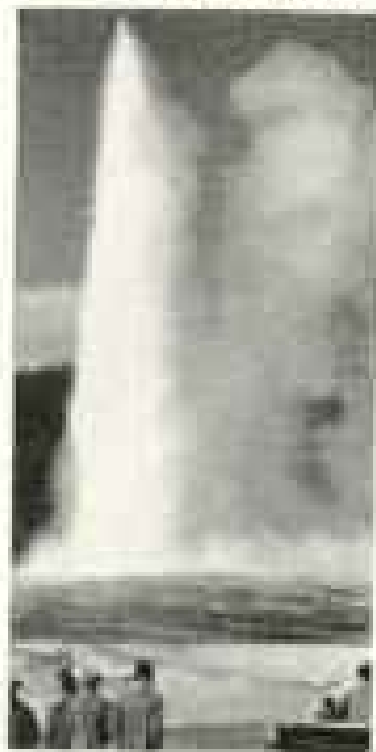
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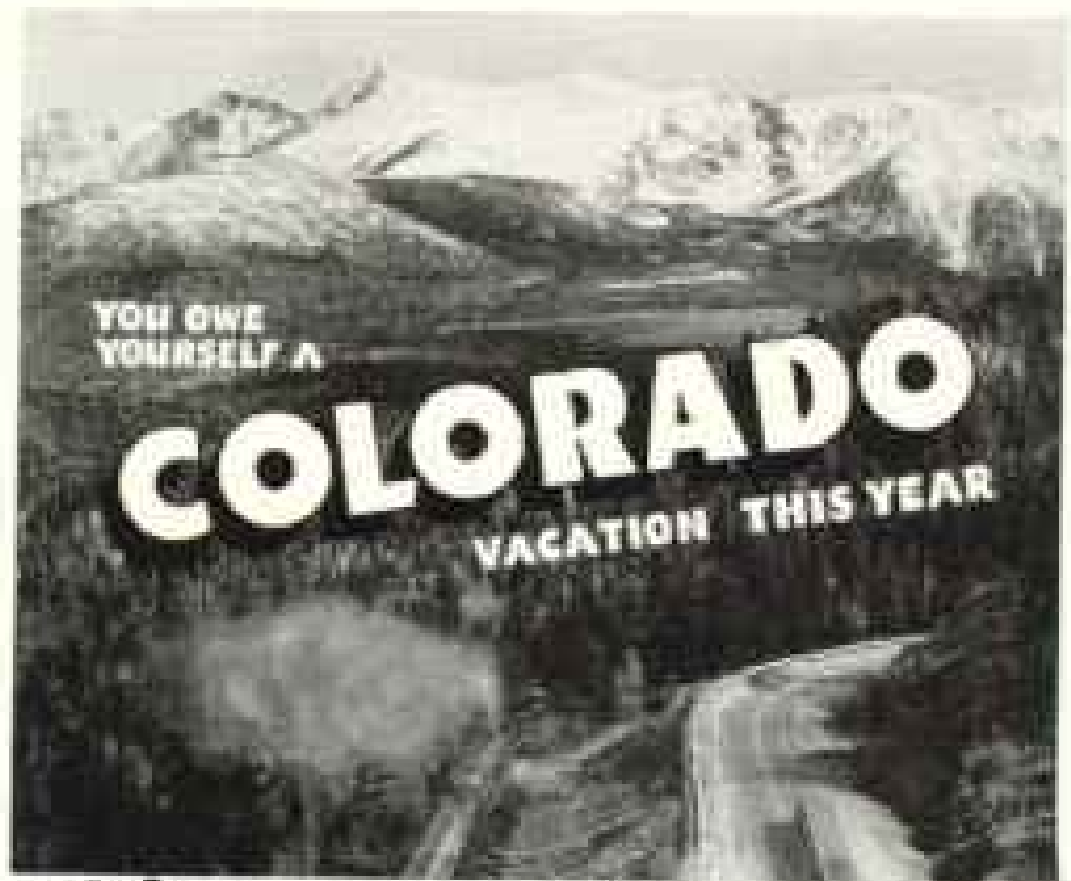
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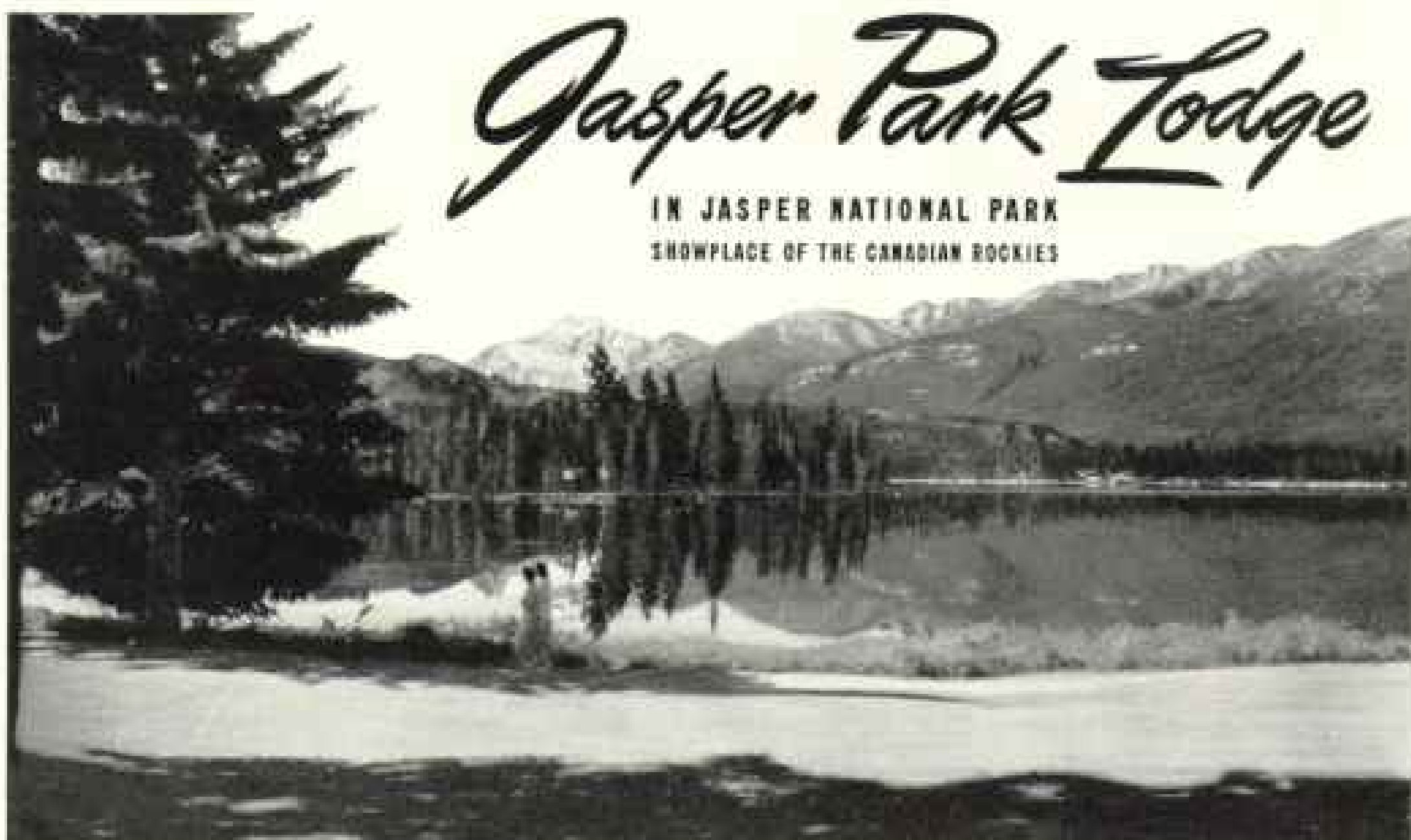
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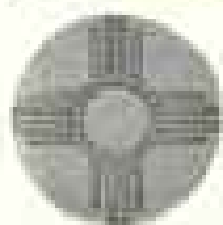
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THE name *hippopotamus* comes from the Greek *hippos*, "horse," and *potamos*, "river." *Dinosaur* means "terrible lizard," coming from Greek *deinos*, "terrible," and *sauron*, "lizard." By similarly tracing their origins, you will discover that *lemur* means, literally, "a ghost"; *porpoise*, "a hog-fish"; *orang-outang*, "a man of the woods."

