SUPPLEMENT: ATLAS MAP OF WESTERN SOVIET UNION

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THE NATIONAL GEOGRAPHIC MAGAZINE

Ranging over a third of the earth, good-will ambassadors of the United States Navy strengthen our ties with the free nations of Asia

Pacific Fleet: Force for Peace

By FRANC SHOR, with photographs by W. E. GARRETT
National Geographic Staff

"THE JOB of our Navy in the Pacific is to protect the interests of the United States wherever they are threatened, by whatever means are necessary," said Adm. Arleigh Burke, Chief of Naval Operations.

The square-cut sailor leaned across his Pentagon desk to emphasize what came next.

"But remember," he went on, "the purpose of our fleet in the Pacific is to influence people, not to kill them. And we want to exercise that influence not through fear but through respect. When you get out there, you'll see what I mean."

Fighting Fleet Wins Friends for U. S.

Photographer W. E. Garrett and I were on our way to the Far East to see that fleet in action. And in the months in which we rode the jet-blasted flight decks of aircraft carriers, dived in submarines, practiced landing techniques with Marines in helicopters, and went ashore in Far Eastern ports with liberty parties, we found that Admiral Burke was more than right.

The astonishing truth is that one of the most powerful striking forces in the history of the world is creating an enormous amount of good will for the United States in the Orient. Every day more than 25,000 sailors and Marines go ashore in Far Eastern ports. They land with money in their pockets and a healthy curiosity about the places they visit. They leave behind a lot of friends.

Orphaned Japanese kids swarm aboard the carrier *Midway* for the biggest Christmas dinner they ever had (page 322); a destroyer crew takes up a collection to help a hospital in Formosa; Navy wives teach English to Tokyo customs officials. It is part of President Eisenhower's "People to People" program, and it works.

The Navy works, too. It has its problems, some of them serious. There is the constant loss of highly trained personnel to better paying civilian jobs. There is the fact that a lot of new weapons which look fine on drawing boards or in the mock-up stage are not yet at sea. But hard work and day-and-night training make up for a lot. And the men are willing.

"In these days," Admiral Burke says, "the important thing is the amount of work done by each man each day. Every man is a weapon!"

So brains and ingenuity, muscle and determination hold the line while the retooling

goes on. And the Pacific Fleet is ready for anything.

Adm. Harry D. Felt, commander of U. S. forces in the Pacific, is proud of the flexibility of his command.

"We're capable of a wide range of military operations," he told us in his office in the Oahu hills high above Pearl Harbor. "That includes everything from brush fires to general war.

"While our mission is defensive, our forces can hit hard and fast wherever and whenever they're needed. We keep those forces close to possible trouble spots. Any potential enemy of the United States knows this and must consider it carefully in his planning."

Bill Garrett and I saw one aspect of that ability to strike hard and fast the following morning. The U.S.S. *Grayback*, the first submarine designed and built to carry guided missiles, was scheduled to fire a Regulus I, and we were invited to watch the operation.

The *Grayback* was already at sea off Oahu's northern coast when Bill and I boarded a sub tender at dawn. Two hours' steaming through choppy waters brought us to her side. Bill

was to remain aboard the tender to photograph the missile's take-off. My job was to get aboard the sub and watch the missile crew at work.

With a battle-starred Navy captain—a veteran submariner and commodore of Submarine Division One—I was lowered into the now-heavy seas in a whaleboat. The launching was difficult, and we wallowed through a quarter mile of whitecaps, the spray salting our faces. As we neared the surfaced sub, my naval friend asked me if I had ever transferred from a small boat to a submarine before.

"I've never even been on one," I told him.

"It's not very tricky," he assured me. "Just watch me and do as I do."

We bumped against the *Grayback*'s sleek side, and her waiting crew members offered the captain a selection of helping hands. He rose to his feet, balanced gracefully on the edge of our pitching craft, and put one foot on the sub's deck. At that moment a particularly heavy wave lifted us, held us high for a moment, and moved us slowly but inexorably away. The captain's step became a stride, then a split, then a splash. His bright-

orange life preserver held up everything but his dignity, and after a few moments of splashing about in search of his gold-braided cap, he was hauled aboard the submarine amid a good deal of laughter.

From the deck he looked down at me and smiled ruefully.

"Change that advice," he laughed. "Don't do as I do—do as I say!"

Missile Gives Sub a 500-mile Punch

Safe aboard the *Grayback*, we warmed ourselves with mugs of scalding coffee in the tiny but comfortable wardroom. While the captain changed into a borrowed uniform, one of *Grayback*'s officers talked about the Regulus I.

"This is the fleet's first operational attack missile," he said. "It flies at the speed of sound and has a range of about 500 miles. It can carry a nuclear warhead or conventional armament. We can fire it from subs, cruisers, aircraft carriers—even shore installations."

A raucous "beep, beep, beep, beep" assaulted our eardrums. "Man battle stations missile!" cried the public-address system, and the *Grayback*, which was running on the surface, suddenly exploded into action.

With my guide I raced forward and struggled up a hatch. As we reached the dome-shaped hangar, the doors swung open and a missile slid slowly out onto the deck.

As its wings unfolded, half a dozen sailors sprang into action, set the tail into place, and snapped on the umbilical connection through which the weapon draws its warm-up power from the sub itself, thus conserving its own power for the actual flight.

The 33-foot scarlet missile stood ready. I mounted to the bridge while the make-ready crew disappeared below. Three men remained on deck.

"Permission to bring igniters on deck?" one shouted.

"Affirmative," from the *Grayback*'s captain.

Two men screwed the igniters into the JATO power packs like caps on a stick of dynamite. The decks were cleared. The captain gave a terse order, and the missile's warm-up jet blast whipped the sea to froth.

Down the ladder we went to the control room. There a television screen showed our screaming monster on the deck above. Methodically, but with machine-gun rapidity, the launch-console operator ran through his check list. Five mimeographed pages—84 individual items—were ticked off before the ready signal was given.

"Control plane coming," someone called.

"What's the plane for?" I asked.

"We call this missile the 'Taxpayer's Delight,'" laughed my escort. "It has a tricycle landing gear and a parachute brake. With any luck at all we'll land it safely over on the island of Kauai and use it again.

"Like the tactical version, it has its own electronic brain, but it can be controlled from either the sub or the control plane. Hold it—here we go."

Baby Will Fly Another Day

The petty officer at the control console took a last look at the television screen and at his check list. An officer said, almost laconically, "Push the pickle." The sailor's thumb went down, and the missile on the TV screen dissolved into a cloud of smoke (page 296).

In the radar compartment I followed the missile's flight on a luminous scope. Straight and true it flew, a purposeful blip of eerie green. Minutes later the radio crackled.

"Baby down safely," called the escort pilot. "She'll fly another day."

Back on shore I had a chat with Rear Adm. Elton W. Grenfell, the much-decorated Commander of Submarine Force, Pacific. Admiral Grenfell, now back in Washington, D. C., on duty with the Chief of Naval Operations, has served with submarines for more than 30 years, and he is naturally enthusiastic about the new striking power they have acquired.

"We've had more experience with this type of weapon than people realize," he told me. "Back in 1947 we took a German missile, the Loon, and adapted it for use on a World War II submarine, U.S.S. *Cusk*.

(*Continued on page 295*)

Life-jacketed Bosun Takes a Coffee Break During Refueling at Sea

The powerful U. S. Seventh Fleet, a seagoing police force in the western Pacific, endlessly patrols its tinderbox beat with aircraft carriers, cruisers, and an armada of destroyers, submarines, and support ships.

The carriers' immense fuel tanks give escort vessels a mobile reserve, extending the range of the task force. This boatswain's mate aboard U.S.S. *Yorktown* has just helped direct refueling of the frigate *John S. McCain* with his signal paddle.

Bombshell Burst of Spray Engulfs a Destroyer from Stem to Stack

Pounding through heavy seas off the Ryukyu Islands to keep pace with the speedy *Yorktown*, the radar picket U.S.S. *Fechteler* shudders under mast-high mountains of water exploding from her plunging bows. Ventilators sealed, hatches dogged, lifelines rigged along deck, the ship endures massive blows that can rip heavy ammunition boxes from their welded mounts or curl two-inch-thick steel stanchions into pretzels. Solid water, hurled 60 feet into the air, smothers the bridge and occasionally clogs search radar atop the mast.

Defying Davy Jones, the destroyer appears to dive like a submarine, taking on tons of green water before shaking free.


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SUPER ANSCOCHROME (ABOVE) AND KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Running Lights Weave Glowing Ribbons During a Carrier Approach by Night

Taken aboard U.S.S. *Bon Homme Richard*, this remarkable time exposure shows the rippled landing pattern of a Douglas AD-6 attack bomber. Turning into the "groove" half a mile astern, the pilot begins a power-on glide to the deck, taking his cues from a system of lights and a 4-foot-square mirror (pages 326-7). He touches down and his hook engages the arresting cable, stopping him within 100 feet, his lights already out.

Fiery whorls from lighted wands record taxiing instructions given to the pilot by a plane director. Lights waved above shoulders mean "Taxi forward"; crossed as shown, "Stop." Wand drawn across the throat commands "Cut engine."

GLOBAL REACH OF THE U.S. NAVY

The United States Pacific Fleet, the most powerful striking force afloat, patrols a third of the earth's surface—from California to the Indian Ocean and from Alaska to the Antarctic—in defense of peace. Its 225,000 officers and men, seaborne ambassadors as well as a crack combat team, promote international good will and earn respect for the United States.

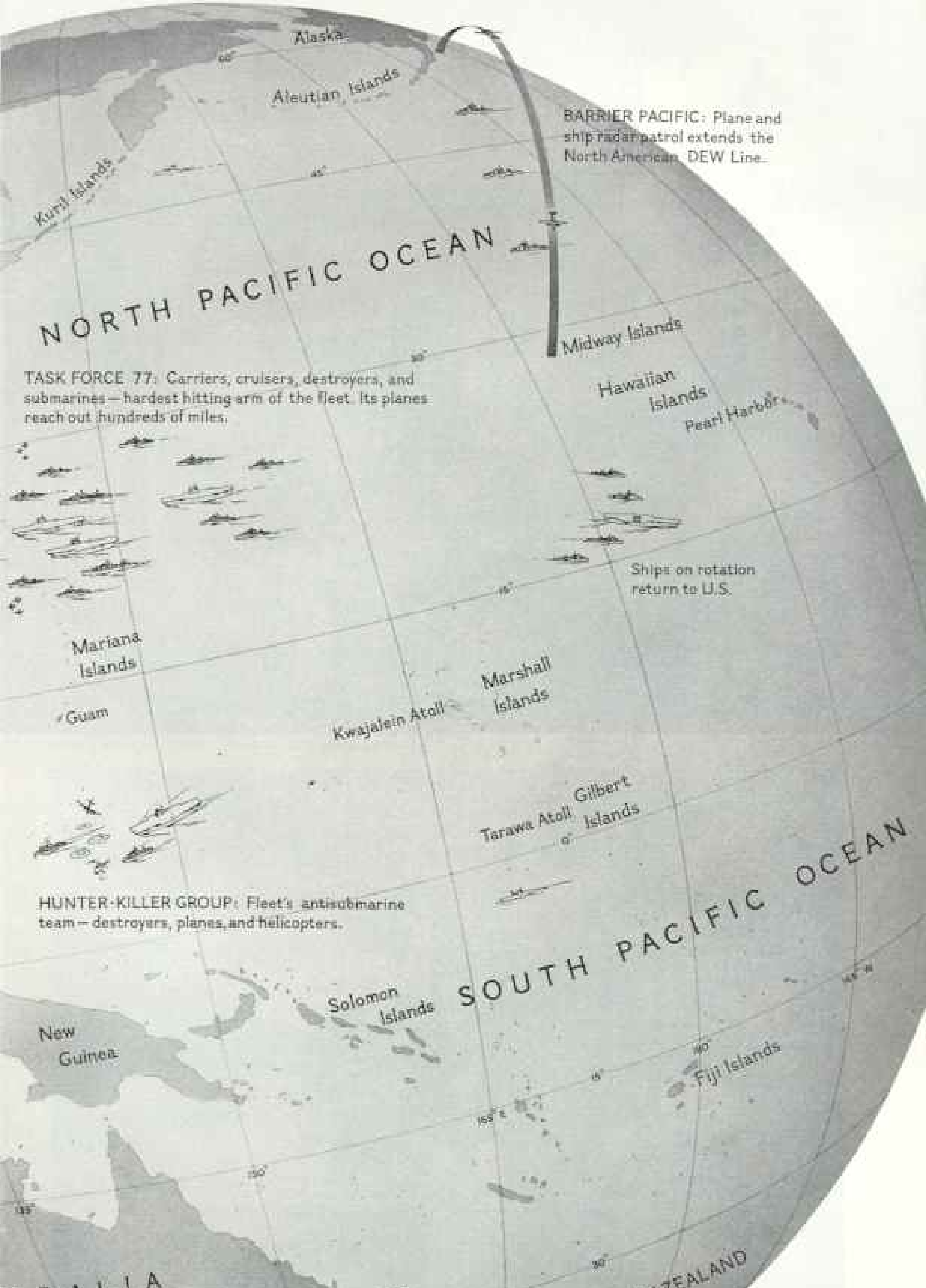
TASK FORCE 72: Formosa Patrol

TASK FORCE 76: Amphibious Unit

TASK FORCE 79: Fleet Marine Unit

TASK FORCE 73: Logistic Support

C.W.O.2 R.W. Nicholson and L.C. Alleman


Alaska
Aleutian Islands
Kuril Islands
NORTH PACIFIC OCEAN
BARRIER PACIFIC: Plane and ship radar patrol extends the North American DEW Line.
Midway Islands
Hawaiian Islands
Pearl Harbor
TASK FORCE 77: Carriers, cruisers, destroyers, and submarines—hardest hitting arm of the fleet. Its planes reach out hundreds of miles.
Ships on rotation return to U.S.
Mariana Islands
Guam
Kwajalein Atoll
Marshall Islands
Tarawa Atoll
Gilbert Islands
HUNTER-KILLER GROUP: Fleet's antisubmarine team—destroyers, planes, and helicopters.
Solomon Islands
SOUTH PACIFIC OCEAN
New Guinea
Fiji Islands
TRALIA
Brisbane
NEW ZEALAND

KODACHROME (UPPER) AND ANSCOCHROME © NATIONAL GEOGRAPHIC SOCIETY

"That trial convinced us that there was a great future in such a weapon. Since then we've developed both missiles and submarines specially adapted to our needs. We're using the Regulus at the moment, but we're moving on to the Polaris as rapidly as possible."

The Polaris is the Navy's entry in the intermediate-range ballistic missile field. It's a solid-fuel rocket that can be launched from either a surface ship or a submerged submarine, delivering a nuclear warhead on a target 1,500 miles away.

Cheaper to build and operate than a liquid-fuel weapon, the Polaris can be kept loaded and ready to fire at all times. Its greater ratio of payload to propellant allows a smaller missile to carry the same size warhead as the larger liquid-fuel vehicles. It's safer to handle, and it doesn't need highly trained technicians for maintenance and firing.

"Don't get the idea, though, that we depend entirely on missiles for our operations out here," the admiral continued. "The submarine is versatile and serves a lot of purposes.

"Our principal military characteristic is stealth. A submarine can operate undetected in enemy waters. It can remain on station for long periods. It can operate far from its base without the need of supporting forces—and that's vital in the Pacific. And it can strike with complete surprise." *

"Hard Work and Just Plain Guts"

The Russians, Admiral Grenfell estimates, have more than 110 submarines operating in the Pacific. We have fewer than 50—and they're kept busy day and night.

"A submarine normally spends about 26 weeks on a tour of duty in the western Pacific," said the admiral. "It uses only two weeks of that time for what we call type training—that is, practicing its own type of warfare. The rest of the time it devotes to services for other units of the fleet, such as providing a target for antisubmarine warfare practice, and to maintenance.

"This is a period of transition for us. We've stopped building the old World War II type of submarine, and the new atomic vessels are just beginning to come off the ways. Congress has authorized 33 nuclear subs; nine will be equipped to handle the Polaris.

"We're outnumbered in the Pacific," the admiral concluded, "but we aren't letting that give us a defeatist attitude. Training and hard work and just plain guts can make up for a lot."

The bright ribbons on Admiral Grenfell's uniform qualify him as an authority on such matters. The Navy Cross and the Silver Star were there—two of the Nation's highest decorations. He won them as commander of the U.S.S. *Gudgeon* in 1941 and 1942, when a vastly outnumbered submarine fleet was demonstrating that hard work and just plain guts could, indeed, make up for almost anything.

Service Force Keeps Fleet Sailing

The whole fleet shares the submariners' problem of keeping old equipment in fighting trim while putting new vessels and weapons into operation. As Commander of Service Force in the Pacific, Rear Adm. Robert L. Campbell bears a great deal of the responsibility for seeing that the job is done right.

"We operate on the principle that the Service Force is a front-line force," Admiral Campbell told me. "Our ships are right out there with the carriers and the cruisers. The combat ships can't stay on station very long without them" (page 287).

Admiral Campbell's Service Force numbers 80 ships, with more than 1,100 officers and 19,000 men. They not only handle repair, supply, and construction, but also distribute personnel to the Pacific Fleet.

"Naturally, personnel matters are a lot more interesting than the handling of supplies," the admiral smiled, "but if food, fuel, ammunition, and spare parts don't move promptly and effi-

* See "Our Navy's Long Submarine Arm," by Allan C. Fisher, Jr., NATIONAL GEOGRAPHIC, Nov., 1952.

Anglo-American allies confer aboard the frigate H.M.S. *Alert* in Hong Kong. Vice Adm. Frederick N. Kivette (center), Commander, U. S. Seventh Fleet, pays a call on Adm. Sir Gerald V. Gladstone, K.C.B., Commander in Chief, the Royal Navy's Far East Station. Capt. (now Rear Adm.) Arthur F. Spring, the Seventh Fleet's Chief of Staff, wears an aide's braided aiguillette at his shoulder.

Adm. Mitsugu Ihara, Chief of the Maritime Staff Office of the Japanese Defense Agency, reviews U. S. Marines aboard the heavy cruiser *Helena*, flagship of the Seventh Fleet, during an official call at Yokosuka, Japan. The attack carrier *Midway*, in the background, ties up beside a huge hammerhead crane, a U. S. World War II prize.

Smoke from a Regulus I Engulfs the Submarine That Fired It

Today's nuclear weapons give the submarine far greater destructive power than a World War II aircraft carrier. Latest guided missiles can be launched under water to pulverize cities a thousand miles away. This striking photograph, taken in Hawaiian waters, catches an air-breathing Regulus I missile, a weapon now succeeded by newer designs, blanketing the U.S.S. *Grayback* in vapor. A North American FJ-3 Fury equipped with remote-control gear streaks in at right to guide the missile to shore for recovery.

Crewmen ready a "bird" beside its watertight hangar. *Grayback* carries several Regulus missiles. Crack crews can surface, fire the weapon, and dive in seven minutes.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ciently, the men can't accomplish much. Our job is to see that they all get to the right place at the right time.

"We've learned a lot from the errors of World War II. For example, in that war our supply system delivered 620,000 tons of aircraft ammunition, and only 124,000 tons were ever used. In Korea, we delivered 291,400 tons and used 235,000. Savings like that make a lot of difference."

At the time I talked with Admiral Campbell, his Service Force listed a total of 614,576 active items, from tiny transistors to 34-ton propellers—a staggering figure. But a mobile support group stocking only 45,764 items was able to fill 85 out of 100 requests.

"Our biggest problems out here are distance and the age of our ships," said the admiral. "And every time there is another crisis, our schedules and our budget take an awful beating. But that's what we're here for."

Barrier Pacific Gives Early Warning

One of the charges of Admiral Campbell's far-flung supply lines is a round-the-clock operation called Barrier Pacific, a picket line of destroyer escorts and Lockheed Super Constellation aircraft which stand watch across 2,250 miles of ocean between tiny Midway and Kodiak Island in the Aleutians.

At the invitation of Rear Adm. Benjamin E. Moore, commander of both Barrier Pacific and the Airborne Early Warning Wing, Pacific, I flew to Midway for a 16-hour patrol flight in one of the big humpbacked, potbellied planes that watch every ship, plane, and submarine entering the area. With a crew of 21, captained by Lt. Comdr. H. W. Couch, we lumbered out of Midway at midnight on a flight to nowhere.

The cabin of our Super Constellation was unlike any I had ever seen. More than six tons of radar equipment had been packed into one end. Eight scopes glowed an eerie green as their operators watched for the bright blip of an aircraft or ship.

Midway in the cabin the combat information center officer stood at a large chart, surveying his scope watchers as they turned the knobs and dials of their intricate instruments. I slipped on a pair of earphones and listened to the crew's friendly chatter. Suddenly an urgent voice broke in.

"CICO, this is Four. I have an air contact. Distance 150 miles. Altitude 17,000 feet. Air speed 270 miles an hour."

Then came bearing, range, and time. The CIC officer spoke into his phone: "Four, this is CICO. Designate your air contact."

It was the first of the night, and it became Four Whiskey One. Our flight was Four Whiskey; One meant first air contact.

The CIC officer passed a message to the radio operator. His key clicked for a few moments, briefing the operational control center at Pearl Harbor, where illuminated wall charts show the position and course of all known friendly air and sea traffic.

Seven minutes later the radio operator handed the CIC officer an answer. Alpha was a Northwest Orient airliner, headed for Seattle. All was well. But if the control center could not have identified it, there would have been action over half the Pacific.

North American Air Defense in Colorado Springs, Colorado, would have received the flash. Jet interceptors in Hawaii and Alaska would have scrambled. The liaison between Navy, Air Force, and Army that is such a vital part of our defense strategy would have come into full play.

A Minute Means 100,000 Lives

I remembered what Admiral Moore had told me about the value of early warning.

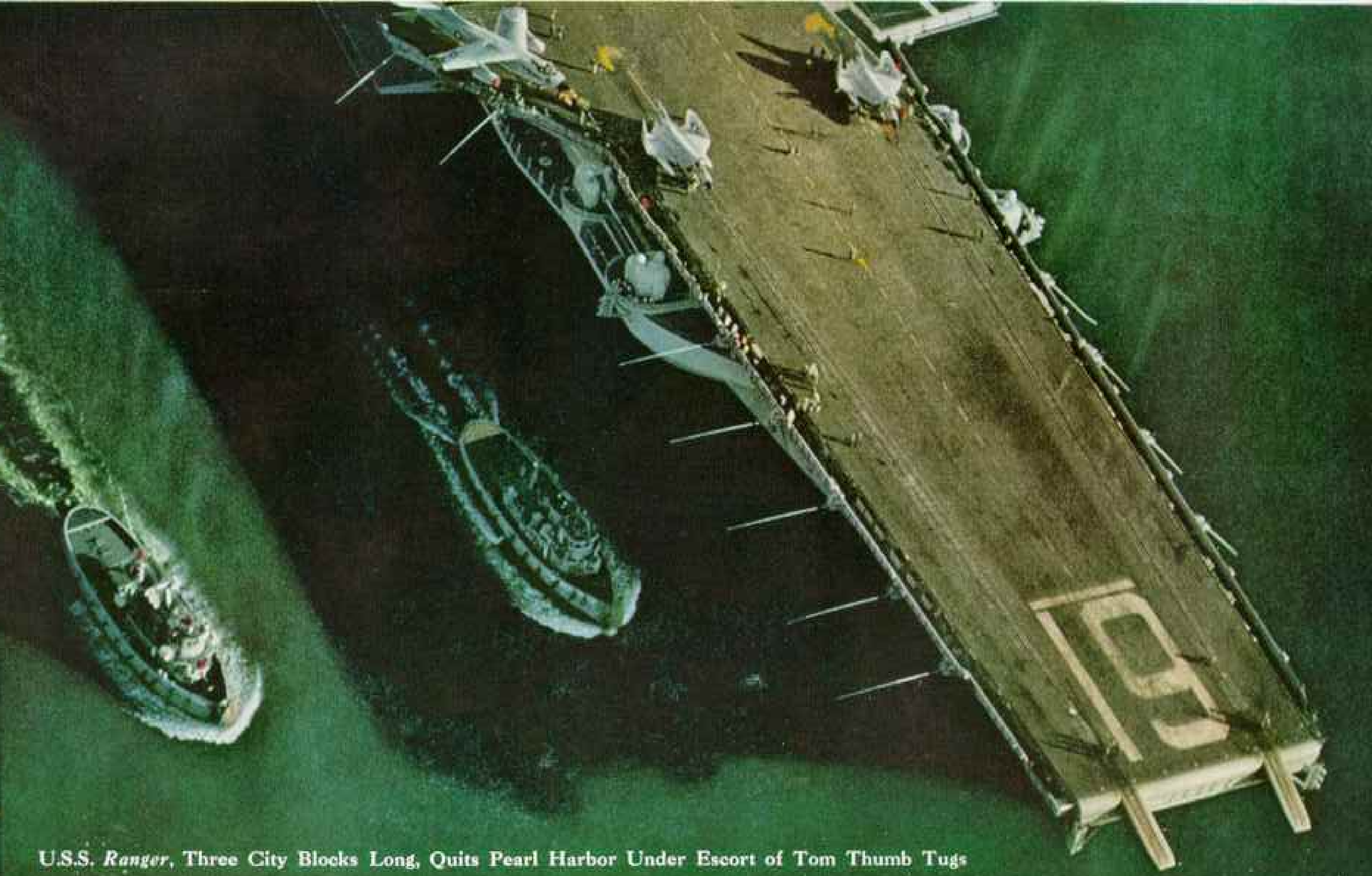
"Without early warning, there is no worthwhile air defense. Every minute of warning means more Strategic Air Command bombers airborne and 100,000 people evacuated by Civil Defense authorities. Our people know that, and it keeps them on their toes. Every second counts."