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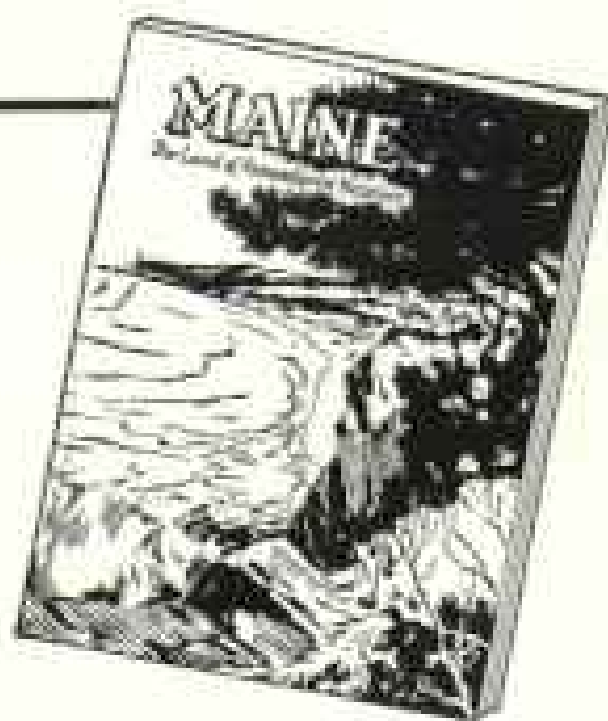
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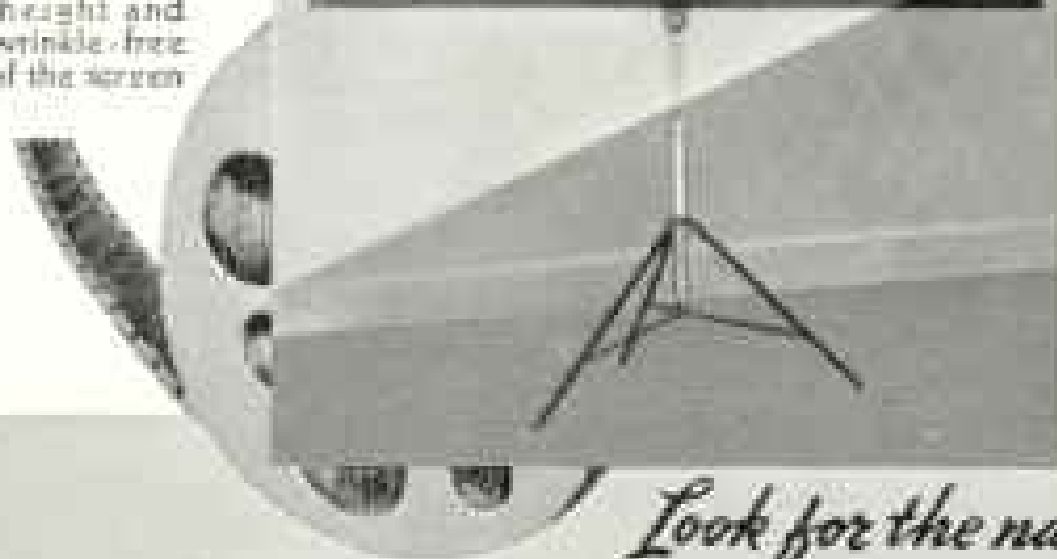




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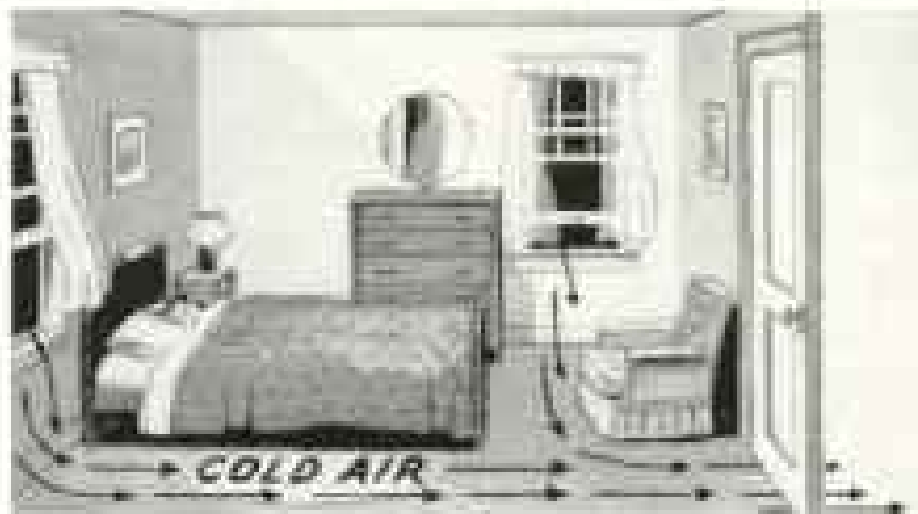
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Metropolitan's free booklet, "Tuberculosis," 42-N, contains up-to-date information about this disease.