At two o'clock the radar watch changed. The relieved operators blinked as we walked into the bright lights of the galley. There I talked with ACW3 Glenn W. Nyenhius, a 21-year-old scope watcher. Born in Wisconsin, Nyenhius went to high school in Minneapolis and drove a truck for his father for six

(*Continued on page 307*)

Sailor's White Hat Tops a Flowing Kimono in a Yokosuka Shop

Navy pay supports the boisterous liberty town jammed with amusement parlors, restaurants, night clubs, and curio shops offering everything from samurai swords to satin pillow covers. This seaman from the *Midway* tries on a long-sleeved kimono. Pagodas, dragons, and peacocks enliven other robes and dresses.



U.S.S. *Ranger*, Three City Blocks Long, Quits Pearl Harbor Under Escort of Tom Thumb Tugs

Jets Shrieking, Catapults Slamming, *Ranger* Launches Her Bat-winged Brood;

***Ranger's* aviation supervisor,** known as the air boss, directs aircraft, elevators, catapults, and crews during flight operations—a tougher job than handling rush-hour traffic in Times Square.

Helmeted plane director wears a radio headset and bubblelike sound muffs.

KODACHROMES AND SUPER ANSCOCHROME (RIGHT) © R. G. S.

Wisps of Steam Whip the Deck Beneath a Steeply Climbing Crusader

Flight deck in miniature tells at a glance the whereabouts of each plane. Precisely scaled templates enable handlers to judge space on *Ranger's* crowded decks. TV screens show actual flight deck. Two bat-winged planes (left) are Douglas F4D Skyrays, nicknamed "Fords."

Hurled by a Steam-driven Slingshot, a War Bird Thunders Aloft from *Midway*

Four catapults and two runways permit the newest carriers to launch four planes a minute. Giant pistons housed in the deck whisk aircraft from standstill to 150 miles an hour in 2½ seconds.

KODACHROME BY FRANC SHOR; NATIONAL GEOGRAPHIC STAFF © N. G. S.

Seeming to hurdle vapor from a spent catapult, a McDonnell F3H Demon springs skyward. The missile-carrying Chance Vought F8U Crusader, wings still partly folded, awaits a call from the plane director (right), who stands knee-deep in steam. A Navy chaplain, experiencing the whiplash take-off, commented, "It's the fastest I've ever gone from complete curiosity to utter panic."

months after graduating from high school. Then he joined the Navy.

"That's when my education really started," he laughed. "I took my boot training at the Great Lakes Naval Training Station in North Chicago. Then they sent me to airman's school at Norman, Oklahoma, for eight weeks. When I finished there it was the radar school at Norfolk, Virginia, for 12 weeks.

"Then I went to the combat information center school at Glynco, Georgia, for eight weeks. When I got to Hawaii I was assigned to ground training with this crew. After six weeks of that, we were given this plane."

Nyenhius and his crewmates spend 16 to 18 days on Midway, then return to Hawaii for two weeks. On Midway they have a flight every 51 hours—18 hours on duty, 33 off.

"It's a tough job, but I like it," he said. "For one thing, I'm doing the job I was trained for. This isn't practice, this is the real thing. When I'm on duty, that scope is the most important thing in the world.

"Midway isn't too bad a place. We can sail and water ski or go fishing, and the Navy is going to put in a television station, I hear. And when we go back to Hawaii, we get a two-day pass before resuming training."

I asked the young man if he planned to remain in the Navy after his four-year tour of duty was completed.

"No, I want to be a teacher," he replied. "I'm going to take my discharge and study biology at the University of Hawaii."

Radar Spotted Mystery Sub

We crossed latitude 40° N., and the captain ordered all hands into rubberized immersion suits. Those suits might mean the difference between life and death if we had to ditch. Without them, no man could live for more than a few minutes in those icy waters.

The big plane droned on, and the hours passed. New contacts were recorded—"bogies" for aircraft and "skunks" for surface vessels—reported to the control center, and identified. I asked the CIC officer if he had ever picked up an unidentifiable aircraft.

"Never an aircraft," he said, "but a few weeks ago we found an unidentified submarine operating 170 miles north of Midway."

Up in the cockpit Lt. Comdr. Couch was conferring with his copilot over the gasoline chart, familiarly called the "Howgoesit." Our gas load at take-off had been 7,850 gallons, enough for about 18 hours' flying, and Couch told me our consumption had been low.

Plane Runs Around Bad Weather

"You picked a lucky night to join us," he smiled. "The weather up here can be about the roughest in the world, but this is a smooth trip. Even when it's rough, all this radar gear makes flying a lot easier.

"We can pick up the weather fronts on the scope and try a broken-field run around them. If there isn't a hole, we can hit them at 90 degrees and get through fast. I'm afraid I'm spoiled for ordinary flying."

After dawn I joined Couch and a few of his crew for breakfast. Well, *they* called it breakfast. Fruit juice, T-bone steaks so large they hung over the plate, fried eggs, potatoes, toast, green salad, ice cream, milk, and unlimited coffee. Starvation is not one of the hazards of flying Barrier Pacific.

On the return flight our radio operator picked up one of the radar-equipped destroyer escort vessels on picket duty below. Even though an attempt has been made to provide improved quarters for the 160-man crews, it's lonely duty, and hard.

"Sure like to trade jobs with you up there," said the DE's radioman. "You'll sleep in a bed tonight. We've been out 18 days, and the last four have been rough. We're getting 40-foot waves. Here comes one now. Out!"

"You can't help feeling sorry for those guys," said our operators. "But they cover an area we can't handle from the air. And

Sub-hunting Destroyer Peppers the Sea with a Deadly Barrage

Seventh Fleet ships pack an arsenal of antisubmarine weapons that includes homing torpedoes, self-propelled mines, and depth charges. Racing to a practice kill off Japan, the escort destroyer U.S.S. *Taylor* fires a salvo of hedgehogs, rocket-launched charges set to explode on contact with a submarine. These practice rockets, carrying dye markers instead of explosives, raise a buckshot pattern of colored geysers.

Bottle-shaped hedgehogs fill a launching rack. In combat, nose fuses replace taped-on dye markers. Bombs are so sensitive that one hit triggers the entire barrage.

besides, it's nice to know they're down there if you have to think about ditching."

All told, we logged 31 contacts on our 15½-hour journey, all promptly identified by the control center. It was midafternoon in bright sunshine when we made a wide turn into line with the runway on Midway's Sand Island.

"Set the bird watch," called the captain over the intercom, and two crewmen pressed their faces to windows.

"It's the gooney birds," Nyenhius explained. "They love to soar above the runways, and they can be plenty dangerous. They're big and heavy, and if one hits a prop you can lose an engine."

Gooney Birds Thwart a Scientist

On the ground I asked Comdr. W. J. Bowers, station commander at Midway, if anything could be done to eliminate the danger.

"Not without eliminating the birds," he replied. "And that's a much harder job than you might imagine."

In a jeep, Bowers took me on a tour of the base, which houses about 3,500 naval personnel and their dependents. Everywhere we found the awkward gooneys—albatross is the proper name—waddling about, sitting on lawns and porches, strolling in front of jeeps. On the beaches were thousands more.

At the north end of the island, where the birds were particularly plentiful, we came upon a civilian busily recording the birds' cries on tape. Commander Bowers introduced Prof. Hubert W. Frings, a zoologist from Pennsylvania State University, who had been brought to Midway by the Office of Naval Research to try to move the gooneys.

"We have two kinds of albatross here," Professor Frings told us. "The black ones are *Diomedea nigripes*. The black-and-white ones are Laysan albatrosses, or *Diomedea immutabilis*. I'm hoping to find and record one of their cries which will cause them to land. Then we'll try playing that over an amplifier whenever planes are taking off or landing.

"Unfortunately, almost nothing is known about the sounds these particular species make. In Honolulu I was even told they had no call at all. That certainly isn't true."

Obviously it wasn't. The big birds were filling the air with raucous cries. Dozens of them were engaged in strange dances, in which two birds would pair off, stretch their necks high in the air, and then fence briskly with their sharp beaks.

We walked among hundreds of the birds, most of which paid no attention whatsoever. Occasionally, if I approached too close, one would rush at me, clacking its bill.

"At first I couldn't even find a way to make them run away," Professor Frings explained. "Then a sailor's wife told me that when she hung her laundry on the line it frightened them. I've tried it, and any flat surface moving toward them seems to make them panic."

He took a large scarf from his pocket and walked toward a group of the birds, holding it in front of him with both hands. Where a moment before they had been quite unconcerned at his approach, they now hustled off, flapping their wings to gain speed.

"That may be a beginning," Frings said, "but this is a big problem, and it will take a lot of study before we have it solved."

One year, I learned, a concentrated effort was made to destroy the birds' nests, and more than 3,000 eggs were broken. Another year, thousands of the adults were killed, but others immediately took their places.

"We even tried changing the contour of the island to discourage them," an engineering officer told me. "We flattened out dunes and knocked down trees along the runways to eliminate the updrafts on which the birds soar. Even that didn't help much."

That night in the Bachelor Officers' Quarters I heard a young lieutenant expounding his own theory of how the job could be done.

"The trouble is," he explained, "that except for planned mass attacks the island personnel have been forbidden to molest them. Youngsters should chase them with sticks and stones. Enlisted personnel should kick them. Officers could say 'Go away' in a firm tone.

"Basically, these are very sensitive birds. Once they realized they weren't wanted, they would leave."

I hope either Professor Frings or the lieutenant finds the solution. I hate to think of the Navy spending time and money leveling Midway for the sake of the gooney birds.

Navy Trains Men and Sees Them Go

I rode back to Pearl Harbor with a Barrier Pacific crew coming off shift. Of the 20 men in the crew, only three planned to remain in the service after their compulsory tour of duty. I remembered Admiral Moore's concern about the dangerously low rate of re-enlistment in his command.

"These youngsters get months of highly

Welders Patch *Midway*'s Stadium-size Flight Deck in a Yokosuka Yard

Capt. John T. Blackburn (left), the skipper, inspects repairs with Rear Adm. Frederic S. Withington, Commander of U. S. Naval Forces, Japan, who must be strategist and diplomat as well as manager of a mighty United States base (next two pages).

specialized training—an education that costs thousands of dollars," he told me. "Then, just when they reach peak efficiency in their jobs, their term of service is over and they leave for better paying civilian jobs.

"It isn't that our ship-over rate is lower than the rest of the Navy. It may even be a little higher. This problem faces every officer in the Navy—and it's your problem as well. You're the taxpayer, and you're paying for it!"

In all Hawaii I talked with only one officer who didn't have a re-enlistment problem. That was Lt. Gen. Vernon E. Megee, a peppery Oklahoman who is Commanding General of the Fleet Marine Force in the Pacific area.

"More than a third of our men re-enlist," he told me. "As a matter of fact, we turn down a lot of applicants. If a man isn't considered noncommissioned officer material by the end of his first tour, chances are he'll be rejected. I think the spirit of the Corps is largely responsible."

Marines Sail with the Fleet

General Megee's Pacific force numbers 61,000 officers and enlisted Marines. Their mission, he says, is to "provide the Commander in Chief of the Pacific Fleet with an integrated, mobile, and ready force with which to project his will ashore."

One unit of that ready force I visited is the First Marine Brigade, stationed at Kaneohe, directly across the island of Oahu from Pearl Harbor. This integrated air-ground unit is the pride of General Megee's heart, and he watches over it like an anxious father.

"This is one outfit where air-ground integration is not an idle boast," he told me.

When the commander of the brigade is a flying officer, his chief of staff is drawn from the ground officers. When the commander is replaced, a foot soldier gets the job, and his chief of staff is a flyer. The 7,000 officers and men of the brigade know each other's problems and work out their solution together.

Adm. Herbert G. Hopwood, Commander in Chief of the Pacific Fleet, was in the Far East on an inspection tour when I visited his Hawaiian headquarters. His chief of staff, Rear Adm. Frank A. Brandley, briefed me on the scope of the fleet's operation.

Carriers: Backbone of Navy Might

The Pacific Fleet's area of responsibility, I learned, stretches from California to the middle of the Indian Ocean, and from Alaska to Antarctica. Nearly a third of the Navy's uniformed men are under its command.

When I was in Hawaii, the fleet's fighting strength consisted of 14 aircraft carriers, 150 destroyers, 9 cruisers, and 46 submarines. Its air strength included 2,800 Navy and Marine aircraft. It was those fighting planes that Admiral Brandley, himself a flyer, pointed out as our greatest asset in the Pacific.

"The aircraft carrier is the backbone of our might in the Pacific," he told me. "The carrier—plus the power of the press to let everyone know it's there and ready.

"The Chinese Communists know about the terrific amount of seapower surrounding Formosa. That's what keeps them from starting anything. It's no easy job to keep in a state of readiness out there, for 98 percent of our supply must be by sea, and those supply lines are long. But we manage.

"Get out and take a look at the Seventh Fleet. It has a primary responsibility for maintaining the peace west of the Marianas—a pretty big assignment. But it has the attack carriers to do the job."

So Bill Garrett and I rode a Pan American Stratocruiser to Tokyo, and found ourselves in a new world. The Japanese capital, hungry and freezing when I last saw it after the war, had been reborn. New buildings were everywhere; the streets were crowded with automobiles; the stores were filled with the products of Japan's rebuilt industries. Great areas that had been blackened ruins were crowded with thriving factories. And everywhere we found

Yokosuka Harbor Shelters Warships in the Crook of Its Elbow

Superb location and a huge natural anchorage made Yokosuka the chief Japanese naval base during World War II. Farsighted U. S. naval officers halted postwar demolition of yards and converted the station into an outpost for the Pacific Fleet.

This aerial view looks east across the harbor's sheltering peninsula with its shops and warehouses to Saru Island in Tokyo Bay. Two aircraft carriers occupy slips on the harbor's far side.

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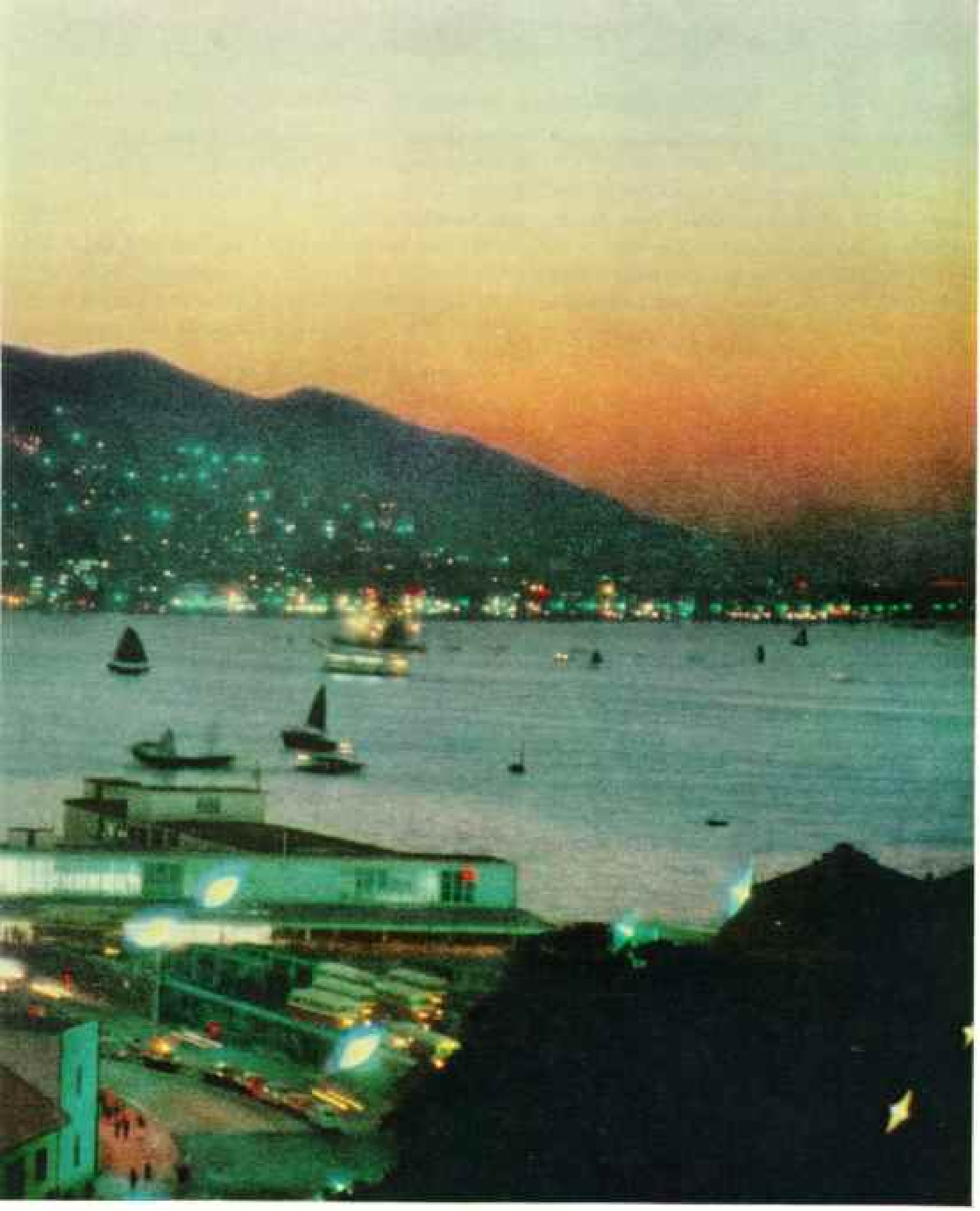
Dusk Kindles a Dazzling Welcome to Ships in Hong Kong's Harbor

Officers and men of the Seventh Fleet rate the British Crown Colony as the queen of Far East liberty ports. Shops, open-air bazaars, luxury hotels, and restaurants compete for the sailor's dollars. This view from the mainland city of Kowloon looks across the junk- and sampan-choked harbor to the glittering waterfront of Victoria on Hong Kong Island. Like jewels on black plush, the lights of the city sprinkle the base of 1,809-foot Victoria Peak. Spire of the Kowloon-Canton Railway terminal, whose tracks connect the colony with Communist China, 22 miles distant, rises in foreground beside the piers of the cross-harbor Star Ferry.

Free-port status of Hong Kong results in bargain-counter prices on French perfumes, Swiss watches, and German cameras. Obliging Chinese tailors produce custom-made suits and dresses in 24 hours. These sailors dicker for a jade ring.



the hard-working Japanese as polite as ever and friendlier than before.

Our first call was at the great Yokosuka (pronounced Yo-kew-ska) Naval Base (page 310), one of the largest in the Far East. It had, I knew, been scheduled for destruction at the end of World War II, and had been saved only by determined U. S. naval officers who delayed demolition until their case could be heard by the highest authorities.

We were met by Rear Adm. Frederic S. Withington, Commander Naval Forces, Japan, whose headquarters are at Yokosuka. A lean, soft-spoken sailor, he praised the Japanese craftsmen who serve our Navy here.

"We have spent about $15,000,000 on repairs and improvements at Yokosuka," he told us, "and we've gotten more than our money's worth. This is the best fleet base in the Far East, and one of the best in the world."

Ship repair at Yokosuka, Admiral Withington told us, costs from 20 to 35 percent of what similar work would cost if the ships were returned to our own west coast. And the saving in time is incalculable (page 309).

"The Japanese work force is exceptionally highly skilled," the admiral said. "We know that when a ship leaves this base after an overhaul, it's in tiptop condition."

During World War II Yokosuka was the heart of the Japanese shipbuilding industry; more than 40,000 civilians worked there. Yet only once was it subject to bombing raids; one of Gen. James Doolittle's famous raiders struck it in 1942.

So little harmed was the great base, in fact, that the Japanese spawned a humorous slogan: "Move to Yokosuka and be safe. The Americans are sparing it for a future base!"

Yokosuka's importance to American interests in the Far East today is summed up in a single sentence by Admiral Withington:

"We do the best we can on underway replenishment, but the fact remains that we cannot operate in the Far East without one good naval base—and this is it."

Seventh Fleet Puts Out Fires

A couple of days after our visit to Yokosuka, Bill and I returned to board the cruiser *Helena*, flagship of the Seventh Fleet, for our first meeting with tall, friendly Vice Adm. Frederick N. Kivette, the flying commander of the Seventh Fleet (page 294). The smiling boss of our most powerful naval striking force is an informal man, and he made us at ease immediately. Within minutes of the start of our first interview he had put his concept of his fleet's mission into simple and readily understandable words.

"We're a fire department," he told us. "And we're flexible. We tailor our operating units to fit the situation. When a blaze breaks out, we send what is necessary to handle that particular conflagration.

"I feel that the Seventh Fleet was a major factor, if not *the* major one, in putting out the recent fire in the Formosa area. It put the necessary striking force where it was needed, when it was needed."

Motto of a Far-flung Armada

He paused, lit a cigarette, and smiled.

"Naturally, we do a lot of planning for our operations, but it's always subject to change. Someone on my staff coined a little joke, and it's become our motto. It goes like this:

" 'We have no schedule, and we adhere to it!' "

The Seventh Fleet's size varies from month to month, since it bases on the west coast and deploys to the western Pacific. At the time we were aboard, it embraced about 125 ships, about 60,000 men, and more than 500 aircraft.

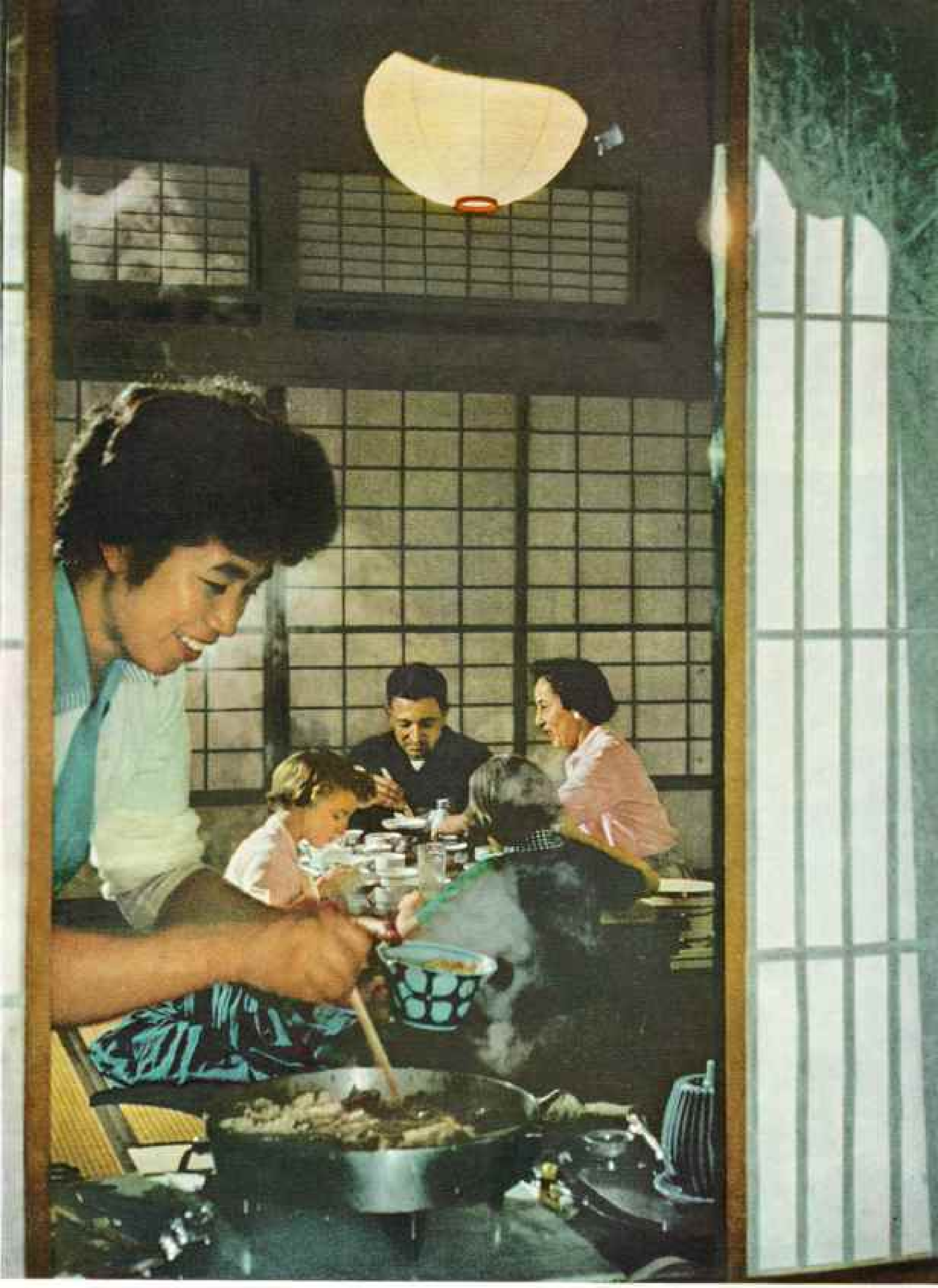
"It is," says Admiral Kivette, "the most powerful peacetime fleet the world has ever known." If you consider the nuclear potential of the Douglas A3D which now operates off some of its carriers, you can strike the word "peacetime." In any event, it is certainly one of the most spread-out operations ever united under one command.*

On a single day in the autumn of 1958, for example, some of the Seventh's mine sweepers were engaged in joint exercises with Japanese vessels off Sasebo. South in the Ryukyus a submarine hunter-killer team of aircraft carrier and destroyers was training with Japanese destroyers. A seaplane tender was on station far to the north in the Aleutian Islands.

Amphibious units were lying off Okinawa, landing supplies on the beach in a joint exercise with the Eighth Army and the Third Marine Division. An aircraft carrier and its escorting destroyers patrolled at full alert off Formosa.

In the Philippines, amphibious units conducted joint operations with vessels of the Philippine Navy. And in the South China

* See "Our Navy in the Far East," by Admiral Arthur W. Radford, USN, National Geographic, October, 1953.



KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

Japanese Skill and American Electric Skillet Produce a Gourmet's Delight

The Seventh Fleet encourages its officers and men to mingle in the life of host countries. Comdr. Edward E. Kerr, a guided-missiles specialist, lives in a Japanese house at Kamakura. The Kerrs use chopsticks to eat sukiyaki, a meat-and-vegetable dish.

Sea, *Helena* was engaged on a mission of mercy. The *Hoi Wong*, a passenger vessel carrying Communist Chinese, was in distress off the Paracel Islands. The *Helena* took off 135 panic-stricken passengers, 115 of them by helicopter, and put them safely ashore in Hong Kong.

The watchword of the Seventh is readiness, even when a vessel is in port.

"We always tie up our carriers with the bows seaward," Admiral Kivette said. "With our catapults, it is possible to launch a strike even while a carrier is in drydock."

When Bill and I were traveling with the Seventh, Admiral Kivette's chief of staff was Capt. Arthur Spring. Spring is now a rear admiral, commander of the base at Subic Bay. Our first night aboard he told us how fast the fleet can operate.

"When the Chinese Communists started their last heavy bombardment of Quemoy," he recalled, "I was at dinner with the admiral. He called a conference for 10:30 that night.

"The *Lexington* was in drydock, with her side open. The *Helena* was also in for major repairs, and her plates were open as well. But at eight o'clock the next morning they were both out and ready for action." *

The Navy Ashore—"People to People"

One of Admiral Kivette's principal concerns is the relationship between the men of his command and the people of the countries they visit. With more than 25,000 men ashore every day, the fleet's impact in the Far East is enormous.

"I'm proud of the behavior of our men out here," Admiral Kivette told us. "People like our sailors and like to have them come to port."

But there's a lot more to be gained from the "People to People" program, he feels, than a simple orientation of fleet personnel. The wives and families of the men under his command are urged to be part of their communities.

More than a hundred officers and men live in private homes in the Yokosuka area. Comdr. Edward Kerr, an Annapolis graduate who is a nuclear-weapons officer on Kivette's staff, invited us for a Japanese-style dinner in his Kamakura home. We found his wife Barbara and their two grade-school daughters enthusiastic about living in Japan.

Ed Kerr slipped off his shoes, Japanese fashion, as he entered the home, and we followed suit. The living room and one bedroom were furnished in Western fashion, but the rest of the house held only *tatami* matting, and in those rooms one sits on the floor on pillows.

"Why come to Japan and live just as you do at home?" Barbara smiled. "I

* See "Life Under Shellfire on Quemoy," by Franc Shor, NATIONAL GEOGRAPHIC, Mar., 1959.

Foam-rubber Mattresses Replace Rope-and-canvas Bunk Springs

Crew's quarters on *Ranger* and other new ships boast bedside lockers, reading lamps, decorative prints, and tile flooring in place of painted steel.

This man folds a freshly laundered mattress cover on the spotless deck.

want to learn all I can about Japan and the way people live over here. And I want Bee and Stacey to be part of this community."

The Kerr daughters attend a Navy school, but among their classmates are Japanese, Hawaiian, and Filipino children. Their schedule leaves no time for Japanese lessons, but with the quickness of youth, they have already picked up many words from classmates and from Teiko, the Kerrs' $30-a-month maid.

"I've made arrangements to take language lessons once a week," Barbara told us. "I hope the girls will study Japanese dancing, and I've started a course in a woodcarving style called Kamakura *bori*, making trays and boxes."

Barbara, whose energy seems limitless, has also scheduled weekly lessons in the art of flower arrangement, volunteered for work with both American and Japanese Girl Scouts and Brownies, and joined the Seventh Fleet Wives' Project which, among other tasks, has given English lessons to Japanese customs men.

"It was a little ominous," she remembered. "The first two words they asked me to explain were 'seize' and 'confiscate.' "

We sat on the floor to eat our sukiyaki dinner with chopsticks (page 315). Sukiyaki is a Japanese favorite, a flavorsome combination of lean meat, vegetables, and transparent noodles served with rice and raw egg. Traditionally it is prepared at table, cooked in a heavy skillet over a charcoal brazier.

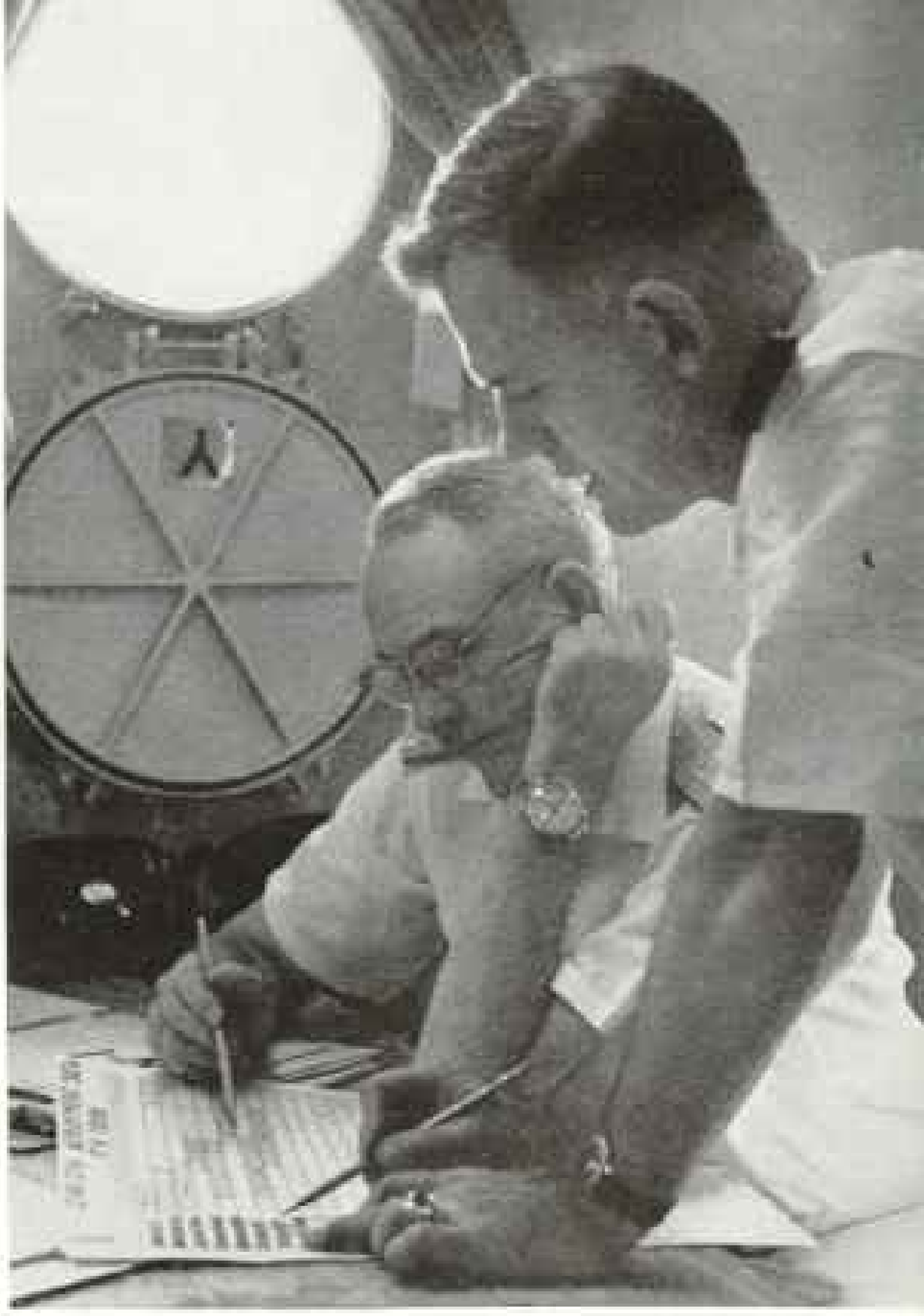
Teiko cooked our dinner as we ate, but a shining American electric skillet replaced the charcoal embers.

"She loves that skillet," Barbara laughed, "and the electric coffeepot and toaster as well. She's a fine cook. I expected her to be good at Japanese food, but she also turns out wonderful pizza and spaghetti."

The idea of eating Italian pizza prepared with American equipment in a dining room looking upon Fujiyama appeals to me. I hope the Kerrs invite us back for dinner sometime.

Officers Get Lost in *Midway*'s Maze

Admiral Kivette was setting off on an inspection tour of his new command and asked us to join him at Okinawa. Bill and I sailed from Yokosuka on the carrier *Midway*, a 60,000-ton behemoth nearly a thousand feet long (page 332). It was familiar country to my colleague, who had been a Navy combat photographer during the Korean war, but I was confused a good deal of the time. I felt better when twice, wandering through the corridors, I came upon junior officers who were as lost as I was.



Shipboard conference absorbs Admiral Kivette (seated) and Capt. Donald Gay, Jr., operations officer of the Seventh Fleet, in the admiral's office on *Helena*. They discuss a deployment sheet showing positions of all ships in the command.

Submarine Killers by Sea and Air Stalk an Invisible Quarry

To trap the elusive submarine, helicopters, aircraft, and escort ships spread an electronic net across thousands of miles, gradually tightening the snare like a purse seine. The next two pages show a carrier-based hunter-killer team, called a HUK group, on a training search off the Philippines.

Rotors ruffling the surface, two Sikorsky helicopters hover at 30 feet, dunking sensitive sonar globes by winch and cable to pin down a goblin, or enemy sub. A twin-engine Grumman S2F Tracker aids the chase with a stinglike apparatus in its tail called MAD—magnetic airborne detection. Unlike sonar, which cannot always distinguish a submarine from a whale or a school of fish, the Tracker's search gear picks up only metallic contacts. Certain of the enemy's presence, the plane here hurls smoke flares to mark the target. A destroyer closes for the kill. But the submarine commander, his ship still far from doomed, may dodge the blow and slip free.


NAVY

"I left my cabin fifteen minutes ago to go to lunch," one of them lamented, "and I haven't found the wardroom yet."

We flew off the *Midway* to Okinawa in a Grumman S2F-1, the Navy's sturdy little carrier on-board delivery plane affectionately known as a COD (page 324). It was my first carrier take-off, and even in this relatively slow craft you get the feeling you're going to be pulled out of your backward-facing seat. Later, when we made landings aboard carriers in those same aircraft, I appreciated the reverse posture. When that hook engages the arresting gear, it's good to have something behind you.

We reached Okinawa the night of the Army-Navy football game back home, and the Navy had laid on quite a celebration. Admiral Kivette had sent a signal to Maj. Gen. David M. Shoup, then commanding the Third Marine Division on Okinawa, warning him that he was bringing two guests and suggesting he provide coonskin coats in which we could listen to the football broadcast. The general topped the gag by producing two Navy cold-weather parkas with the alpaca linings turned inside out—a reasonable facsimile.

The game started at 3:30 in the morning, Okinawa time, and it was a somewhat sleepy crowd that watched the play-by-play re-created on a blackboard from the short-wave broadcast. The host officers had done everything possible to conjure up stateside atmosphere, including a goat, the Naval Academy mascot.

Unhappily, the evening—or morning—ended in something of a debacle. Army swamped the Middies 22 to 6, and in an unguarded moment the goat ate a flower-decked hat belonging to the wife of a visiting admiral.

I talked with General Shoup the following day about the part his Third Marine Division plays in American strategy in the Far East. One of their functions, he told me, is to train with the forces of our allies, and he is enthusiastic about the results.

Leaning against the wind of the East China Sea, a hooded plane pusher—unsung hero of the deck force—awaits the next recovery beside one of *Yorktown*'s helicopters. Carriers launch and land aircraft in the foulest weather, guiding pilots to safety by radar. Tireless "blue shirts" turn out at all hours, forever wrestling planes between hangar deck, flight deck, elevator, and catapult. Scurrying along pitching runways, unsnarling arresting cables, and dodging furnacelike jet exhausts, they suffer more injuries than the pilots.

"The Koreans, the Filipinos, and the Nationalist Chinese have all shown a real desire to work with the Marines," he said. "And when we train with them, they don't just watch. They get an actual job to do.

"We integrate the allied forces right into our own organization. If you're going to play with them on your side in the championship game, you ought to use them as part of the team in the practice sessions."

The general paused a moment for emphasis, then went on:

"The officers and men of our allied armed forces have demonstrated their complete understanding of the role we all are expected to play in the job of maintaining a world in which men may live as individuals."

General Shoup's glasses and bland face give him a deceptively mild appearance. But the white-starred blue ribbon on his blouse, the symbol of the Congressional Medal of Honor, does not bespeak a man mild in battle. When I got home, I looked up the citation. It happened on Tarawa in 1943:

"Although severely shocked by an exploding shell soon after landing at the pier," I read, "and suffering from a serious painful leg wound which had become infected, Colonel Shoup fearlessly exposed himself to the terrific relentless artillery, machine gun and rifle fire from hostile shore emplacements and, rallying his hesitant troops by his own inspiring heroism, gallantly led them across the fringing reefs to charge the heavily fortified island and reinforced our hard-pressed, thinly held lines . . . ." There was quite a lot more.

When such a soldier speaks so highly of our allies in the Pacific, I thought, we must have some outstanding people on our side.

Like a Monkey on a Trip to Space

Bill and I spent the next few weeks afloat with the fleet, a good deal of the time on the *Midway*. I eventually learned to find my way about, and Bill became practically part of the crew. To photograph the actual performance of the fantastic Sparrow air-to-air missile (page 330), he flew one day in an A3D Skywarrior. I asked him how it felt.

His notes read: "A monkey on a one-way trip into space couldn't have felt any more at the mercy of machinery than I did on my first catapult launch. Strapped into the bombardier's seat beside the pilot, I had a new look at the flurry of activity on the deck as planes were launched. Brown-shirted plane captains and blue-shirted plane pushers crawled and slid under the aircraft to pull the chocks.

"The yellow-shirted plane directors kept the jets moving toward the catapults. As soon as an aircraft was astride the catapult, the green-shirted 'cat' crew scrambled under the belly to attach the plane, while the red-shirted ordnance men scurried along the fuselage to arm practice rockets. Almost too soon, it was our turn.

"The catapult officer, spinning one hand above his head like a helicopter rotor, signaled our pilot to open throttle. When everything was ready, he lunged forward like a saber-wielding Zorro (page 284). A surge of power pinned me to the backrest.

"The flight deck seemed to be jerked from under our wheels. By the time I could pull my head off the backrest we were airborne.

Lack of Oxygen Blacks Out Passenger

"Suddenly we were away from the painful scream of jet engines. We floated in the calmest, smoothest flight imaginable. We seemed suspended in space.

"Jet crewmen must wear oxygen masks at all times while in the air. I couldn't take pictures with the mask on, so I held it in my hand and took deep breaths between shots. While photographing at lower altitudes I put it aside.

"Without my realizing it, the pilot went into a climb. I had a deliciously pleasant sensation of floating—floating—floating into unconsciousness from anoxia. I awakened to find a crewman holding the oxygen mask to my face and shouting to me to breathe deeply."

Not until the target plane had been shot down, and the jet was returning to the carrier, Bill told me, was there any real sense of speed.

"As we swooped toward the deck, the green 'O.K.' lights flashed on to signal a proper approach," he wrote (page 327). "A moment later our wheels touched the deck. The tail hook caught one of the arresting cables stretched across the deck and, like a free-wheeling Yo-yo at the end of its string, everything spun, shook, and quivered.

"I was hurled forward violently into my shoulder harness. Another 'controlled crash' on the flight deck of a Navy carrier had been successfully completed."

Bill experienced it; I only watched it. But in watching it hundreds of times day and night, in all weather, I came to have a regard bordering on awe for the clean-limbed young-

sters who risk their lives daily to maintain the respect that keeps the Pacific pacific.

I stood on deck one day a hundred feet from an A3D as it thundered down in what appeared to be a perfect landing. Crouched behind the landing mirror I saw the wheels touch down, the tail hook probe for its arresting cable. The gear seemed barely to flick the line, then bounced free.

It hit the deck between that cable and the next—and grasped empty air. There was a mighty roar as the twin jets blazed back to full power, and the great 30-ton craft swooped safely up from the angled deck.

New Landing Technique Saves Lives

In the constantly changing language of the carrier breed, the pilot had "bolted the deck." There is no odium attached to being a bolter; on a straight-deck carrier he might have been a casualty. Today when a jet pilot touches down on a canted deck, he pours the power to his engines. If he feels the jolt of the arresting gear, he cuts the thrust. If not, he has what it takes to get airborne.

Even with this safety factor, the pilot must exercise an incredible number of faculties in a few rushing seconds. In a final eye-blink, instinct, training, and experience must combine with superb reflexes to strike the balance that may mean life itself.

I have seen many bullfights, and I am familiar with what *aficionados* call the "moment of truth," that point in time when a *torero* stands before a tired but still deadly beast, his sword poised, calculating the exact place and moment for the final stroke.

But to me that golden-helmeted youth in his metal monster laden with explosive fuel faced a far more dangerous challenge, and answered it as casually as you or I shift gears at the proper spot on a steep hill.

I got my own particular thrill on a miserable December day when I rode the carrier *Yorktown* with Rear Adm. E. E. Colestock and the staff of his Task Group 70.4—designated as a submarine hunter-killer group, or HUK. The modern HUK team uses everything from the human eyeball to microphone-equipped sonar buoys to detect enemy subs. It also comes equipped with search planes, destroyers, helicopters, and a bewildering variety of electronic detection devices.

For two days I had been on the topside team. I had ridden helicopters when they dipped their sonar globes, and watched while destroyers foamed into position to act as sights for the "rifle pass" of the Grumman S2F's with their depth charges (page 318). I had listened to the marvelous code lingo of the hunters as they stalked their prey:

"Michigan Valley, are you out of orchids?"

"Soap Box, are you hot?"

"Head Band, request your playmate make dip 3,000 yards ahead Soap Box."

"Michigan Valley to Cactus, all cowboys are cold."

"Negative, Roughshod is hot."

Sunk Twice, the Admiral Fights Back

Well, I didn't understand it all either, but I didn't need to. I saw them, helicopters and destroyers and S2F's working like the eyes and arms and legs of a single body to find and destroy that simulated enemy hundreds of feet below. And I had sat on the bridge of the *Yorktown* with Admiral Colestock and heard his ideas of how to fight submarines.

He had taken over Task Group 70.4 only a few weeks before. On the *Yorktown*'s first two sorties from port with him aboard she had been sunk—theoretically, of course, by our own submarines lying in wait. The admiral decided to invoke a little team spirit.

Out to the group by radio went a poem, written by the admiral's own hand. It may never cause John Masefield any trepidation, but it stirred up a good deal of activity in the immediate vicinity. It went like this:

The time has come, the Admiral has thunk
To keep the Yorktown *from being sunk.*

Boarding Party of Japanese Orphans Attacks Christmas Dinner on *Midway*

During layovers in port, Seventh Fleet officers and men double as language teachers, blood donors, rescue workers, and even high school athletic coaches. Decked out in their hosts' white hats, these children enjoy a shipboard holiday at Yokosuka.

Family roughhouse pits two sailors against their dog in the enlisted men's quarters on Guam. Regulations permit men to decorate their rooms, a vast improvement over the drab barracks of World War II. Sailors capture the young of the island's wild dogs; they call the puppies "boonies," short for boondocks, or back country.

Christmas mail arrives aboard *Yorktown* via COD, the Navy's efficient carrier on-board delivery service. Blue-shirted plane pushers unload the sacks, less than a week en route from home.

Passing out cigars on the flight deck, plane captain Warren E. Kemery celebrates the birth of a daughter in Oregon.

Yorktown's Elevator Becomes the Stage for a Standing-room-only Performance

Ship's engineers raised the lift several feet, transforming hangar deck into orchestra and flight deck into balcony. This USO dancer captivates an audience at Subic Bay in the Philippines.

KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

1,800 yen I will give from my pay
To the man making contact for a sub
kill today.

Well, 1,800 yen won't buy much time in the hot spots of Yokosuka, but the competitive spirit in the American sailor is easily aroused. They knocked off *two* submarines the next day, and the men responsible on both destroyers, the *Walker* and the *Picking*, got their prizes by helicopter. The signal that came back from the *Walker* showed the spirit Admiral Colestock brought to his team.

"Thank you for improving morale situation for Chief Jones in particular and morale for *Walker* in general."

Author Drops to Sub in a Sling

But to get back to my personal thrill of a lifetime. I had seen the HUK operation from above, I wanted to experience it from below. And Admiral Colestock, after a speculative glance at my girth, agreed to have me lifted by helicopter to the submarine *Sterlet*.

It was raining, it was cold, and visibility was low. My helicopter searched for half an hour before we located the surfaced sub. Then, while we hovered overhead, the crew chief helped me into the sling, a bright-yellow canvas inner tube.