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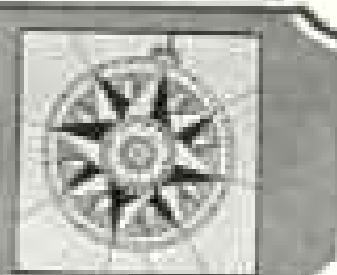
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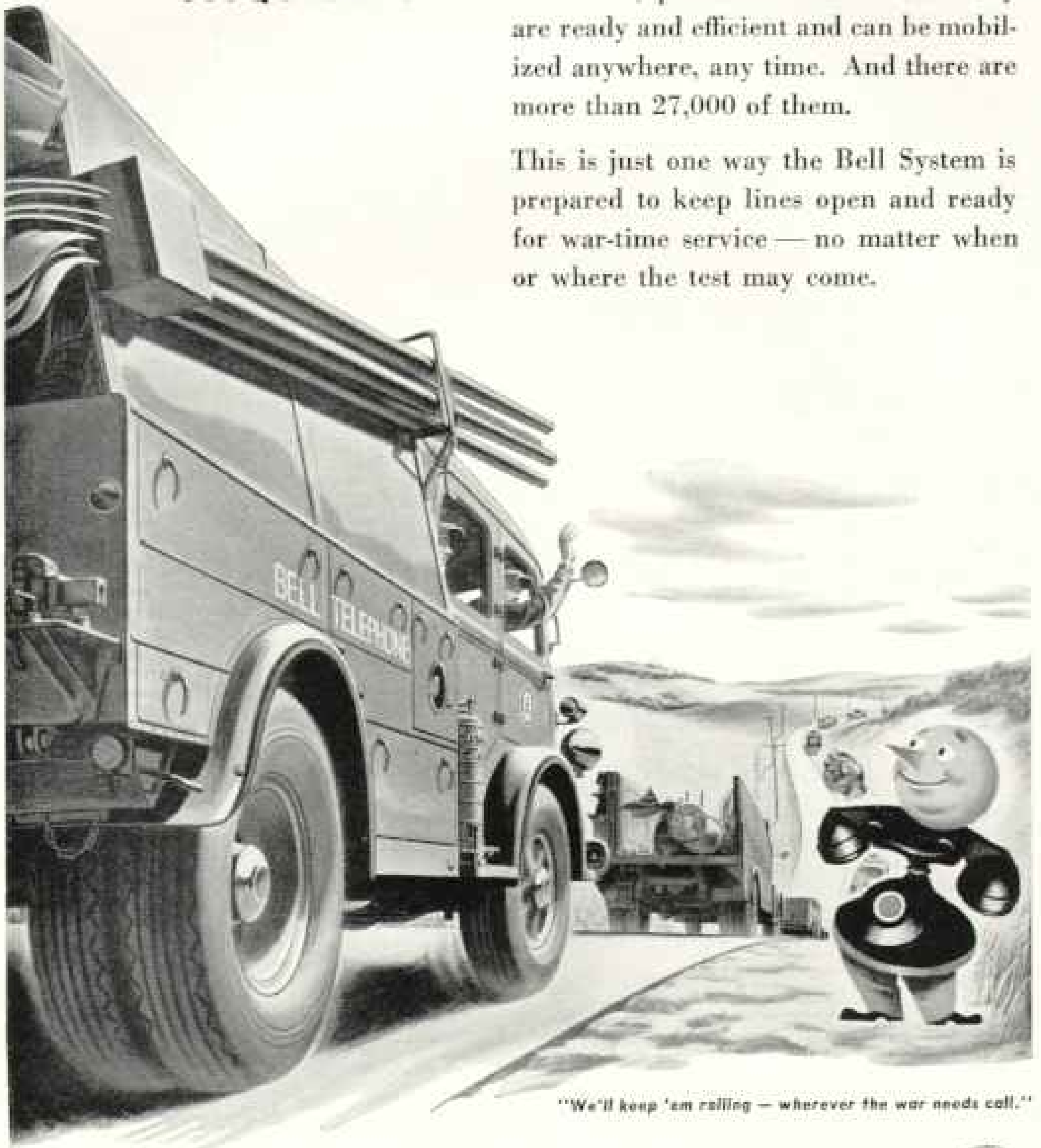