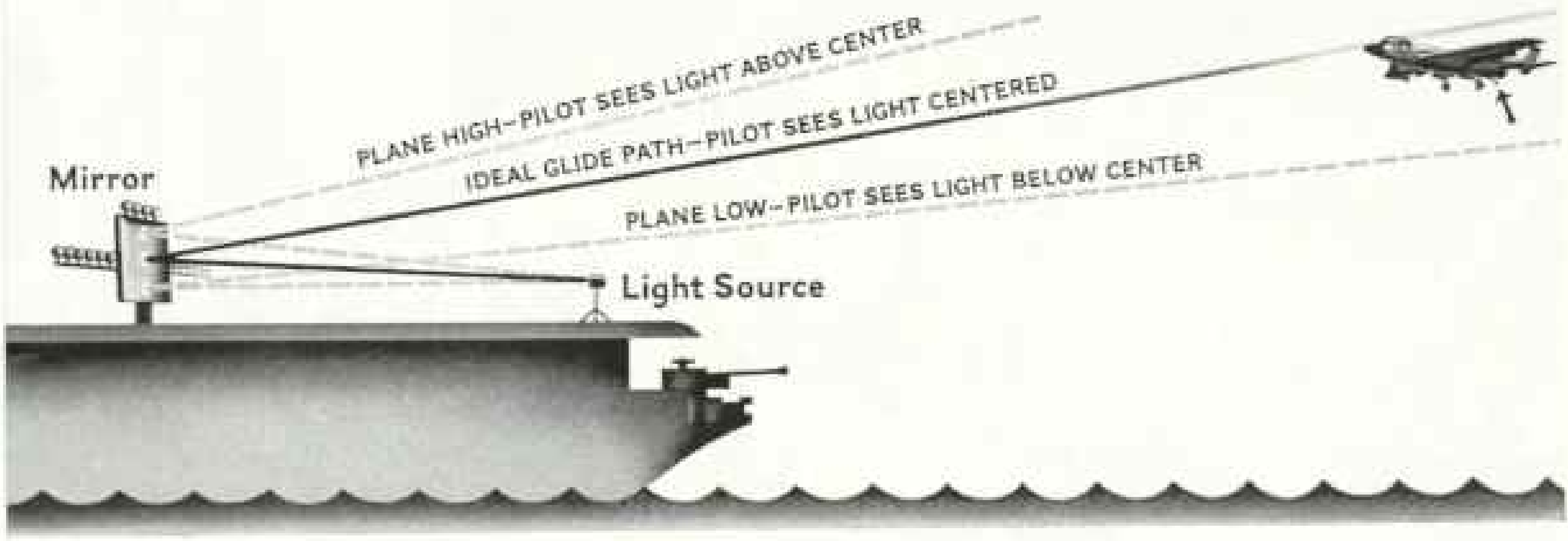
Carefully he hooked it to a winch above the whirlybird's open door. I stepped out into space, dangled aimlessly for a moment, and then was lowered gently and—strange as it sounds—in comfort and with considerable exhilaration, to the tossing deck of the sub.

Lt. Comdr. Haydn Owens, Jr., captain of the *Sterlet*, led me below to the wardroom.

Hatches were secured and we submerged. I had never been under water in a submarine, and I expected to be frightened. Instead, sitting in the cozy wardroom and sipping a mug of coffee, I felt as secure and comfortable as if I were in my own study.

"When we pick up the task force," the captain told me, "we'll try to slip in between

(*Continued on page 335*)



Pilot's-eye View: a Looking-glass Landing at 150 Miles an Hour

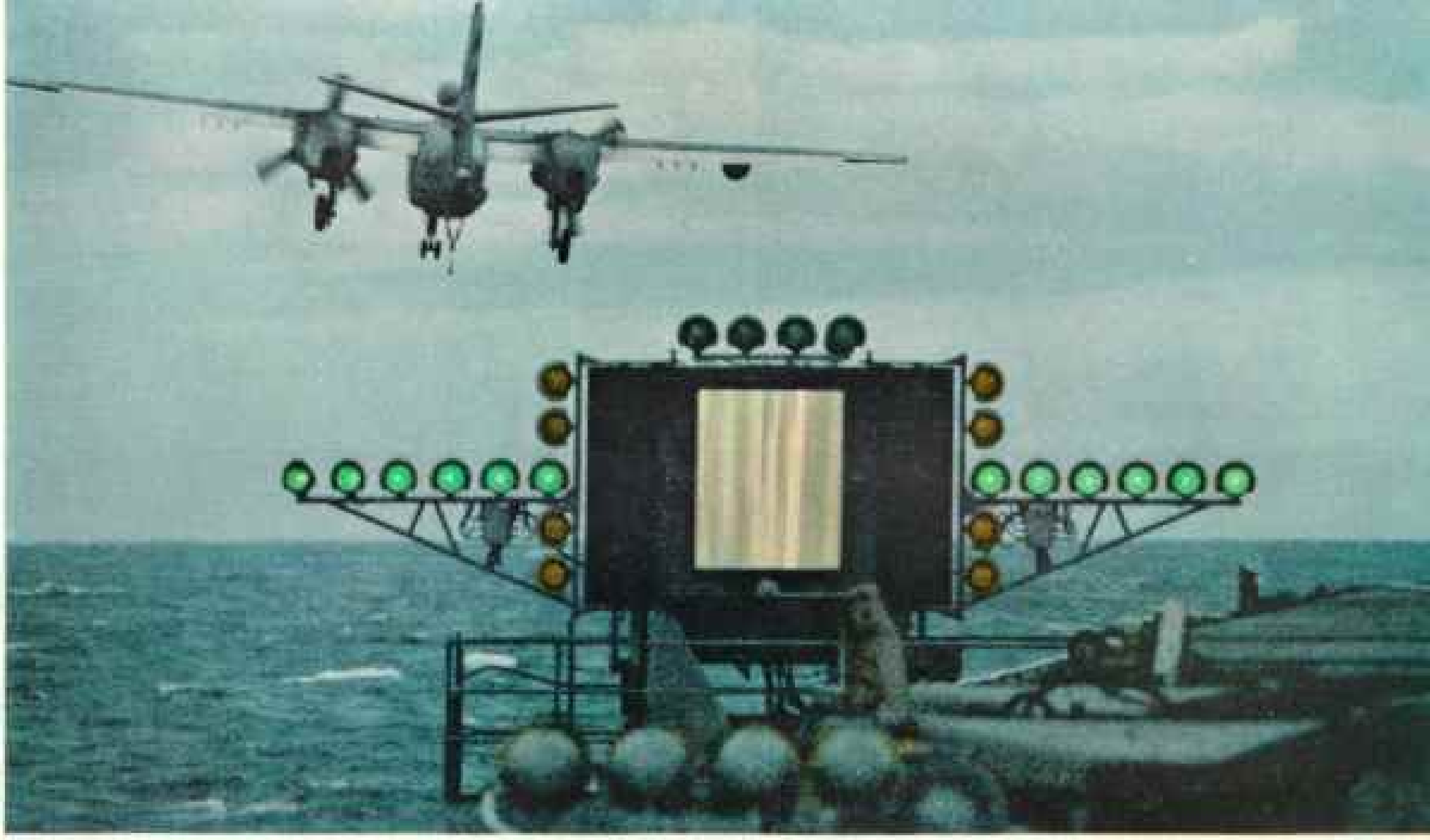
Carrier pilots, who once depended on a paddle-wielding signal officer for safe landing, today aim for the flight deck by an ingenious system of lights reflected in a mirror. Diagram and photographs on these two pages demonstrate the new system that has helped cut fatal accidents to less than one in 10,000 flight hours.

As a pilot nears the ship (lower photograph), he spies the "meatball," a pinpoint of orange light reflected in a four-foot-square mirror at the left of the angled runway. To stay on the descending glide path, he adjusts his rate of descent to align the image with horizontal rows of green lights flanking the mirror. If off the center line of the carrier deck, he is warned by radio by the landing signal officer in yellow at deck's left edge (center picture).

If the pilot is making a poor approach, the lights around the meatball mirror flash red, signaling a wave-off. Although the slower-landing (100 m.p.h.) Grumman S2F above, its tail hook dangling, has just taken a wave-off, the red warning lights bordering the mirror have already gone dark in readiness for the next plane, normally less than 30 seconds behind.

To take the dramatic aerial views at bottom and center, photographer Garrett hunched in the copilot's seat of a plane on the final approach.

Arrow in diagram points to a plane's hook set to engage an arresting cable on deck.

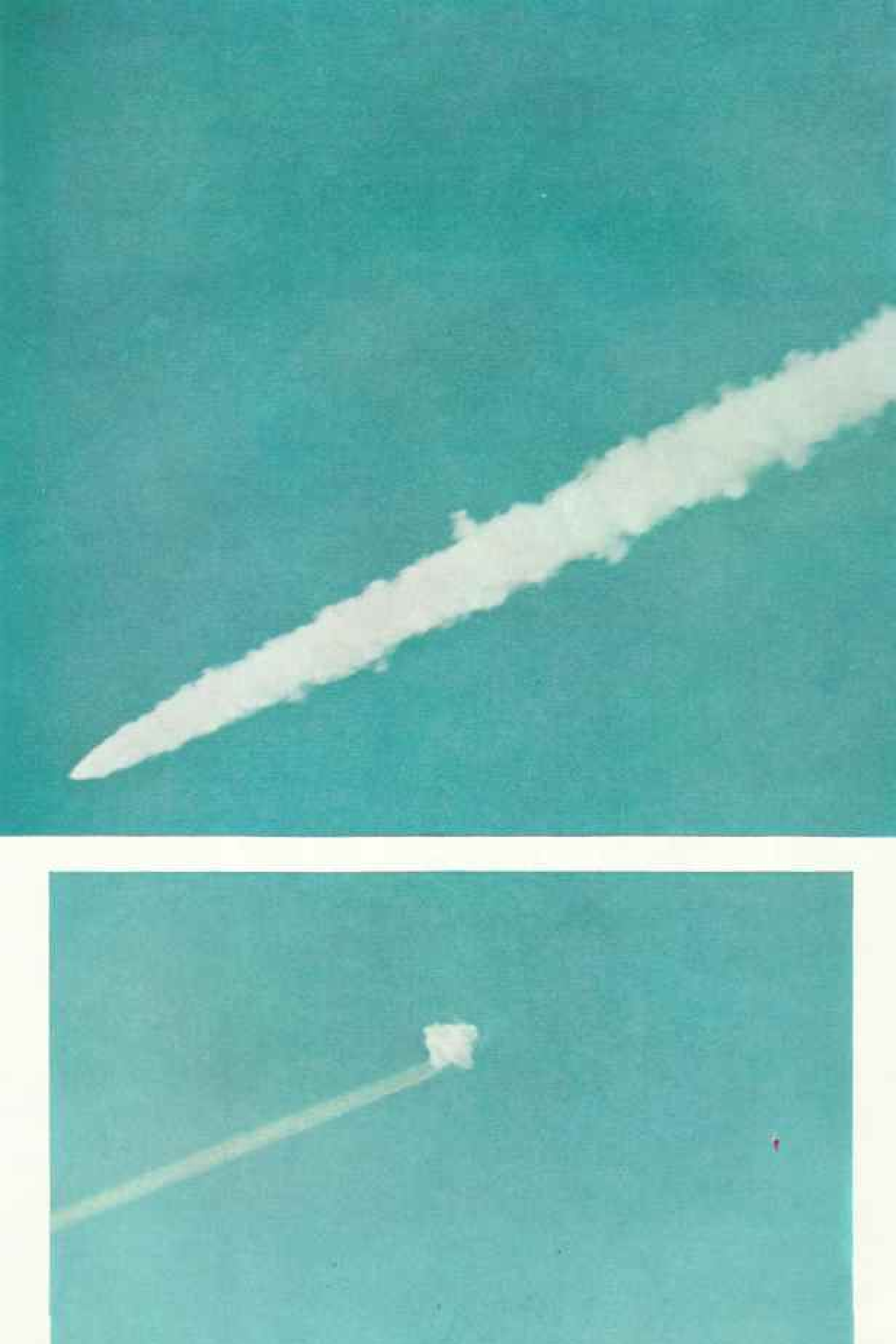


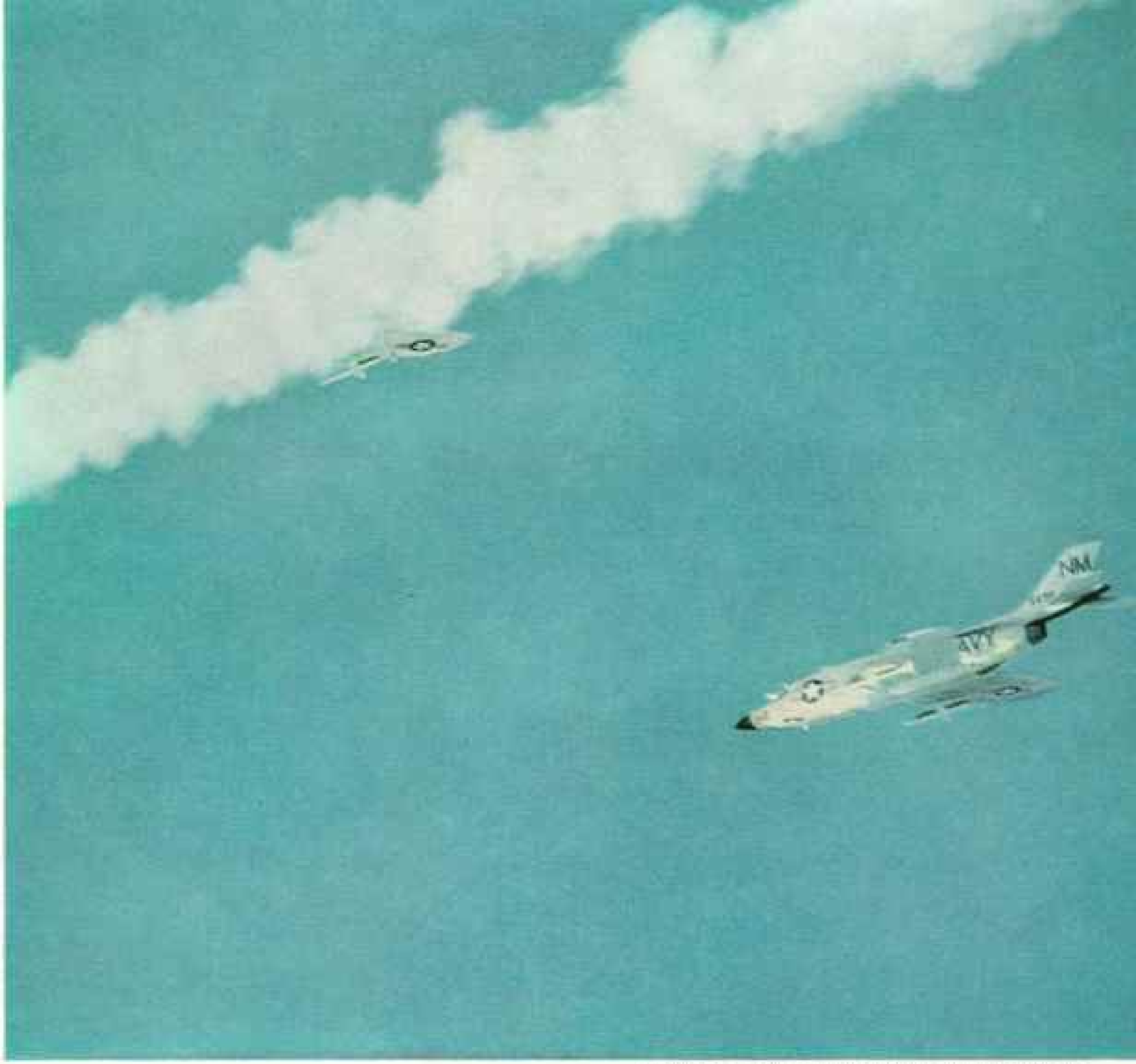
"Mach diamonds"—shock waves produced by jet exhaust—spout from an F3H fighter as the pilot cuts in his afterburner. This device, used for bursts of emergency power in take-offs or duels with enemy fighters, dumps fuel into an auxiliary firing chamber, enormously boosting the jet's thrust.

One pilot likened the afterburner to the passing gear on a car. "The only difference," he said, "is a few hundred miles an hour."

Twilight Reigns Within the Glowing Walls of a Carrier's Nerve Center

The combat information center houses the ship's fighting brain, digesting data on enemy movements and deploying defending forces. This view shows the bewildering array of equipment aboard U.S.S. *Bennington*. A radar operator (left), his scope scanning the skies for miles, relays information to the air control officer (with telephone), who constantly shifts the carrier's planes to meet the attack. Seaman at the transparent plotting board records movements of enemy aircraft, known as bandits, and the fleet's own aircraft, like the one at left, called friendlies.





KODACHROMES BY W. E. GARRETT, NATIONAL GEOGRAPHIC STAFF © N.G.S.

Sparrow III, Aerial Killer, Streaks for the Target on a Shaft of Smoke

Radar guides the newest airborne missiles, enabling pilots to knock out enemy planes they may never see. These extraordinary photographs record the death of a target drone by a supersonic Sparrow III fired from a Demon jet. At launching, the 12-foot missile cloaks the parent ship in its wake.

Sparrow's blast (opposite) leaves an expanding puff of smoke. Debris from the drone, an obsolete World War II Hellcat, skitters across the sky.

Shattered drone, in red paint, plummets past another jet carrying two more Sparrows.

Wings Lifted High, *Midway*'s Attack Force Roosts at Sunset on the Flight Deck

Jet engines quiet, catapults idle, the ship prepares its fleet of Douglas A3D Skywarriors for a night operation in the Pacific. Mechanical mules patrol

KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

the deck, maneuvering the heavy attack bombers into launching pattern. Plane captains groom their ships, making last-minute checks. Soon the roar of warming jet engines will shatter the calm, and the command "Launch aircraft!" will once more engulf the carrier in the tumult of take-off.

NAVY
VAH-6
CVG-14

two escorts and work up to the *Yorktown*. If we cannot do that, we'll try to slip in behind the end destroyer."

An hour later, snug at 200 feet below the surface, we listened in the sonar room while the task group passed us by. The sonar operator, listening to the propellers of the destroyers above, called them by name, identifying each by some peculiarity of sound. Just as it appeared we had escaped detection, the trailing destroyer—I later learned it was equipped with a new type of detection gear—turned and churned in our direction.

Ships Play Cat-and-mouse Game

Grimly the order to dive was given. At 300 feet we began a game of cat-and-mouse—a game to us that day, but a macabre life-and-death matter in real warfare. Again the strange language of men in battle:

"Right full rudder."

"Steady at zero two zero."

It was no use. The sonar man spoke quietly: "Destroyer closing off port quarter."

We could all hear it, the growing throb of propellers bearing men who sought our blood.

"He's coming over!"

A single practice depth charge, carrying only a few ounces of explosive, sounded harmlessly a hundred yards away. We waited breathlessly. But the team above was on us now. Right rudder, left rudder, all ahead full—all were to no avail.

Again the voice of the sonar man. "Escort closing fast bearing 215."

Another charge, this one closer. The captain tries more evasive tactics. Then once again the oncoming surge of the hunter. This time a pattern of five charges.

The first three are close, but the captain says they might not be fatal. Then two more, flush on our hull. Even though they're only practice shots, they ring throughout the vessel. No use pretending now; we've had it.

We surface, and Lt. Commander Owens acknowledges that he and his crew are technically dead. The helicopter picks us out of the fog, I inch my way along the slippery deck, and the winch-drawn cable lifts me through misty space to the helicopter.

Discouraging to be on the losing side, but I remember the captain's parting comment: "Every time they get me I feel better."

Aboard the *Yorktown* Admiral Colestock sustains a bristling, war-ready alert at every hour and in every kind of weather. Yet strangely enough it was this same ship that a few days later brought sharply to my mind Admiral Burke's remark: that the purpose of our Pacific Fleet was to influence people not through fear, but respect. It happened, appropriately enough, in Christmas week.

A fire swept the town of Koniya on the little island of Amami O Shima in the Ryukyus, south of Japan. More than 6,000 people were left homeless. Admiral Kivette, hearing of the disaster, flashed a signal to the *Yorktown*, and her war games were put aside.

With seven escorting destroyers, the HUK flagship steamed for 19 hours to the stricken island. Within a few hours after anchoring, the American vessels had put ashore 14 tons of food and medical supplies, tents, blankets, and clothing. A lot of that clothing was donated by the sailors of Task Group 70.4, the same young men who had been so busy practicing how to kill each other off when I was with them ten days earlier.

The crew of the escort destroyer *Taylor* dug into their own pockets for 54,720 yen ($153) to help out in the relief work.

Yorktown Wins a "Well Done"

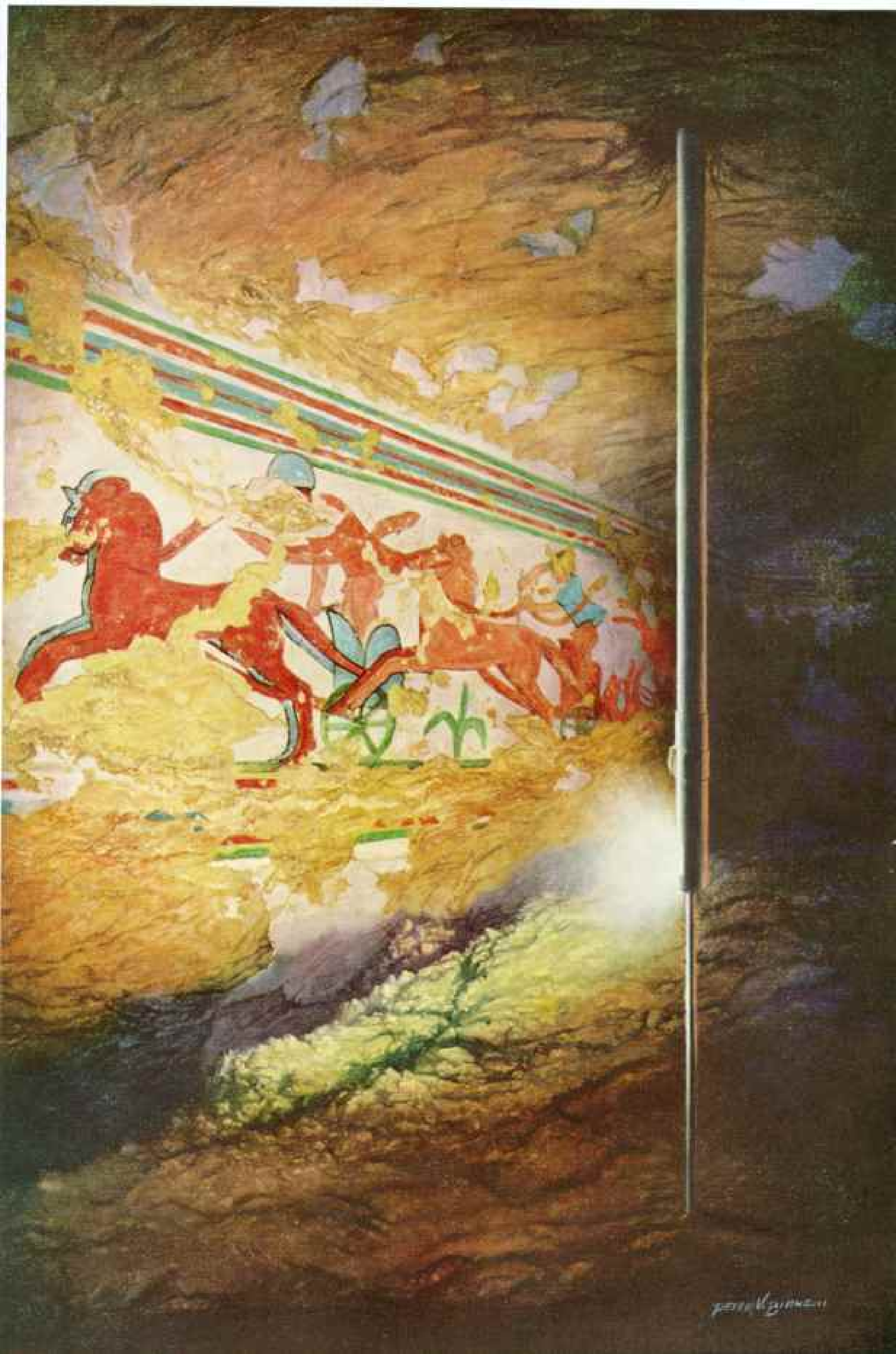
A few days later Admiral Kivette received a radiogram from Douglas MacArthur II, our Ambassador to Japan. This is part of it:

> MY OWN TASK, AS YOU KNOW, IS TO WORK FOR CLOSER FRIENDSHIP AND CO-OPERATION BETWEEN JAPAN AND THE UNITED STATES. YOUR TIMELY ACTION HAS GREATLY CONTRIBUTED TO THIS TASK, AND I AM GRATEFUL TO YOU. WILL YOU EXPRESS MY APPRECIATION TO ALL HANDS AND CONVEY TO THEM "WELL DONE."

When Bill and I started on this assignment, I had read a Navy press release which referred to the personnel of our Pacific Fleet as "combat-ready ambassadors." A nice phrase, I thought, but slightly exaggerated. Now I am not so sure.

Tail-hook Unhooker Scrambles to Free a Bomber from the Arresting Cable

Violence marks the carrier-based aircraft's return as well as its departure. The sudden jolt of landing snaps a pilot against his shoulder harness with two or three times the force of gravity. Flyers describe the touchdown as a "controlled crash." This flight-deck crewman straightens a kink in the cable, permitting the pilot of the A3D to retract the black-and-white-striped hook. Radar bulb in the tail controls the rear turret.



A tiny camera pierces ancient tombs to discover 2,500-year-old treasures

Periscope ON THE Etruscan Past

By CARLO M. LERICI

Vice President, Lerici Foundation of the Milan Polytechnic

ONE MARCH day last year the quiet of my office in Rome was broken by the irregular long-distance ring of my telephone.

"You are being called from Tarquinia," said the operator in a voice of urgency.

At once I was all ears. For more than two months our geophysical prospecting team had been exploring the ancient Etruscan cemetery of Monterozzi, 40 miles northwest of Rome near Tarquinia. There, on a gentle hillside, the predecessors of the Romans buried their dead, decorating the underground tombs in rare instances with painted scenes of a luxurious life that vanished about the time Christ was born.

For long weeks the daily reports to my office had told the same story: more tombs located by our new electrical probing techniques; more borings made into the hidden vaults with our special "photographic drill." But nothing unusual —no valuable furnishings, no wall paintings.

Now Franco Brancaleoni, leader of our field party, was on the wire. His voice was so full of excitement that at first I did not recognize it.

"Is something the matter?" I asked.

"It looks as if we've done it," I heard him say.

"You mean you've found something new?"

"The film of tomb 53 . . . men . . . horses. . . . Please come as soon as possible."

Early next morning, in Tarquinia, I eagerly examined a strip of miniature photographic film. We had indeed found men and horses.

PED. PETELLINI FROM M.E.

Photographic eye probes an Etruscan city of the dead. This watertight aluminum tube holds a miniature photoflash unit and a camera the size of a cigarette lighter. Using such tools, Italian scientists systematically explore the sprawling cemeteries of the Etruscans, powerful, luxury-loving rulers of much of Italy before the rise of Rome. Technicians photograph hundreds of tombs to find a rare few whose painted walls or rich furnishings speak mutely of the people who left them.

Tomb of the Olympiad (opposite), one of the century's most important Etruscan finds, lies near ancient Tarquinia. NATIONAL GEOGRAPHIC artist Peter V. Bianchi portrays the moment when the electronic flash shatters 2,500 years of darkness, revealing chariots racing in still-vivid color across a frescoed wall.

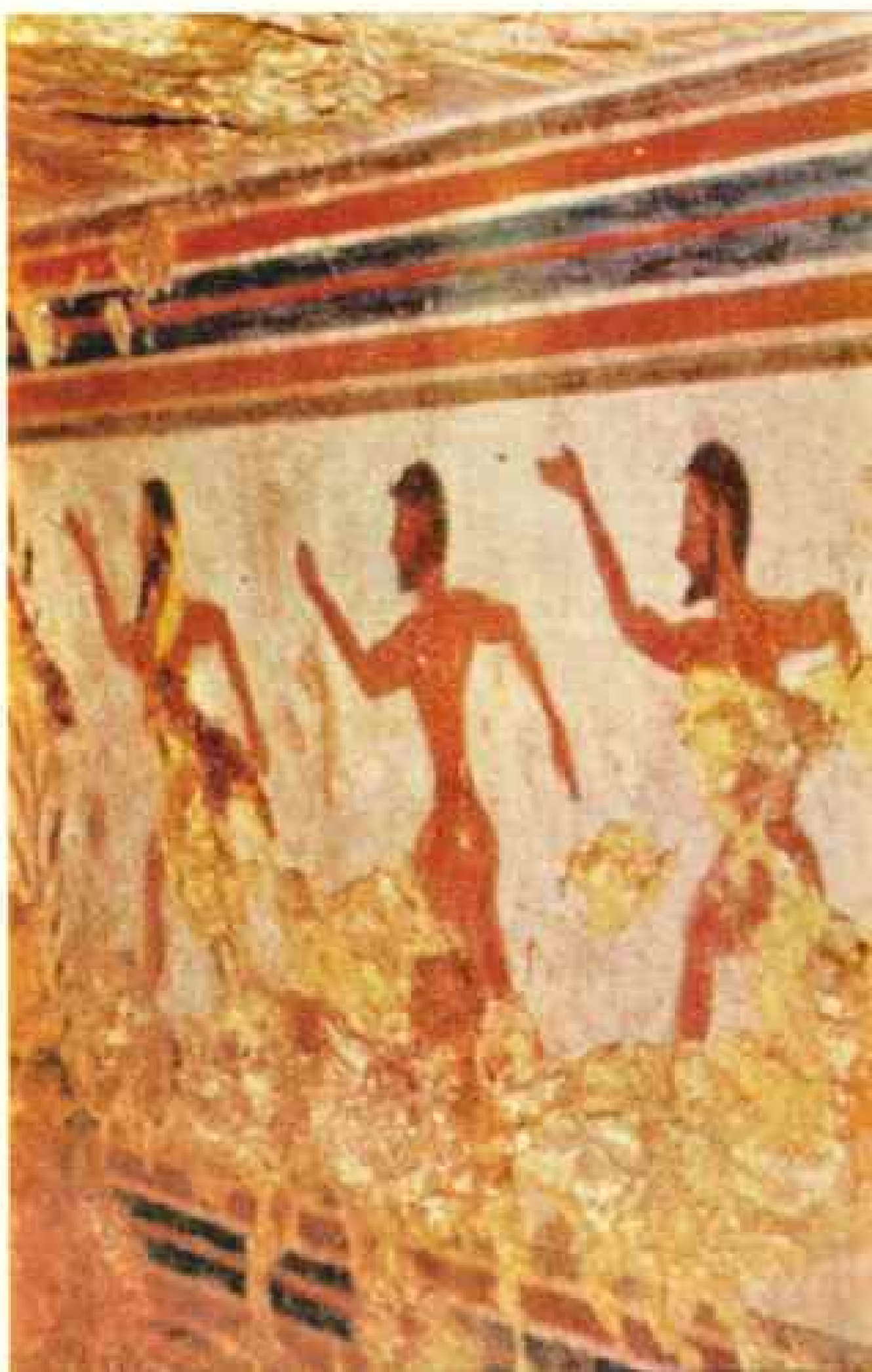
Etruscan Games Live On in the Olympiad Tomb. Charioteers Whip Wild-eyed Horses

To the early Etruscans, death promised only more of life's joys. Sports, dancing, music, and banquets filled their days. Their tomb paintings foretold endless diversion in the shadowy hereafter.

Etruscan art tells much of what is known about its creators. Their literature has vanished, and even brief inscriptions usually defy translation. Their rich civilization between 800 and 100 B.C. bequeathed to Rome, and hence to western culture, a love of games, triumphal celebrations, and life itself.

Miniature photographs (shown actual size, left) taken underground revealed the Olympiad frescoes to investigators on the surface. Flaked by dampness, the paintings date from the 6th century B.C. For safekeeping, they have been painstakingly transferred from walls to canvas.

Lifelike figures charged with energy and realistic detail rank the artist with the Etruscans' best. He painted with bold line and skillful shadings of color on a white plaster base laid over the tomb's creamy rock walls. Perhaps as a humorous touch, he gave the longest beard to the leader of the foot race.



Past a Spilled Competitor. Athletes (Below) Race, Jump, and Hurl the Discus

ITALIAN DEPARTMENT OF ANTIQUITIES

Head in a Bag, a Gladiator Fights His Foe's Rope and Savage Dog

Etruscan funeral games included sacrificial combat, foreshadowing Roman spectacles in the Colosseum. This famous mural appears in Tarquinia's Tomb of the Augurs; badly damaged Olympiad paintings echo the scene. Masked man on left, called *Phersu*, encourages the hound to bite his entangled adversary, who tries to club the beast.

There were pictures of athletes running and hurling the discus. Others showed horses galloping in a spirited chariot race—all across tomb walls that had closed upon some Etruscan personage two millenniums ago. The paintings were still vividly colored and seemed in fair condition.

I can scarcely convey the tremendous emotion these tiny photographs of a buried room gave me. Tarquinia is famous for its painted crypts—the Tomb of the Funeral Couch, Tomb of the Lionesses, Tomb of the Augurs—all discovered in the 18th and 19th centuries. Now we had found another—the first important painted sepulcher since the classic Tomb of the Bulls was opened at Tarquinia in 1892.

Armed with our photographic evidence, I hurried back to Rome to consult my friend Prof. Renato Bartoccini, Superintendent of Antiquities for Southern Etruria. Together we arranged to excavate the tomb. Our film even showed its entrance, so that opening it would require a minimum of digging.

Tomb of the Olympiad we named our find, in honor both of the athletes portrayed on its walls and of the Olympic Games to be held in Italy in 1960.

I was elated, not only because our discovery surely would add to the treasury of knowledge of the early Etruscans, but also because it was the first real victory for the revolutionary new methods we were bringing to archeological exploration.

Scientists "See" into the Earth

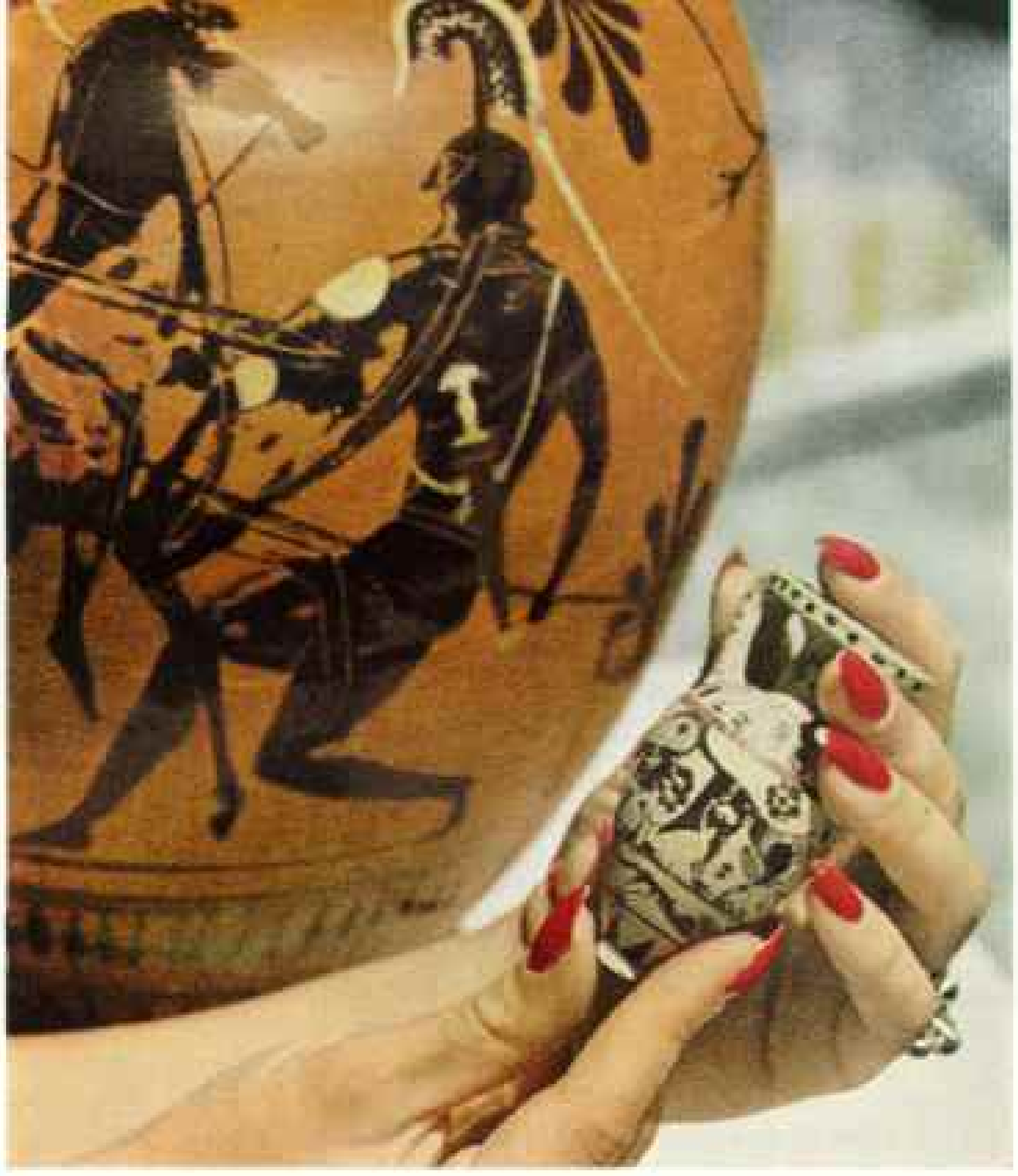
In our work we are making use of aerial photography, electrical "tomb detectors," and special underground photographic apparatus, as well as a periscope, by which to see into the earth and record the interiors of buried chambers.

Our photographic drill consists of a three-inch tube fitted with a tiny Minox camera, originally used in wartime espionage work. It takes film only slightly larger than that of 8-mm. home movies (page 338).

A high-intensity photoflash unit behind

Magnificent Pottery Solaced the Dead

For life beyond the tomb, the Etruscans hewed out rock replicas of their earthly dwellings and filled them with rich furnishings, jewelry, and weapons. Their finest ceramics, many imported from Greece, were ornamented with soldiers in plumed helmets, prancing horses, and stylized oxen. This tiny ewer perhaps held a noblewoman's perfume.



Shattered wine jars take shape under the hands of a restorer, who fits the pieces together as he would a jigsaw puzzle. He fills gaps with white gypsum that he later tints to match the original. Many of these jars bear the names of their Greek creators. Glass bottle holds glue.

ITALIAN DEPARTMENT OF ANTIQUITIES (ABOVE); FED. PATTELLANI (OPPOSITE ABOVE); AND W. ROBERT MOORE, NATIONAL GEOGRAPHIC STAFF

another window in the tube provides light. The tube is lowered through soil, rock, and the roof of the tomb itself, in a hole previously bored by an electric earth drill. By remote control we can then trigger the light and camera, advancing the film after each exposure. In 12 shots, turning the tube 30 degrees after each, we can photograph the entire interior of the tomb.

With our "Eye of Minos," as it has been dubbed, we thus not only can tell if a tomb is empty or hopelessly disintegrated, forestalling useless excavation, but also can make an exact photographic record of the contents of a sealed chamber before it is opened to the light of modern day.

Etruscans Buried History with the Dead

The Etruscan tombs have often been called "tombs of gold" for the treasures of jewelry, sculpture, urns, and other objects these shadowy people buried with their dead.

Much of what is known about the Etruscans indeed comes from these sepulchers—how they lived, their religion and art, the music, dancing, and athletic games they enjoyed.

Their civilization, we know, flourished along the western shore of Italy from about the 8th century B.C. until it was overwhelmed by the Romans between the 4th century B.C. and the beginning of the Christian Era.*

The Etruscans grew strong on trade, mining, and craftsmanship in iron, bronze, gold, and other metals. Their loose confederation of 12 city-states ruled much of Italy from south of Pompeii to the valley of the Po. They developed a distinctive art of elegance and originality and gave the Romans many rites, ceremonies, and symbols of authority, such as the fasces and the toga.

With powerful fleets, the Etruscans dominated the Tyrrhenian Sea for centuries against the Greeks and Carthaginians. At the same time, they traded extensively with the Greeks, and their artists borrowed from Greek styles.

Yet scholars still do not agree on just who the Etruscans were, whether immigrants from Asia Minor or basically a native Italic people. Nor is their language yet fully understood, though individual words and an Etruscan alphabet, linked to the Greek, are known.

I am an engineer, not a trained archeologist. But for some years now I have been fascinated both by the mysteries of the Etruscans and by the challenge of using modern geophysical techniques—newer methods of searching for underground ores, oil, or water—to hunt for buried clues to the past.

One such technique is the use of aerial photography, by no means new to archeology. A few years ago, however, I learned of the work that an English archeologist, John Bradford, was doing in mapping ancient sites in Italy from RAF wartime air photographs. It was astounding to me how much could be learned of what lies beneath the earth's surface by studying shadings of the soil, relative

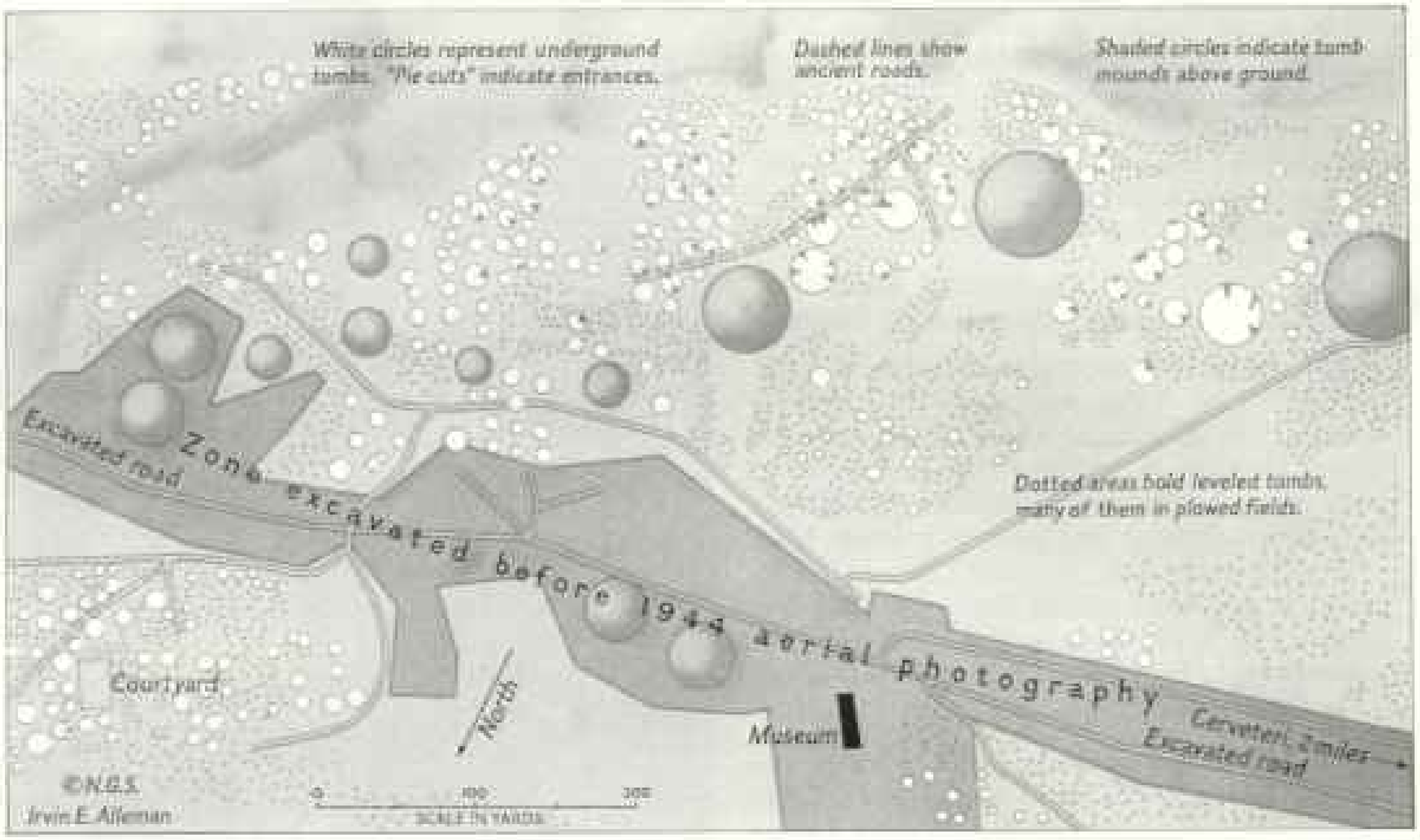
* In "Ancient Rome Brought to Life," by Rhys Carpenter, NATIONAL GEOGRAPHIC, November, 1946, an Etruscan funeral and festival are depicted on pages 572-5.

"Eye of Minos," journalists' nickname for the Minox camera-tube, gives archeology a revolutionary new technique. The tiny camera is mounted behind the round window; the opening at right shields an electronic flash. Franco Brancaleoni, leader of the field party, adjusts wires by which he controls film, shutter, and light while standing on the surface.

Peering into an Underground Sepulcher, the Camera Sees a Massacre in Stone

For months the author's team drilled into the cemetery of Vulci, searching for unlooted tombs. At last, boring into a five-room crypt, they hit treasure. Here the sudden glare of the periscope's photoflash reveals a spectacular stone sarcophagus graven with a scene from Etruscan mythology. Winged Charun, at left, a grim adaptation of the Greek ferryman on the River Styx, oversees punishment in the underworld. His minions, gripping two maidens by the hair, put them to the sword.

Beneath a black cloth, geophysicist Lerici looks into a burial vault sealed some 2,500 years ago. His specially designed earth periscope, casting its own light into underground chambers, slides in a test hole bored by the spiral bit on the ground. Piles of earth behind the team mark tombs opened for study.



ROYAL AIR FORCE PHOTOGRAPH; DRAWING ADAPTED FROM A MAP BY JOHN BRADFORD

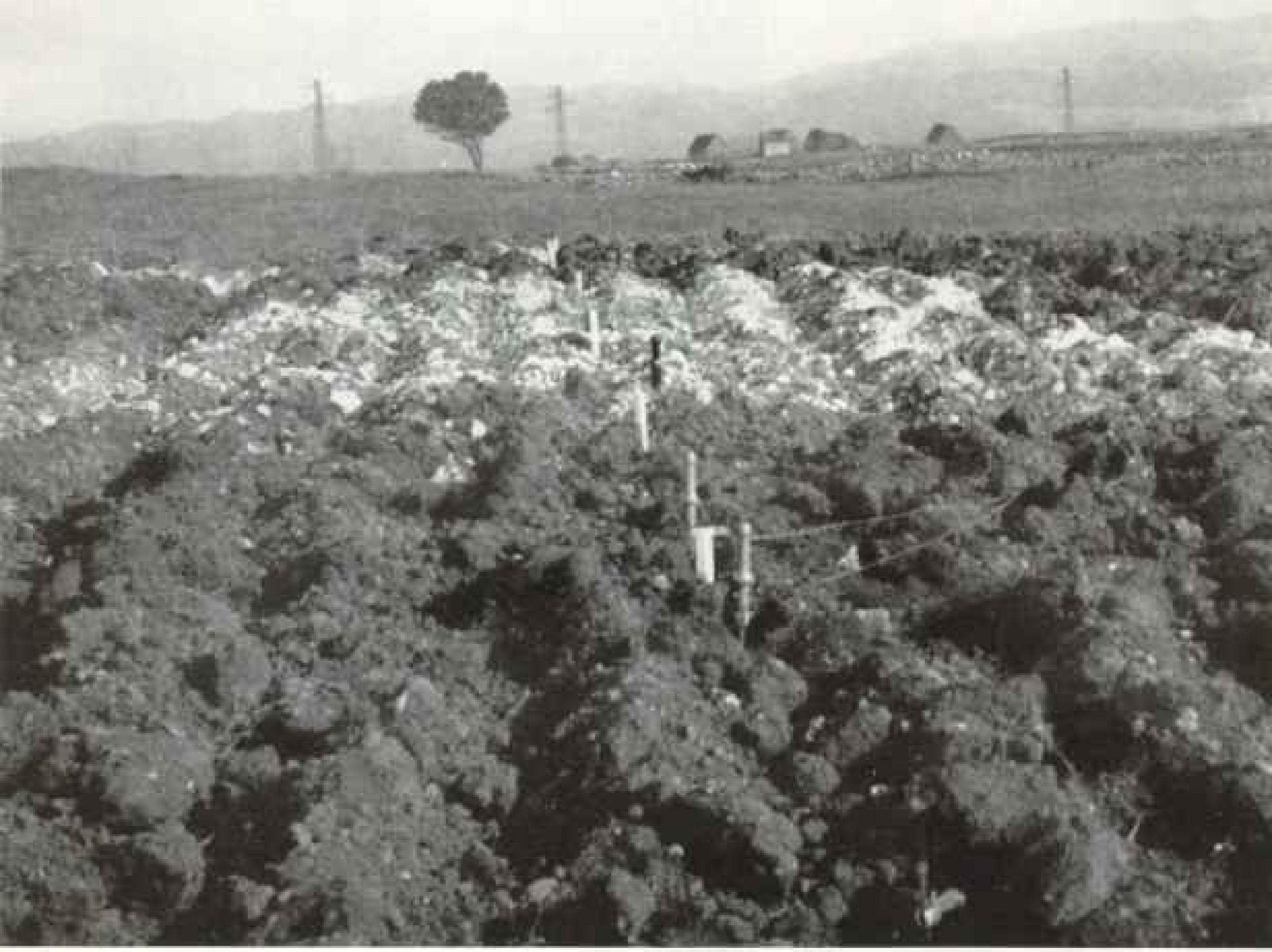
Banditaccia, a City of Tombs, Seems Pitted with Bomb Craters

Archeology benefits vastly from aerial photographs. City outlines, vanished roads, or buried ruins invisible from the ground show up as on an X ray.