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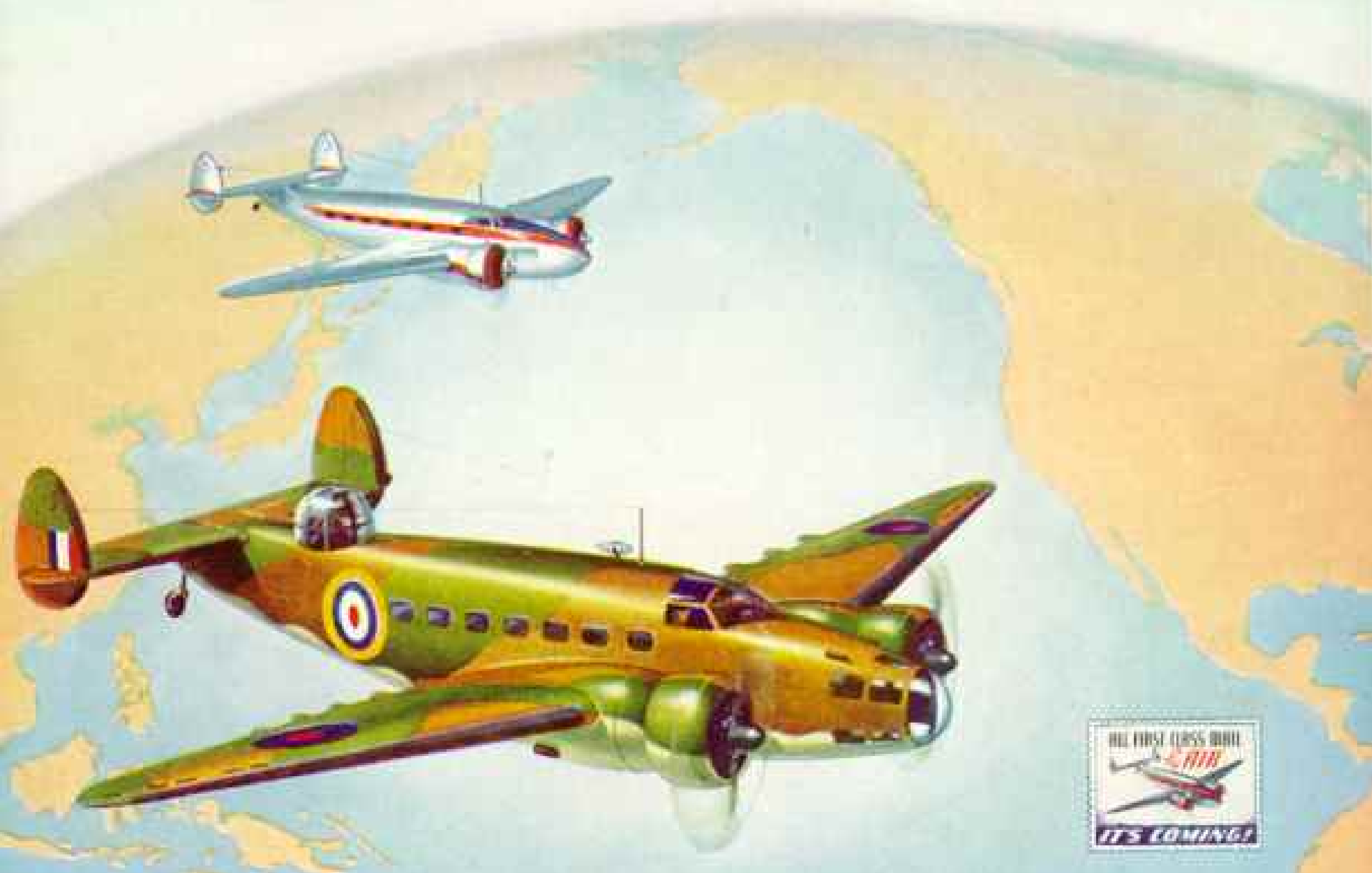
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