British flyers photomapped much of Italy during World War II. Taken near Cerveteri in 1944, the RAF view below focused attention on previously unknown tombs and enabled cartographers to draw maps such as the one at left. Scattered stones and variations in the texture of grasses provided clues to crypts beneath. Restored tombs and cemetery lanes flank the modern road slanting across the necropolis.

Studying aerial photographs, the English archeologist John Bradford (center) mapped ancient landscapes from the England of Roman times to the street plan of classical Rhodes. His work in Italy first interested the author (right) in Etruscan exploration.

Etruscan League of 12 royal city-states held sway from Salerno, south of Naples, to Spina at an ancient mouth of the River Po. Etruscan kings, the Tarquins, ruled Rome before the Republic. Tuscany embodies the Etruscan name, and the Tyrrhenian Sea commemorates the country's fabled founder, Tyrrhenus.



growth of vegetation, shadows and markings revealed in the raking light of dawn or sunset.

Thanks to new films and filters and three-dimensional viewers, aerial pictures can almost be said to "talk." Under favorable conditions they afford a veritable X ray of features often invisible from the ground (page 344).

Electricity Finds Buried Tombs

Aerial photographs are often not enough, however. The markings they show must be found on the ground, a difficult task at best, and sometimes impossible. Even when located, they may have been changed or blotted out entirely by farmers' plows. But here the geophysicist's tools can be used.

Earth conducts electricity in varying degree, depending upon the nature of the soil and any underground irregularities. By sending a current along a predetermined path and by measuring differences in electrical potential at given points, it is possible to detect irregularities or buried features, to "see" into the ground. Thus hidden rocks, walls, terraces, roads, or tombs may be found and pinpointed.

With a team from the Milan Polytechnic in the fall of 1954, I first tested this means of finding tombs in ancient cemeteries in a region northeast of Fabriano, in central Italy.

Aerial photographs showed a number of circular marks similar to those of the famous Etruscan cemeteries of Cerveteri, northwest of Rome. Though no sign of these markings could be seen from the ground, we pegged out a sounding line we felt sure passed through one of the circles.

We were lucky. At the precise point the photograph seemed to indicate, our instruments showed a marked electrical resistance. We dug, and under a layer of large stones about three feet down, in a long-collapsed rectangular trench, we found pottery fragments and the burned bones of a woman, buried there in a time long forgotten.

Several more tests were equally successful. We had found our first tombs.

In December, 1954, I asked for a meeting at the Department of Antiquities in Rome, and there outlined a program for utilizing these new methods of exploration. Most of the superintendents of antiquities for the various regions of Italy either took part in person or promised their support.

Since then have come further experimental work and full-scale explorations, at Cerveteri, at Vulci, and at Tarquinia, one of the very

Electric Currents Pinpoint a Tomb Beneath Its Plowprint of Rubble

As roofs for their underground tombs, the Etruscans carved circular platforms in soft rock and mounded them with the excavated earth and stone. Today, leveled by centuries of cultivation, these tumuli leave grayish patches of powdered debris in Tuscany's orange-brown soil. But plowing in the same direction year after year has so shifted the residue that surface features no longer serve as accurate guides to the tombs.

The author, an engineer, uses geophysical instruments to locate sepulchers precisely. Here, employing a technique not unlike that used by oil prospectors, his team tests electrical resistivity of the soil near Cerveteri. Any hidden object produces a telltale variation. Cables connect the instrument-bearing truck with a line of electrodes driven into the ground.

An earth drill powered by a portable generator probes a spot chosen on the basis of geophysical readings. Mr. Lerici, kneeling, and an assistant study the potentiometer.

earliest of Etruscan city sites. We have tested not only electricity but magnetism, seismic shock waves, even radioactivity as aids to our subterranean search.

From the beginning we needed an easier means than digging to explore the underground structures revealed by our geophysical instruments. With a portable power drill, we could quickly bore a small test hole 15 to 20 feet deep, sufficient to reach any buried tomb.

In our workshops we then built our camera probe. Photography, however, was time consuming and often wasted effort, since many of the sepulchers were empty. So we had a specially designed periscope built for us by the Nistri optical workshops in Rome, equipped with a powerful light by which we could inspect tomb interiors (page 343). With a camera attachment we could take pictures directly through this periscope as well.

We were amazed to find, as our work progressed, the extent to which Etruscan tombs have been opened and rifled by clandestine diggers in both ancient and more recent times. In 1957, while exploring the necropolis of Monte Abbatone, near Cerveteri, we estimated that more than 300 sites had been excavated and robbed in the last 10 years. Bona fide archeologists working here in the same period had opened an average of only one tomb a year. These figures represent a remarkable, if disgraceful, success for private initiative.

Of the more than 500 tombs we located and investigated at Cerveteri, nearly all had been opened at one time or another, some many times, either in antiquity, during the Middle Ages, or in recent years.

In contrast to present-day plunderers, the early tomb robbers sought only jewelry and precious metals. They were not interested in tomb furnishings and left behind much useful archeological material.

Clandestine looting today, however, not only costs Italy billions of lire and often irreplaceable treasures of art, but also denies archeologists the opportunity to study many cultural objects in their original sites.

The Tomb of the Olympiad, for example, was opened by robbers at some unknown time and then crudely closed again to conceal their illicit digging.

Ancient Frescoes Saved on Canvas

When we reopened the tomb at last, we found its precious frescoes in such fragile state that they could not be preserved where they were. The loamy limestone walls had absorbed moisture over the centuries, and in places the paintings had cleaved away and fallen to the floor.

But under the able guidance of Prof. Cesare Brandi, director of the Central Institute for Restoration, these fragments were collected, the walls cleaned, and the frescoes transferred to canvas, much as experts can remove a rare

Husband and Wife Recline Side by Side in Death, as They Did in Life

Bold sculpture adorns many objects found in the burial vaults. The funeral couch was a favorite theme of Etruscan artists.

This sarcophagus, preserved in Rome's Museum of Villa Giulia, attests the equal status given to Etruscan women. Scandalized Greeks and Romans, who sequestered their gentlewomen in the home, considered such social freedom immoral and barbaric.

painting from its disintegrating base and transfer it to a new one.

Even damaged, the brilliant scenes that first met our eyes in the tomb more than repaid us for our long search.

The wall to the left of the entrance was filled by a group of boxers and a dramatic line of four two-horse chariots in a wild dashing race (page 338). Here the lead charioteer turns anxiously to watch his pursuers, while the third whips his team to a frenzied gallop to pass his rivals. And the last has met disaster, the driver hurtling through the air, one horse fallen to the ground, legs tangled in the harness.

On the right wall the artist sketched a desperate scene that appears also in the famed Tomb of the Augurs (Etruscan priests or diviners), in Tarquinia: a bloody contest between a man, his head in a bag and armed only with a club, and a ferocious dog held on a leash by a man wearing a peculiar high conical hat (page 340).

Near by, in the new tomb, a discus thrower, broad jumper, and three foot racers are frozen in the graceful rivalry of their ancient tournament. On the tomb's rear wall, beside a painted doorway, cavort groups of male and female dancers.

Olympiad Artist Possessed Rare Talent

Since I am not an expert in ancient Etruscan art, I can only speak of the thrill I felt when I first looked at these scenes which an unknown artist had created with firm, sure strokes and broad sweeps of color.

The appraisal of Professor Bartoccini and his associate, Dr. Mario Moretti, following their careful study of the tomb, is perhaps more significant:

"What distinguishes this from all other tombs in the cemetery, and indeed from any other Etruscan tomb so far discovered, is the remarkable artistic personality of the painter.

"His composition and organization of decoration and his conception of the portrayal of the human figure display a personal quality that was quite independent of the prevailing style. He reveals a skill of draftsmanship, a sense of style, and a feeling for color, which are altogether out of the ordinary."

Experts have deduced, from the paintings and the tomb itself, that they were executed sometime during the second half of the 6th century B.C., at the height of Etruscan power and civilization.

During 1958 and the first half of 1959, in our field work at Tarquinia, we located more than 850 tombs. Among them, besides the Tomb of the Olympiad, was another painted sepulcher bearing a rare representation of an Etruscan sailing craft, with full-rigged mast. We have named it the Tomb of the Ship. Several other vaults contained fragments of paintings and decorations, as well as pottery and other artifacts.

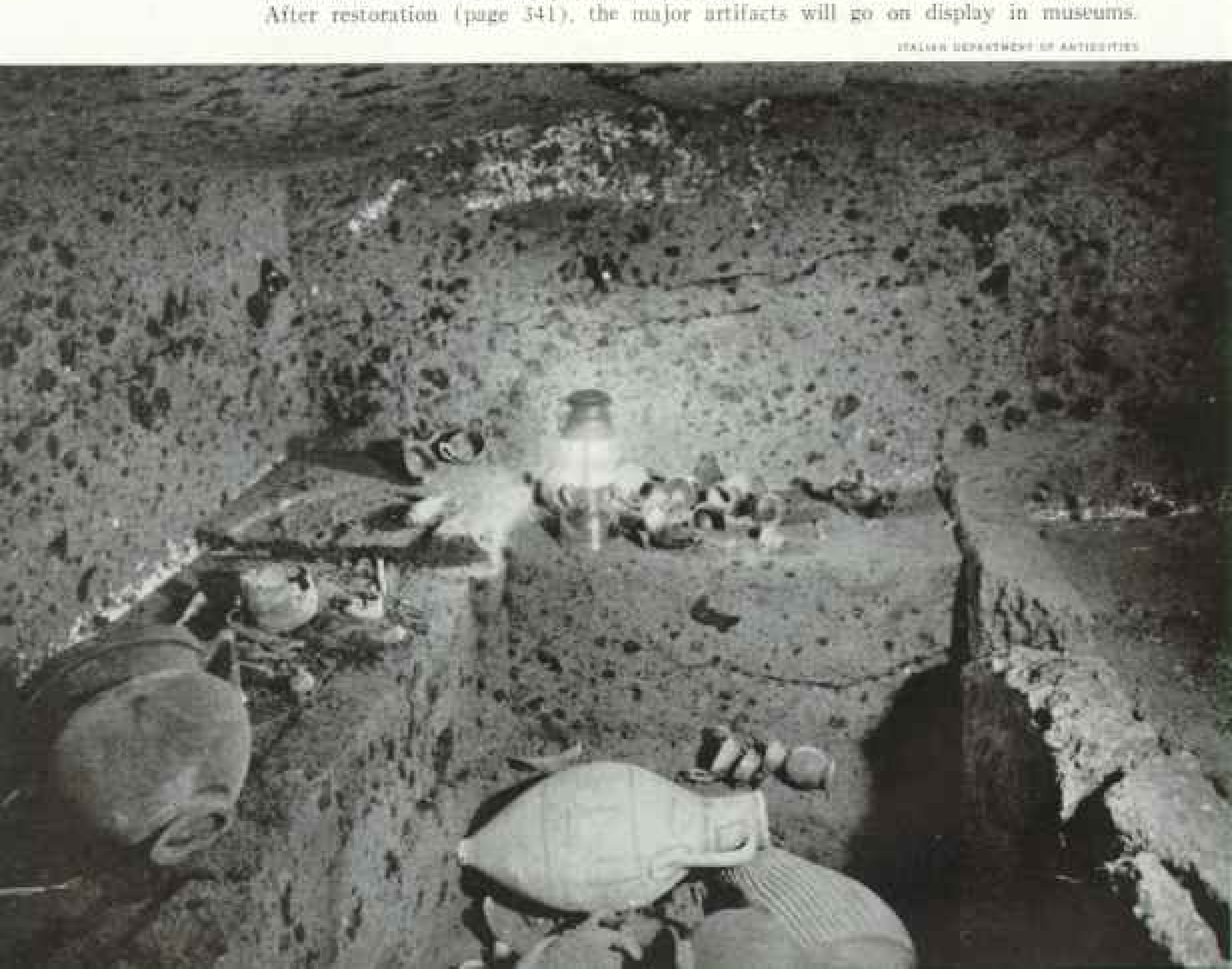
Yet so far we have covered only a small fraction of the necropolis. We would estimate that at least 10,000 tombs lie buried at Tarquinia. It would be a 20-year task for a single team to examine them all.

We feel a sense of great urgency in continuing our work against the irreversible damage of time and tomb robbers. The new techniques we have developed lure us onward, and always there is the hope of more painted tombs and more objects of Etruscan art. Perhaps when you read this, our drill may have penetrated the roof of yet another spectacular tomb, and we will be gazing through our underground periscope at still more lost treasures from the past.

Unopened for 25 Centuries, a Tomb Gives Up Its Treasures

Looters long ago stripped 99 Etruscan crypts in every hundred. This sepulcher at Cerveteri, near Rome, came to light untouched. Stone benches held the bones of a man and woman. Funerary jars and cups appear to have been toppled by earthquakes. After restoration (page 341), the major artifacts will go on display in museums.

ITALIAN DEPARTMENT OF ANTIQUITIES



The Society Reports to Its Members on Russia Today

NO MATTER how you and I may feel about the Soviet Union—about the policies and practices of its political leaders, about their often avowed determination to destroy or subvert the United States of America and all free nations, about the whole doctrine of Communism with its denial of religion and even of God—the fact remains that the Union of Soviet Socialist Republics covers one-sixth of the world's land surface and contains more than 200,000,000 people.

In the official journal of the National Geographic Society, this large and populous country cannot simply be omitted and ignored.

Knowledge is power, and especially since World War II there has been a great and growing demand for accurate information on the Soviet Union. Since December, 1944, when the National Geographic Society published its large 10-color wall map, *Union of Soviet Socialist Republics*, and distributed a million and a quarter copies to its world-wide membership, the plates have had to be returned to the presses five times to fill the orders of interested individuals and governments. This map has been exceeded in popularity only by the maps of the United States and the World.

In response to this demonstrated demand for accurate geographical information concerning the Soviet Union, the National Geographic Society will retire this excellent but old map and replace it with a new and thoroughly up-to-date presentation, both in wall-map size and in two sections specially designed for The Society's growing Atlas Series. The first of these, *Western Soviet Union*, is distributed to 2,400,000 members as a supplement to this issue (see page 408).

In choosing the author for an article on this subject, your Editor and his associates sought an American who could speak and read Russian, was familiar with Russia's past and present, and could view the Soviet Union and its people with a scholar's detachment. Their choice was Dr. Thomas T. Hammond, Associate Professor of Russian History at the University of Virginia.

Dr. Hammond, born 39 years ago in Atlanta, Georgia, worked his way through the University of Mississippi as a journalist and photographer, served as a lieutenant in the U. S. Navy during World War II, and did graduate work at the Russian Institute of Columbia University, where he studied the Russian language and earned a Ph.D. in Russian history.

In Dr. Hammond's article, some of the names and locations have been disguised to protect his sources of information from possible punishment.

—*The Editor*

An eyewitness report by a young American professor of Russian history.

Firsthand Look at

352 The Kremlin's towered wall looms beyond Moscow girls at play; golden cupolas top historic

coupled with an Atlas map of western Russia, gives members a

the Soviet Union

By THOMAS T. HAMMOND, Ph.D.

With photographs by the author and ERICH LESSING, Magnum

RUSSIA VIEWED BY ERICH LESSING © NATIONAL GEOGRAPHIC SOCIETY

cathedrals that are now museums

"HAVE YOU EVER *been* to Russia, Professor Hammond?"

This was the question that plagued me for years as I taught my courses in Russian history at the University of Virginia. It didn't matter that I was a graduate of the Russian Institute of Columbia University or that I had read many books about the Soviet Union. So long as I had not seen the country with my own eyes, my lectures and writings lacked a certain element of authority.

To this oft-repeated question I had to reply, "No, I've never been there. The Soviet Embassy won't give me a visa."

In 1955 I became hopeful. A number of Americans were admitted, and Supreme Court Justice William O. Douglas asked me to go with him as interpreter on his tour through Russia. But again the Soviet authorities turned me down, perhaps because they were reluctant to allow him an American interpreter.

Three Visits in Three Years

Finally, in 1956, my opportunity came. By that time the Soviet Union was opening its doors to more and more foreign visitors, and visas became easier to obtain. That summer I served as leader of a group of Americans touring European Russia, and in the summers of 1957 and 1958 I returned alone.

Now I can tell my students about experiences in 23 different Soviet cities and towns, of conversations in Russian with dozens of Soviet citizens, and of visits to collective farms, factories, universities, youth camps, and

churches. I trust that now I am better able to give them an understanding of this vast and complex country.

Like other visitors to Russia, I was under the care of Intourist, the national travel agency. Tourists are permitted to visit only certain cities. Within these cities, however, I was usually free to wander about alone, chatting with anyone I met.

I was seldom aware of surveillance, but this may indicate simply that my shadowers were skillful. In any case, it was fairly easy for the authorities to keep track of me, for I was usually either at an Intourist hotel, traveling with an Intourist guide, or riding with an Intourist chauffeur.

On my last trip I arrived in Moscow from Prague in a Tupolev 104-A, one of the new Russian jets that the Soviets were obviously proud to show off. There were new things to show off in Moscow too, for Russia puts its best foot forward for foreign visitors. One was a new 30-story hotel called the Ukraine, topped with a cafe, a tall steeple, and, at the summit, the inevitable red star.

My two-room suite on the 27th floor had a magnificent view—and a television set. I turned it on but got no picture, only sound.

"Aha," I thought, "like so many things in Russia, it *ne rabotaet*—it doesn't work." The joke was on me—telecasts did not begin until 7 p.m. that day. But the only program I could get then was a discussion of how to increase agricultural production.

Tamara Takes Over as Guide

No sooner had I arrived in Russia than Intourist assigned me a guide for my entire stay. Like almost all Intourist guides, mine was female. She was Tamara, a solidly built, determined-looking Russian of 35, daughter of the director of a large Moscow factory.

She never tired of criticizing the United States and boasting about the supposed superiority of the Soviet system. Since she saw only one side to every question, and since she could talk faster and louder than I, there was little two-way conversation. It was more fun—and much more rewarding—to talk with chance acquaintances, who were not required to give me the Communist Party line.

Soviet citizens, I found, are eager to meet Americans. They are no longer afraid to talk with foreigners, though they are careful what they say when others are listening. I spoke with all kinds of people, and, despite the constant anti-American propaganda disseminated by the Government, I almost never encountered hostility.

My accent in speaking Russian sometimes confused those I met. Several times in outlying regions I was mistaken for a Russian from Moscow. One factory worker in the Caucasus flatly refused to believe that I was an American. Usually, however, my clothes—especially my shoes—identified me as a foreigner.

Curbside Forum Discusses America

One night in Kiev I fell into conversation with a man on the street. We chatted about the United States. Passers-by stopped to listen, and soon I found myself in the center of a crowd of fifty or sixty people.

We were blocking the sidewalk on the main street, and the traffic officer on the corner looked unhappy. I suggested to my listeners that we break up the gathering.

"No! No!" they insisted. "We want to talk with you."

So, like a celebrity surrounded by autograph seekers, I led my crowd up a side street, and they peppered me with questions:

"Do people live better in America?"

"What is your salary?"

"What are the wages of an average worker?"

"How much does an American car cost?"

"Do you have social security?"

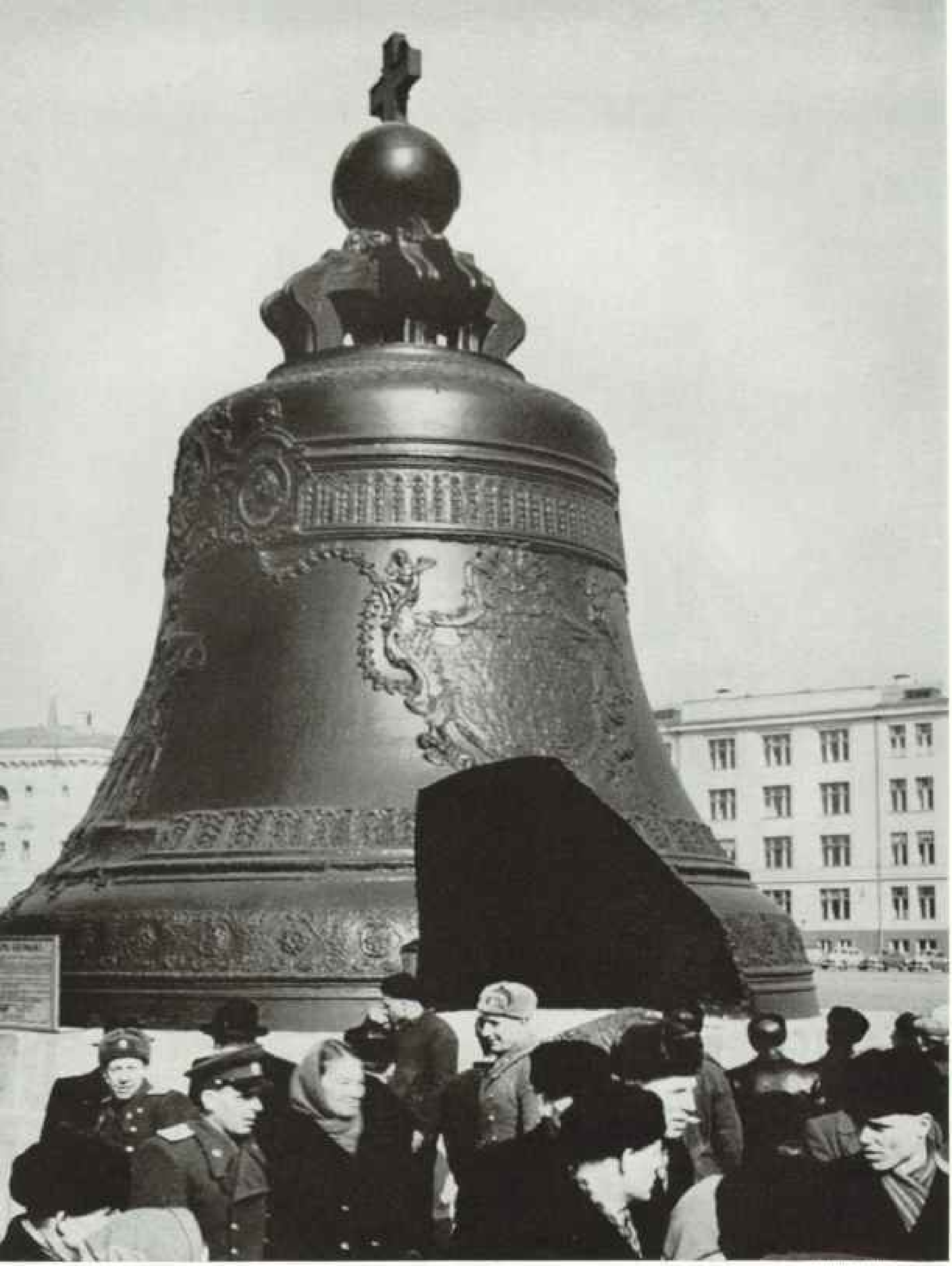
The subject of war and peace and American foreign policy cropped up repeatedly:

"Does America want war?"

"Why can't America and the Soviet Union reach a disarmament agreement and end the threat of war?"

Flamboyant Monument of a Dead Tyrant, St. Basil's Dominates Red Square

Byzantine, Renaissance, and Tatar design unite in St. Basil's soaring fantasy of color and form. Ivan the Terrible in the 16th century ordered the cathedral built to commemorate his capture of the Tatar stronghold of Kazan. Twisted, faceted domes, each surmounting a chapel, lend a touch of fairy-tale beauty to Red Square. They also recall a chilling legend: that Ivan blinded his architects lest they produce another work of equal splendor. St. Basil's no longer resounds to the chanted liturgy of the Orthodox Church; the state has converted it into a museum.



BRIEN LEEMING

Never Hung, Never Rung, the World's Largest Bell Stands in the Kremlin

Bellmakers in 1735 cast the 200-ton Tsar Kolokol, or King of Bells. Tradition says Muscovites contributed 72 tons of gold and silver to the molten metal. When fire swept Moscow two years later, the bell fell from its cradle and, cracked by heat, lay half-buried for 99 years. As it was being raised, an 11-ton piece dropped out of the lip.

Often the questions disclosed a desire among Soviet citizens to travel in foreign countries—something very few have been permitted to do. When I named for them the twenty or so countries that I had visited, they "oohed" and "ahed" with envy.

"We are glad that you have come to see our country," said one young girl. "Please send more Americans here, so that we can talk with them and our two nations will come to understand each other better."

"When the Crawfish Start to Whistle"

I promised to do so. "And when will you be able to visit America?" I asked.

"Oh," she laughed. "When the crawfish start to whistle, and the fish begin to sing!"

When I said good night, a man pressed a silver-plated matchbox into my hand. "Keep this," he said earnestly, "as a souvenir of the friendship of the Soviet people."

In Moscow, where foreigners are a common sight, one is less likely to attract a crowd, but people approach you for other reasons. Little boys waited in front of my hotel to ask for chewing gum—none is made or sold in the U.S.S.R.—or to swap *znachki*, badges and insignia which they collect and pin to their skullcaps.

Some of the older boys have become "beeznis men." My first acquaintance of this type was a young man of about 18 in a white nylon shirt and shoes with thick rubber soles.

"Wanna do a leetle beeznis?" he asked in English.

"What kind of business?"

"Wanna sell suit, shirt, tie, shoes? Anyteeng you got, I buy eet."

"Sorry, but I need all the clothes I have."

"Maybe you got electric razor, jazz records, photo apparat, nylon stockeengs. Anyteeng. I pay much money."

"What will you do with them?"

"Maybe I keep, maybe I sell. Make money."

"But don't they manufacture things like this in the Soviet Union?"

"They make, but no good. You know Philips electric razor? They make copy in Kharkov. Eet look the same, but not good like Philips. Eet scratches. You see this nylon shirt? Made in U.S.A."

To him and the many others like him I had to say, "Sorry, no sale."

The efficient Tamara took me in hand to show me the sights of Moscow. In the capital and show place of the Soviet Union, the gilded domes of ancient churches and monasteries are overshadowed by seven postwar skyscrapers in the exaggerated style sometimes sarcastically described as "Stalinist Gothic" (next page).

There is no shortage of things to do and places to go in Moscow. A recent guidebook lists 43 museums, 9 exhibitions, 30 theaters, and 13 principal parks and gardens, including one with the grandiloquent name Central Maxim Gorky Order of Lenin Park of Culture and Rest. The main attraction, however, is the Kremlin.

Although everybody has heard of the Kremlin, few know what it means. "Kremlin" is simply the Russian word for "citadel." It refers to the most ancient and strategic part of the city, which was—and still is—walled in by fortifications.

The citadel contains old royal palaces, governmental bureaus, and churches where the tsars were crowned and buried. Some government offices, including Premier Khrushchev's, are still located there and are closed to casual visitors, but other buildings have been opened to tourists since the death of Stalin.

Royal Gems and a Gargantuan Gun

Our first stop inside the Kremlin wall was the Armory, which contains a museum of tsarist treasures. A crowd of Soviet soldiers joined us in staring at the glass cases filled with jeweled crowns, robes, and golden dishes that had belonged to various tsars and their families.

At the base of the tall Bell Tower of Ivan the Great, I saw the enormous Tsar Kolokol, the King of Bells (opposite). Near by bulked another Kremlin attraction, the Tsar Pushka, King of Cannons. Seventeen feet long, with a barrel three feet in diameter, this 16th-century behemoth was designed to launch cannon balls weighing two tons each. But, like the great bell, Tsar Pushka was never used. I paused to watch groups of Soviet citizens, like tourists in any nation, posing proudly for snapshots before the giant relics.*

Leaving the Kremlin through Spasskiye Gate, we entered Red Square. The huge cobblestoned rectangle was empty except for a long line of people—whom I joined—waiting to enter the Lenin-Stalin Mausoleum.

* Among 102 photographs illustrating Gilbert H. Grosvenor's prophetic article "Young Russia: The Land of Unlimited Possibilities," in the November, 1914, NATIONAL GEOGRAPHIC, appeared many pictures of the Kremlin's treasures and of the Russian people and their life in prerevolutionary times.

World's Fifth Largest City Flings Its Sea of Apartments Far Beyond the Moscow River

"Moscow: those syllables can start a tumult in the Russian heart," wrote the poet Alexander Pushkin more than a century ago.

The city he described scarcely exists today. True, he would recognize the Kremlin, St. Basil's, and the raised circle of stone in Red Square where the headsman's ax once rose and fell. But the streets lined with wooden houses and log cabins are disappearing. In their place rise rank upon serried rank of apartments. Jammed into housing both new and old, Moscow's more than five million people are packed so desperately that most families inhabit a single room. Only Tokyo, London, New York, and Shanghai exceed Moscow in population.

Sidewalks in the heart of the city overflow with a shuffling, rushing river of humanity. Red Army officers in colorful uniforms contrast with drably dressed workers, while thousands of exotic visitors—Uzbeks, Tadzhiks, Turkomans—testify to the Soviet Union's geographical sweep. Ever-present delegations from the Mongolian Republic and Red China remind the observer of the city's proximity to Asia.

Visitors to Moscow rarely can find a telephone book or a city directory, and the newspapers carry scant advertising. But information kiosks stand ready to answer travelers' questions for a few kopecks. And everywhere one finds ice-cream carts, even in sub-zero temperatures.

This view focuses attention on a "Stalinist Gothic" skyscraper that houses the Ministry of Foreign Affairs and the Ministry of Foreign Trade. Moscow River, once a shallow stream suitable only for small boats, has been deepened. Large Volga steamers now reach the capital by canal.

Woman Does Man's Work in Russia; Housing Rises on Moscow's Fringe

The capital's drastic housing shortage has sparked a feverish building program. Endless blocks of stereotyped apartments explode from fields bounding the metropolis. Cranes lift prefabricated wall sections, and battalions of laborers lay bricks. This development rises in sight of the tower of Moscow University.

Russian women outnumber men, and most of them work. Families need the added income, and the nation requires their labor. Women often perform the heavy tasks of street cleaners, hod carriers, longshoremen, and foundry workers.

When we passed within the massive doors of the tomb, all conversation automatically ceased. At the foot of a dimly lighted flight of stone stairs, we came upon two reclining figures, bathed in orange-colored light. I made out the features of Vladimir Lenin and Josef Stalin, both so well preserved that I had the uneasy feeling that they might come back to life and expel me as an unbeliever.

Since I was particularly interested in the status of religion in the Soviet Union, Tamara arranged a Sunday morning visit to Moscow's only Protestant church, that of the Baptists.

We arrived at the church at eleven o'clock. People jammed the building and overflowed the doorways. The service, one of three that day, had already started; so tightly packed were the aisles that we spent five minutes pressing our way to the pew reserved for us.

Both the interior of the church and the order of service resembled those at home. In the balcony a choir sang familiar old hymns that were strange only for their Russian words. Behind the pulpit glowed a stained-glass window, its three-word message seeming to suffuse the entire church: *Bog Est Lyubov*, God Is Love.

Baptists Provide New Russian Bibles

After the service I met the minister, the Reverend Ilya Ivanov, and the Reverend Jacob Zhidkov, President of the All-Union Council of Evangelical Baptists. The Reverend Mr. Ivanov told me that the church also held services on Tuesday, Thursday, and Saturday. All were well attended.

"How many Baptists are there in the Soviet Union?" I asked the Reverend Mr. Zhidkov.

"The church has more than half a million baptized members over the age of 18," he responded proudly.

There are, I learned, more Baptists in the U.S.S.R. than in any nation other than the United States. During the thaw that followed the death of Stalin, the Soviet Government permitted the first Russian editions of the Bible since 1928 to be published. The Baptists printed 10,000 copies from matrices contributed by Americans, helping to relieve a critical shortage. The few Bibles previously available had been all but worn out.

Later, at Zagorsk, 45 miles north of Moscow, I saw further evidence that religion in Russia is far from dead. There, where silent forests of white birch pierce the crisp blue of the northern sky, I visited a venerable Orthodox shrine—the Trinity Monastery of St. Sergius, founded in 1340 (page 386).

I had arrived on the anniversary of the monastery's founding, and thousands of pilgrims thronged the grounds. All waited patiently for an opportunity to enter one of the

ERICH LESSING

several chapels, where, amid the scent of incense and flickering red votive lamps, bearded priests chanted an age-old liturgy. I looked at the pilgrims—old, wrinkled peasant women with kerchiefs around their hair; young, fairly well-dressed adults; even a handful of soldiers. Belief shone in every face.

"Religion Is Like a Nail"

Originally the Soviet regime had hoped to abolish religion in a few years, and the church was harshly persecuted. But as one commissar ruefully remarked: "Religion is like a nail; the harder you hit it, the deeper it goes into the wood." In recent years the Government has softened its campaign and has even opened some closed seminaries. Yet all public schools still teach atheism.

Before leaving the monastery, I visited the tomb of the tsar whose reign inspired Moussorgsky's great opera *Boris Godunov*. I recalled the poignant, prophetic scene that ends Moussorgsky's original version. Boris Godunov lies dead in the Kremlin, as the new claimant to the throne, Dmitri, marches toward Moscow. The flames of revolution redden the horizon, and a simpleton—Moussorgsky's symbol of the long-suffering Russian people—wails in the forest:

Russia's sorrow
is great . . .
Cry . . . cry . . .
Russian land . . .
hungry people . . .
cry. . . .

Back in the capital I made my way to the towering new building of Moscow University.

Like a wedding cake on a shelf, it perches on a bluff above the Moscow River. The central "multistory building"—the word "skyscraper" is not used in Russia—contains more than 1,000 study rooms and laboratories, auditoriums and concert halls, a swimming pool, dining halls, and libraries (page 365).

Better School Grades Bring More Money

I asked Tamara if I could visit some students in a dormitory.

"We can show you an empty room," she replied, "but Intourist does not have the right to infringe upon the privacy of Soviet citizens."

Deciding to bypass Intourist, I stopped a student in the hall and asked if he would show me his room. He was happy to do so.

Adolph had a small study-bedroom to himself and shared a bath with Vaclav, a student from Czechoslovakia. As we talked, their friend Boris joined us. All three were studying chemistry.

"How much does it cost you to attend the university?" I asked.

"There's no tuition here or in any other school in the Soviet Union," replied Adolph. "All education is free."

"But what about your living expenses?"

"Like most students," said Adolph, "we have government scholarships. The size of the scholarship depends upon the grades we make. For example, Boris gets 25 percent more than I do because he made all A's, while I got one B. So you see, there's a big incentive to study hard."

"What do you have to do to get into the university?" I asked.

"Every applicant must take a competitive examination, and only the best get in. The competition is pretty stiff, especially in fields like engineering, where 10 or more students apply for every one admitted."

"Why did you decide to study chemistry?"

"Chemistry and other sciences have great prestige in this country," said Adolph. "The president of the Academy of Sciences, Nesmeyanov, is a chemist. Everybody in Russia knows who he is."

"Also," added Boris, "scientists are well paid, and chemists are in special demand now because the Communist Party plans a huge expansion in the production of plastics and synthetic fibers."

Not everyone in Moscow lives so well as the fortunate students at the university. Although new apartment houses are going up rapidly, many a Muscovite inhabits an old, dilapidated log cabin.

"Housing is the No. 1 problem of our standard of living," an Intourist official told me. "The Government has declared that this problem must be solved within the next ten years."

Ivan's Home: One Basement Room

The next day I learned exactly how acute the housing shortage was. Ivan, a typical factory worker in his thirties, had agreed to show me his family's apartment.

We walked down one of Moscow's main avenues to a building that looked quite presentable from the street. But within its courtyard the picture changed: a mass of rubbish covered one end; rain had flooded the other part. We picked our way across the puddle and descended to the basement.

The "apartment" consisted of one room, about 15 by 30 feet. Two iron beds were crammed on one side; another bed, an unpainted wooden table, and a chest of drawers jammed the other. One corner, enclosed by a curtain, served as closet and dressing room. Near the top of one wall a solitary window framed a bleak view.

"My mother, father, and I moved in 25 years ago, when I was a child," said Ivan, "and we're still here."

Envious Pedestrians May Look, but Few in Russia Can Afford a Family Car

Driven by an obsession to overtake the West, Soviet leaders have for decades thrown the nation's wealth and manpower into heavy industry. Massive equipment, symbolized by the 40-ton dump truck in Moscow's permanent All Union Agricultural and Industrial Exhibition, is produced in volume. But automobiles, like most other consumer goods, are chronically in short supply. On the highways, trucks far outnumber passenger cars.

Russia's latest automobile, the Sea Gull, is scheduled to begin rolling from the assembly line this year. One of the largest Soviet cars, it will go chiefly to important personages, who ride at state expense. Covetous enthusiasm for automobiles seizes every Russian. "Do you have a car?" "What kind?" "What did it cost?" These questions were often put to the author. But even the four-cylinder Moskvich, the smallest car, costs 15,000 rubles—more than 18 months' wages for an ordinary worker.

SUPER ANSCOCHROME (ABOVE) AND KODACHROME (OPPOSITE) BY ERICH LESSING, KODACHROME (BELOW) BY THOMAS T. HAMMOND © N. G. S.

A New Generation of Scientists Studies Beneath the Red Star

Soviet children must finish at least seven years' schooling, including heavy doses of mathematics, chemistry, physics, and biology. Universities and technical schools also put extreme emphasis on science. They admit only top students and give most of them stipends for living expenses.

Intent scholars at a science lecture (above) and a chemistry laboratory (left) live and work in the gigantic new building on the page opposite. Russian students, serious and eager to learn, are the nation's future elite.

Moscow University teaches the sciences here. Its students in the humanities go to older buildings.

Statue honors Mikhail Lomonosov, 18th-century poet and scientist for whom the Lomonosov Ridge in the Arctic Ocean was named.

RICHARD E. STOCKWELL

Down the hall he showed me a small kitchen and a toilet. In the hall was a wash basin. "We share these with two other families. Nobody tries very hard to keep them clean, because they figure the other families will only get them dirty again."

"What about baths?" I asked.

"We go to the public bath down the street."

"But how about all the new apartments being built?" I asked. "Won't you get one?"

"I hope so," said Ivan, "but some families are worse off than we. The population of Moscow has grown a lot since the Revolution. Also, hundreds of buildings were destroyed during the war."

Muscovites Show Off Their Subway

When I met Ivan the next day, his face was creased with worry. "I guess I'd better not see you any more," he said. "Last night one of my neighbors asked me why I had brought a foreigner to my apartment. It's best not to take any more chances."

On the way back to my hotel, I took an escalator to the subway. The Moscow subway, opened in the 1930's, has long been known for its beauty. Each station glitters with marble, glass, statuary, mosaics, and indirect lights.

At my stop one of the subway employees came up. "Is the subway in New York as beautiful as this?" he asked. I think he already knew the answer.

"No, the New York subway isn't beautiful at all." At this his face brightened. "But," I added, "the New York subway has more than 400 stations, whereas you have only about 46."

"Well," he said, "some day we will have 500 stations, and all of them will be as handsome as these."

I often heard other Soviet citizens voice pride in their accomplishments, combined with a determination to surpass the United States. They evaluate almost everything in terms of competition between the two systems.

One day I saw thousands of Muscovites enjoying something that I never expected to find in Russia—horse racing.

The Hippodrome featured both trotting and flat races that Sunday afternoon. Not only

were there races, but—much to my surprise—there was organized betting.

I took a seat on a bench amid a crowd of intent racing fans, each studying the list of horses for the next race with unmistakable zeal for capital gain. Next to me sat a friendly-looking old gentleman with a white mustache, riding pants, and leather boots.

"The purpose of the races isn't to promote gambling," he explained, "but to train, test, and develop better breeds of horses."

"But why does the Government need fast horses except for racing?" I asked. "You don't hitch a race horse to a plow."

When Russians go to the fair, smiles of anticipation light their faces. Scores of sprawling pavilions house Moscow's vast exposition (page 362). Though not for sale, these gay fabrics are a promise of tomorrow. The Kremlin, after decades of stressing heavy industry at the expense of consumer goods, last year called for expanded synthetic-textile production. Present-day prices are cruelly high: a rayon dress may cost $50, a man's suit of good quality up to $200.

Stocking mill in Tbilisi, Georgian S.S.R., helps to satisfy the great thirst for more and better clothing. This mill, run by a woman, has earned numerous production awards.

"Maybe you are right," he conceded, smiling. "Maybe the real reason is that the Government gets a nice big cut out of the bets. Besides, a lot of people like horse races, including some who are pretty important."

Young Russians Like U. S. Jazz

Moscow's many theaters are well attended. In the famous Bolshoi I watched an unbelievably elaborate performance of Tchaikovsky's *Sleeping Beauty* by Russia's most illustrious ballet company (page 376). Elsewhere I saw *War and Peace*, the opera by Sergei Prokofiev based on Tolstoy's famous novel.

For years I had heard about Leonid Utesov and his jazz orchestra, and one night I went to hear him. Actually the Russians call it an *estradnyy*, or variety, orchestra, for jazz is officially condemned as decadent. Nevertheless, the program included such American songs as "The Breeze and I," "After You've Gone," "When Johnny Comes Marching Home," and "Goodnight, Sweetheart."

Only once, however, did Utesov admit that he was playing an American tune. "And now, comrades," he announced, "we present a genuine American composition, 'The Song of the American Unemployed.' The lyrics have been translated without change."

Utesov donned an old felt hat and a ragged

scarf, thrust his hands into his pockets, assumed a sad, hopeless look, and sang the old song of the depression era, "Brother, Can You Spare a Dime?" So propaganda enters even into the program of a jazz band.

Despite official disapproval, the young people love jazz. Many of them listen to a Voice of America program called "Music U.S.A.," which, unlike the news broadcasts in Russian, is not jammed.

In Moscow I met two jazz fanciers—Nicholas, a tall, lean geology student, and his vivacious girl friend Galina, who was studying electronics. They invited me up to Nicholas's room to hear his records. Some were Soviet pressings of old American tunes such as "I Saw Stars" and "Lady, Play Your Mandolin." His most prized recording was Elvis Presley singing "Jailhouse Rock."

"Where did you get that?" I asked.

"An American sold it to a friend of mine, and he sold it to me," replied Nicholas. "Soviet turntables don't run at 45 r.p.m., but I slow mine from 78 r.p.m. with my finger."

I noticed some discs of what seemed to be photographic film. "What are they?" I asked.

"Those are old X-ray films," said Nicholas. "A friend of mine has a recording machine, but the only material we can get to cut records on is this film. It's not high fidelity, but at least it gives an idea of the music."

"What's that one?" I asked.

"Oh," he replied, laughing, "that's Glenn Miller's 'Moonlight Serenade,' with a compound fracture on the other side."

WIDE WORLD

Children Come First in Russia

In many ways, children in the Soviet Union are given the best of everything. It is quite common to see parents in old, faded clothing leading children dressed in the newest and brightest attire. The Soviet regime follows much the same policy, taking great pains to see that children are well cared for and that they become loyal supporters of Communism.

The Soviet Union does not permit Boy or Girl Scout organizations but promotes instead two Communist youth groups: the Pioneers, 9 to 14; and the Komsomols (Communist Youth League), 15 to 28. Most cities have elaborate children's clubs called "Pioneer Palaces," and many children spend summer vacations in inexpensive Pioneer camps.

I visited one of these camps near Zvenigorod, about 30 miles west of Moscow. It had a fairy village with a tiny castle, a gingerbread house, and a log cabin; there were also a puppet theater, a radio station, and equipment for numerous other activities.

Igor, a handsome blond boy of 15 who was vice president of the camp, showed me through the library. On the wall in a place of honor I saw a photograph of a young boy.

"That," said Igor, "is Pavlik Morozov, a hero to all Soviet youth. In 1932, during the drive to collectivize agriculture, his father tried to organize resistance. Pavlik informed

Stiff-as-starch honor guard stands by as Premier Nikita Khrushchev meets Britain's Prime Minister Harold Macmillan at Moscow's Vnukovo Airport. An interpreter walks behind them. The British statesman, who visited Russia last February, wears a Russian-style cap.

the Government, and his father was arrested and executed. For this Pavlik's grandfather killed him. Pavlik became a martyr for the cause of Communism."

As I wandered about the camp, I noticed a smiling boy of about seven tagging behind. His head was completely shaved.

"Where are you from?" he asked.

"America."

"Tell me, are there children in America?"

"Of course," I grinned.

"Wait a minute," he said, "I want to get something from my cabin."

After a moment he returned with a toy helicopter. "Give this to some American boy," he said, "to show the friendship of Soviet children for American children."

By Red Arrow to Leningrad

When the time came for us to leave for Leningrad, Tamara obtained tickets for the Red Arrow, the best train in the U.S.S.R.

The Red Arrow turned out to be modern and comfortable enough, except for one thing —no air conditioning. As we sped through the countryside, the conductress brought us hot tea in glasses, which is the usual Russian way. Tamara began rubbing her face with something from a small bottle.

"What's that?" I asked.

"Vodka with bits of cucumber in it," she explained. "It's very good for the complexion."

Leningrad, surprisingly, doesn't look very Russian. The buildings are neoclassic and baroque, with stuccoed walls in green, yellow, pink, or maroon. This is because Leningrad is not an old city but dates from the early 18th century, when western European styles were favored by Russian tsars and aristocrats.

Tsar Peter the Great founded the city in 1703, named it St. Petersburg, and made it his capital. It remained the political, cultural, and social center of Russia until 1918, when the Bolsheviks returned the capital to Moscow. After Lenin's death in 1924 the city, then called Petrograd, was renamed Leningrad.

Walking through Leningrad one day, I found myself in front of an imposing building in classical style, with long colonnades curving out from either side. It looked like a small-scale imitation of St. Peter's in Rome.

The present purpose of the building, however, is far from spiritual. On the façade are inscribed the words *Akademiya Nauk SSSR Muzey Istorii Religii*—Museum of the History of Religion of the Academy of Sciences of the U.S.S.R.

My museum guide, a tall, innocent-looking girl of 20 with long blond hair, explained that until 1929 the building had been known as the Kazan Cathedral.

"After the Revolution," she said, in her memorized speech, "most of the people became atheists, and so the church was closed." In 1932, she claimed, "the people requested" that the building be converted into an antireligious museum. In place of icons and burning candles, the cathedral is now filled with exhibits designed to prove the fallacy of all religions.

The following day I went to the Hermitage, most magnificent art museum in Russia and one of the greatest in the world.

The Hermitage is part of the Winter Palace, from which the last of the Romanovs, Tsar Nicholas II, once ruled Holy Russia. The graceful palace, a serene composition of pale green trimmed with white, was a focal point of the Russian Revolution, from the first warning rumble through the uneasy years leading to the final upheaval.

The 20th century's most important political drama began at its gates in 1905. A priest, Father George Gapon, led 200,000 ragged workers to the Winter Palace to present a petition: "Sire . . . help thy people. . . ."

Troops opened fire in the Palace Square, killing hundreds of men, women, and children and wounding thousands. Russian history knows the day as "Bloody Sunday."

When the masses of Petrograd rose again in rebellion in March, 1917, the tsarist regime

(*Continued on page 379*)

Blimp, Missile, and Paraders Sweep into Red Square on May Day

The vast cobblestoned rectangle, foreshortened by the telephoto lens, echoes to the stamp of thousands of feet as well-drilled masses march for hours past reviewing stands. Egypt's Gamal Abdel Nasser stood as a guest with Nikita Khrushchev and other Soviet notables on this 1958 occasion.

Spasskiye Gate (with clock), highest of the Kremlin's 20 towers, marks the main entrance to the citadel; the Kremlin wall runs the length of Red Square. Colonnade in center tops the mausoleum where Lenin and Stalin lie in state. The Historical Museum (left) fills the northwest end of Red Square, and St. Basil's domes rise beyond. Lofty banner above the crowd proclaims "Glory to the People—the Builders."

СЛАВА НАРОДУ-СОЗИДАТЕЛЮ

Searchlights Weave Shifting Patterns Above the Kremlin on May Day

For 70 years the first of May has been an international labor holiday. These celebrators in Manezhnaya Square carry May Day festivities far into

KODACHROME BY ERICH LESSING © NATIONAL GEOGRAPHIC SOCIETY

the night. As bands and accordions play, regional groups occasionally break into flashing traditional dances. The long Kremlin building bordering the square was an arsenal before the Revolution. The Bell Tower of Ivan the Great (center) reflects the glare of searchlights.

Vacationists stroll a seaside park at Yalta, holiday spot of tsars and commissars. Expense-paid trips to this Black Sea resort reward workers who exceed their quotas, citizens who perform exceptional service, and high officials. Working women on the bench contrast sharply with their better dressed sisters on vacation.

Mannequin parades the runway at a fashion show in GUM, Moscow's largest department store. The dress is not for sale, but eager customers may buy the pattern and make the garment.

By Western standards, Soviet street dress tends to be unimaginative; outfits like this are rare luxury items.

Golden Glitter of the Bolshoi Echoes Grandeur of Tsarist Days

The famed ballet of the Bolshoi Theater grew out of a dancing class organized in 1773 for homeless children in the Moscow Orphanage. Among its stars and students the company has counted such names as Yekaterina Geltser, Leonid Massine, and Galina Ulanova.

On his tour Dr. Hammond discovered that "leading ballerinas are more famous and more honored than movie stars, Ulanova being nothing less than a national heroine."

Last spring the Bolshoi Ballet appeared in the United States for the first time and won public acclaim.

"The company is all stars," wrote one critic after watching the dancers' gravity-defying leaps and beauty-defining sweeps.

This scene catches the intermission during Soviet composer Aram Khachaturian's latest ballet, *Spartacus*.

SUPER ANSCOCHROMES BY THOMAS T. HAMMOND (LEFT) AND ERICH LESSING © N.G.S.

Leaping in Abandon, Bolshoi Dancers Create Magic for Tchaikovsky's Opera *The Sorceress*

To keep the Bolshoi among the world's top opera and ballet companies, the Soviet Government spares no expense; its subsidy accounts for much of the $12,000,000 spent by the directors each year. In contrast, New York's Metropolitan Opera functions on an annual budget of some $6,000,000.

A city within a city, the Bolshoi maintains its own power plant, print shop, shoe shop, and costume and scenery factories. The work of 3,000 technicians goes into a single performance on the 85-foot stage. The state finances a nine-year school for aspiring dancers and pays top salaries to some 250 ballet artists alone.

"Russia's magnificent theatrical tradition retains much of its luster, especially at the Bolshoi," says Dr. Hammond. "Yet nightly the huge theater is packed with an audience of strangely plebeian look: men often wear no ties or coats."

collapsed. For eight months a Provisional Government dedicated to establishing a democratic Russia ruled in the Winter Palace. But while the Russian people enjoyed the greatest degree of freedom they have known, Lenin's Bolsheviks jockeyed for power.

Early in the morning of November 8, Bolshevik troops stormed the Winter Palace and arrested the members of the Provisional Government. Russia's brief dream of freedom lay strangled in the soft November snow.

Museum Plays Down Its Moderns

Amid ghosts of what might have been, I entered the Hermitage. I spent four enchanted hours in the museum but should have had a week. Intricately carved Greek and Scythian jewelry glittered in a vault, and sumptuous picture galleries displayed a wealth of paintings by Leonardo da Vinci, Raphael, Rembrandt, Titian, Van Dyck, and others of the world's great masters.

Tucked away upstairs in plain, unadorned rooms were the moderns—paintings scorned by the Soviet regime. Dozens of pictures by Cézanne, Gauguin, Van Gogh, Matisse, and Picasso blazed on the walls. Standing before a huge Matisse was a man about 40, with a finely chiseled face and black, bushy hair.

"Do you like this picture?" I asked.

"Very much," he said. "Most of the people here think that Matisse is 'degenerate,' but I find his work exciting. You see, I am an artist, so I come here often."

I told him that I had just been in Paris, where I had bought a new book of reproductions of modern art.

"Would you sell it to me?" he asked eagerly. "Or could I look at it?"

I promised to show him the book that night. We met in a little park not far from the Neva River; though it was almost ten o'clock, there was still plenty of light. Leningrad, farther north than Juneau, Alaska, has almost no night in the summertime. My artist friend pored over the volume of reproductions.

"Very few books on modern Western art are published in this country," he said ruefully. "I wish I could paint in this style."

"What sort of pictures do you paint?"

An embarrassed smile broke across his face.

"I paint portraits of Lenin," he said. "I do Lenin over and over again, day after day, month after month."

"Why do you do it?" I asked.

"It pays well. I make 6,000 rubles [about $600] a month. You see, there's an inexhaustible demand for portraits of Lenin. Every office, store, schoolroom, and apartment has to have one. A few years ago I painted Stalin, but there's not much demand for him any more."

"Couldn't you try something besides portraits of Communist heroes?" I asked.

"Sometimes I paint things in modern style," he said, "but I can't make a living that way. The museums won't buy them, and private persons don't have the money or the taste. The only thing salable besides portraits is propaganda art—smiling girls driving tractors and that kind of stuff.

"Still, things are loosening up a little. Stalin had terrible taste in everything, and the whole nation had to like what he liked. He isolated us, locked us away from the mainstream of Western culture. But there's a little fresh air in Russia now. Take us. A few years ago I wouldn't have dared to meet you like this."

"You mean it's no longer dangerous for a Soviet citizen to talk to foreigners?"

"Nobody can be sure," he shrugged. "Secret agents are everywhere. They've probably seen me talking to you, but I don't think I'll get in trouble if they don't know what I've been saying. We develop a sixth sense for this sort of thing."

A few minutes later, as we chatted, a policeman appeared out of nowhere and walked toward us. I felt a surge of terror. Had someone been spying on us? Would my friend be arrested?

"The park closes at midnight," said the policeman. "You have to get out."

Sleeping Cars—"Hard" and "Soft"

Besides Russia proper, I was eager to see some of the territories taken over by the Soviet Union under cover of World War II. One of these was little Latvia, now called the Latvian S.S.R. Riga, its capital, was on the list of cities I could visit.

When I left Leningrad for Riga, the railroad station—like all I saw in Russia—was a

A Pyramid of Amazonian Riders Circles the Ring in Moscow's Circus

The Soviet Government operates the circus, as it does almost all other enterprises. In its permanent building, this show plays nightly to capacity audiences.

THOMAS T. HAMMOND

His smile bridging gaps between nationalities, the author dines with officials of a collective farm at Podberezisy, near Lvov (page 397). Dr. Hammond, seated between his Intourist guide at left and his host, a worker on the kolkhoz, drank toasts to "peace and friendship" as he interviewed Mayor Stepan Moskva (second from right) and Comrade Silaev (right), farm director.

seething mass of people. Peasant women with white scarves over their heads sat among piles of gunny sacks and wicker baskets, while children slept beside them.

My sleeper was called a "soft" car, which meant that the compartments were fairly spacious and the berths had springs. Next to it was a car marked "hard." Each compartment contained four wooden bunks. For an extra charge one could rent a thin mattress, a pillow, and sheets. Farther along was still another type of car, with no closed compartments, only triple wooden tiers for sitting and sleeping.

Though Tamara had assured me there were no classes in the Soviet Union, certainly there seemed to be classes of travelers.

At Riga I met Janis Vesmanis, a guide, who recited a little of Latvia's history.

"We Latvians," he said, "have our own distinct language, completely different from Russian. Germans invaded this area in the Middle Ages, and they dominated us even during the 200 years that Latvia was part of the tsarist Russian empire. In 1918 Latvia won its independence, and in 1940 requested admission to the U.S.S.R." (He failed to mention that Soviet troops occupied Latvia before this "request" was made.)

One afternoon in Riga I was caught in an unexpected summer shower and ducked into an ice-cream parlor. A woman, smiling shyly, spoke to me in English. "Excuse me, please, but maybe you are English or American?"

"Yes, I'm American."

"I beg your pardon, please, but would you speak with me a little? I teach English in a high school in Kursk, but I never have practice in speaking."

We had a pleasant chat, during which she asked all sorts of questions about America.

"What kind of films does Greta Garbo appear in now?"

"She has not made any for years. Haven't you seen any recent U. S. films?"

"No," she said, "we haven't had any new ones since the war. But tell me, what are American newspapers like?"

"Oh," I said, "they're completely different from yours. For one thing, they express different political views, even within the same newspaper. Also, they're much bigger. The one I read, the *New York Times*, has fifty to seventy pages during the week and four hundred or more on Sunday."

"Four hundred pages!" she said in astonishment. "But *Pravda* usually has only four or six. What do they put in four hundred?"

I told her about the many departments in the *Times*, and the advertisements, which Russian newspapers generally lack.

A woman of about 55 came to our table. "I speak English, too," she said. "May I join you?" Somehow she looked different.

"I am Latvian," she explained. "I learned English at the University of Riga. I can also speak German, French, and Swedish very well. I should like to teach foreign languages, but I can't get a job in any of the schools here, because I'm not a Communist but a former member of the bourgeoisie."

"What kind of job do you have?" I asked.

"I'm a cleaning woman in a hospital," she explained, showing me her callused hands.

Latvian Laments Loss of Family Life

The Russian woman liked neither the Latvian nor what she was saying. "You should be proud to perform manual labor," she said.

"I ought to be able to get a job as a teacher," retorted the Latvian. "I have no other experience because before the war I never had to work. When Latvia was independent, almost none of the women worked. Now wives have to work because their husbands' wages aren't enough to live on."

The Russian schoolteacher's smile gave way to an angry scowl. "How can you talk like this in front of a foreigner? You have no right to complain just because you are too lazy to work. You know very well conditions are much better in Latvia since the establishment of Soviet rule."

"Not at all," snapped the Latvian. "In the old days we lived well. Now our life is rotten."

"Rotten? My mother was a peasant and my father a simple worker. Yet I had a free education, I have a job with good pay, and every summer I have a nice vacation at some resort. Furthermore," the Russian added ingenuously, "I have a silver-fox neckpiece!"

"But what about family life?" rejoined the Latvian. "From the time a child is three months old, it's usually in a nursery all day long. Why, I know women working as railroad conductors who see their children only on Sundays."

"Most women are grateful that the Soviet system gives them job equality with men. Besides, the nursery teachers are better qualified to bring up children as model Soviet citizens."

"No one," said the Latvian pointedly, "can take the place of a mother."

By this time the Russian woman was furious, and the Latvian, afraid she was getting into trouble, tried to modify some of her more extreme remarks.

"Well, maybe it's not worse now for the working class in Latvia," she said. "But it's worse for me."

With that she shook my hand and hurried away, looking over her shoulder to see if the Russian woman was following her.

Citizen Poimanov Issues a Warning

One day in Riga I told the chauffeur I wanted to photograph a panorama of the city. We drove across the river to a spot with a good view of the Old Town, with its many towers and spires. I walked down to the riverbank and took several shots.

As I headed back toward the car, I suddenly noticed a uniformed policeman wagging an ominous finger in my direction.

"Follow me," he said.

The policeman led me across the street to a serious-looking man in civilian clothes.

"You have violated a law of the Soviet Union," he said. "You have photographed a bridge."

"I didn't photograph any bridge," I replied angrily, for I had been extremely careful not to take pictures of bridges.

"I saw you do it," he insisted.

"No, you're mistaken," I repeated. "Come with me, and you can look through the camera from the spot where I was standing."

We walked back to the shore of the river, and he looked through the view finder of my camera. No bridge was visible.

"But you took pictures back there by the car," he said. "There you can see the bridge."

"I didn't take any pictures by the car," I said. "Ask my guide. She'll tell you."

Little did I know my friend Tamara. "It's not my fault," she insisted, for fear she might get into trouble. "I told him not to take pic-

tures of bridges. He has no respect for the laws of our country, and you should give him a good warning."

With this encouragement from Tamara the plain-clothes man proceeded.

"You took pictures of the bridge," he said, "and we must give you a written warning. Show me your passport."

"All right," I said, "but you must show me your identification papers also."

"I'm just an ordinary Soviet citizen," he said, handing me an identification card in a blue cover. It read:

Factory No. 299
POIMANOV, VLADIMIR IVANOVICH
Bookkeeper

"If you're just an ordinary citizen," I asked, "what right do you have to tell people what to do?"

"It is the duty of every Soviet citizen to be on guard against lawbreakers," he said sternly. "We must maintain Socialist vigilance."

While the uniformed policeman wrote, he dictated the following briskly, as if accustomed to this kind of thing:

STATEMENT

We, the undersigned, Militiaman Lieutenant N. Kolosov and Citizen V. I. Poimanov, have composed the present statement to the effect that Citizen of the U.S.A. Thomas Taylor Hammond on the 3d of July 1958 at 11:40 was present at the wooden bridge on the Zadvinia side and photographed a panorama of Old Riga with a view of the October Bridge.

Citizen Thomas Taylor Hammond was warned that it is prohibited to photograph the above-mentioned bridge and we suggested to him that he choose a more suitable place for photographing Old Riga, and composed the present statement to that effect.

(Signed) Kolosov
Poimanov

They gave me a copy and went away. I got back in the car and glared at Tamara.

"You certainly are a helpful guide," I said.

Our next stop, Kiev, with a population of some 1,100,000, is the third largest city in the Soviet Union, after Moscow and Leningrad; dating back to the ninth century, it is also one of the oldest. As Ukrainians will proudly inform you, it was the capital of the first organized Russian state. Beautifully sited on hills overlooking the Dnieper River, Kiev abounds in trees, gardens, and pleasant parks.

From a park near the center of Kiev, I looked down to the broad Dnieper. Below, a huge statue of St. Vladimir, the Kievan prince who in 988 made Christianity the official Russian religion, stared into the distance.

According to a chronicler, Vladimir had sent envoys to seek out a suitable religion for his people. Unimpressed by Judaism, Roman Catholicism, or Islam, the envoys were awestruck by the magnificent Orthodox ritual they witnessed in Constantinople. They reported: "... We knew not whether we were in heaven or on earth. For on earth there is no such splendor nor such beauty, and we are at a loss how to describe it. We only know that God dwells there among men, and their service is fairer than the ceremonies of other nations."

I made my way down the river to the famous Monastery of the Caves, for centuries a meeting ground of devout Orthodox pilgrims. This is easily the most sacred spot in Russia, for no fewer than 73 saints are buried in the catacombs beneath the hill.

I bought a candle from the bearded priest at the door to the catacombs and stumbled along by its meager light. Small niches held the coffins of the saints. Through the glass tops of the coffins I could see their elaborate vestments. Pilgrims knelt to pray or to kiss the top of a coffin, while others stopped to burn a candle in front of an icon.

Flying over Russia's Breadbasket

From Kiev I took a small two-engine passenger plane south to the Black Sea. We flew at about 750 feet—perhaps not the safest altitude, but one that afforded a fine view of the countryside below.

For a while we followed the meandering Dnieper and then struck out across the broad Ukrainian steppes, breadbasket of the U.S.S.R. The wheat fields stretched away like a huge yellow sheet, patched here and there by green squares of pasture. Harvesting machines cut geometrical patterns in the yellow grain.

Peasant cottages huddled in bunches, each with a small vegetable garden and a few fruit trees. Sometimes a church dome rose from a village, and usually there was a muddy pond flecked with the white of ducks and geese.

We skimmed down at the unpaved Kherson airport. Everyone piled out and headed for

(Continued on page 391)

Ivan Buys a Young Rabbit at Sunday's Pet Market

"During three trips to Russia," says the author, "I saw not a single cat and only four or five dogs. Housing is so cramped and wages are so low that most Russians consider large pets a luxury."

As a result, Muscovites turn eagerly to small pets. On Sunday mornings they gather at Moscow's Kalitnikovskiy market to buy and sell birds, fish, rabbits, cages, aquariums, and pet food. There they bargain with zest in an atmosphere of free enterprise.

This towheaded youngster smiles with delight as he fondles his new friend.

Fur-capped fanciers haggle for pet fish on a wintry morning.

PHOTOGRAPHS BY THOMAS T. HAMMOND (RIGHT) AND BRIAN LEHRING

The Kremlin Has Shut Many Churches, but Religion Lives in the Hearts of the Devout

Following the Revolution, Bolsheviks ruthlessly persecuted the church, charging that the clergy was leagued with the tsarist government. Through its League of Militant Atheists, the Soviet regime waged a clamorous frontal attack on religion. Today's Communists employ more subtle methods of education and propaganda; they do not openly persecute worshipers. No one admittedly religious, however, may aspire to Party membership or to an important job. Despite discrimination, millions still follow the Orthodox faith; millions more are practicing Moslems, Protestants, or Roman Catholics.

Like other historic churches, St. Sofia's in Kiev (opposite) is now a museum. Devout congregations in Moscow's Church of the Epiphany attend Mass (above) and burn candles (below).

Trinity Monastery of St. Sergius Lifts Mushroomlike Domes Above Zagorsk

Six hundred years of Russian history have swirled about this monastery, once one of the richest and most important shrines of the Orthodox Church.

DRAWN BY ERIK LESSORE © NATIONAL GEOGRAPHIC SOCIETY

At the peak of its prerevolutionary grandeur, St. Sergius's owned 120,000 serfs and reckoned its treasure at 650,000,000 rubles. Pilgrims still make the 45-mile trip from Moscow to visit the monastery's half-dozen churches, and its monks maintain one of the few seminaries in the Soviet Union.

Deserted Castle Near Yalta Looks Down on a Black Sea Playground

More than half a century ago a wealthy merchant ordered this battlemented hideaway near Cape Ay-todor. He was never able to move in: the foundations proved unsafe.

To this day the Swallow's Nest has no tenants save the birds that give it a name. Five miles distant, the city of Yalta clusters beneath a steep headland.

Mark Twain once reveled in this wild coastal scenery, praising its beauty in *The Innocents Abroad*. Roosevelt, Churchill, and Stalin met near Yalta in February, 1945.

Ukrainians whirl in a peasant dance beside the Prut River. The Soviet regime subsidizes folk art, and every large city boasts a professional ensemble of singers and dancers. Smiling girl at left models a costume of her native Bucovina region near the Romanian border.

KODACHROME BY THOMAS T. HANNUM © NATIONAL GEOGRAPHIC SOCIETY

After Queuing Up for a Church Wedding, Newlyweds Face the Future

Stalingrad, rising anew from the ashes of Nazi destruction, has rebuilt only one church in a city of 500,000 citizens. Mass weddings are necessary; a priest married this pair simultaneously with three other couples. Since the state does not recognize church ceremonies, the couple had to register their marriage in a government office.

a small wooden building with a sign "Buffet." There one harried woman passed out beer, mineral water, and lemonade. The only food I could find was black bread and cheese.

The contrast between the rather primitive facilities on this flight and my earlier flight to Moscow by jet could hardly have been greater. I remembered then and on many other occasions what an American friend had told me in Moscow:

"In Russia the best is very good, sometimes the best in the world, as the Sputniks have shown. But the average in most fields is rather poor, far below the average in the United States."

Ten Vacationists in a Tsar's Bedroom

From our next stop at Simferopol, a car took us over the mountains to the Black Sea and then along the coastal road to Yalta.

With its deep-blue water, craggy shore, white villas, and granite mountains rising sharply behind, Yalta was the favorite refuge of the tsars and is a popular resort today. It is most famous, of course, as the site of the wartime conference between President Roosevelt, Prime Minister Churchill, and Premier Stalin, and the first thing I went to see was Livadiya Palace, where the meetings were held.

Built for Tsar Nicholas II in 1911, Livadiya has been used since the Revolution as a rest home for workers. Upstairs we were shown the former bedroom of the tsar. The guide did not miss this opportunity to get in a bit of propaganda.

"This room was formerly occupied by one despot," she said. "Now it is shared by 10 representatives of the toiling masses."

I also visited the modest home of Anton Chekhov, who lived in Yalta from 1899 to 1904 and wrote some of his famous plays and stories there while trying to recover from the tuberculosis that finally killed him. The house is now a museum.

A Russian friend had told me: "When you get to Yalta, don't fail to make a side trip to Bakhchisaray, the old capital of the Crimean Tatar khans. You'll suddenly find yourself in the Middle East." I took his advice, setting out by car one morning across the mountains.

Driving through the narrow streets of Bakhchisaray, we came to a group of buildings surrounded by a wall. Two slender minarets reached up into the sky, and tiny pointed chimneys projected from tiled roofs in typically Turkish style. Here for centuries the Tatar khans lived, prayed to Allah, housed their numerous wives, and planned their raids into Russian territory.

The Tatars swept into Russia in 1237, killing and plundering, to set up an oppressive rule that lasted more than two centuries. Ivan III finally threw off their yoke in 1480. Tatars from the Crimea continued to make annual raids, however, and in the campaign of 1571 captured 100,000 Russian slaves. Not until 1783 was Russia finally able to annex the Crimea and its Tatars.

Though the palace of the khans remains, I saw not a single Tatar in three visits to the Crimea. After the Revolution they had their own Tatar Autonomous Republic, but were unhappy under Soviet rule and during World War II welcomed the invading Germans as liberators. Stalin wreaked vengeance by killing some, deporting the rest to the interior, and abolishing the Crimean Tatar Republic.

On my two earlier trips I had visited another fascinating part of Russia, the mountainous, oil-rich Caucasus, between the Black and Caspian Seas. Such strategically important places as the big oil center of Baku, however, were out of bounds.

From Ordzhonikidze in the northern Caucasus I traveled south over the Georgian Military Highway, one of the most spectacular mountain roads in the world. It climbs the steep gorge of the Terek River to one of the few passes through the Caucasus range.*

Along the way we saw white-capped 16,558-foot Mt. Kazbek, where, according to legend, Prometheus was chained. The road passed square towers that in ancient times were used to warn the mountaineers of approaching enemies. In small patches of meadow, bearded, fur-capped Georgian herdsmen tended their flocks of sheep and goats.

Proud Georgians Recall Their Past

Russians say that people live longer in the Caucasus than anywhere else on earth; there are cases of people who claim to be 130 or even 140. I saw a stooped, grizzled old man by the roadside and asked him his age.

"Over 100," he replied.

"How much over 100?" I asked.

"Isn't that enough?" he grunted. "Why do you care? Are you going to buy me like a horse?"

Finally we came to Tbilisi, old Tiflis, capital of the Georgian S.S.R. Unlike the Russians, the Georgians are not Slavic but speak a

* See "Roaming Russia's Caucasus," by Rolf Singer, NATIONAL GEOGRAPHIC, July, 1942.

Russia's Breadbasket Stretches Across the Ukrainian Steppes

Soviet agriculture is tightly organized into some 70,000 kolkhozes, huge collective farms where workers share the profits, and about 6,000 sovkhozes, or state farms where laborers work for wages. Each farm sells most of its produce to the state at fixed prices. Individual families on the farms may cultivate small plots for their own food and sell any surplus in private markets.

Full heads of grain, nearly ready for harvest, are inspected by the burly director of a collective farm near Lvov.

An oxcart takes sacked grain from a combine on a Georgian farm near Tbilisi. This side-by-side coexistence of the modern and the primitive appears in many areas of the Soviet economy.

strange language, written in a curious, twirling script. Georgian men, with their bushy black mustaches and fierce eyes, are tough and masculine. They are also hospitable.

Walking into a restaurant alone one night, I was unable to find an empty table. A group of Georgians invited me to join them, filled me with delicious Georgian dishes and wine, and refused to let me pay for anything. They told me with pride of Georgia's long history.

"Georgia was an independent kingdom for 2,000 years," said one. "Our civilization is much older than that of the Russians. Georgia had many great kings, scholars, and poets. The greatest poet, Rustaveli, lived in the 12th century, in the time of Queen Tamara."

"How did Georgia lose its independence?" I asked.

"It is simply a matter of arithmetic," answered one of my new acquaintances. "There are only four million Georgians, but we were bordered on one side by Iran, on another by Turkey, and on still another by Russia. It was impossible to remain independent with such powerful neighbors."

"Local Boy" Neglected Georgia

The best-known Georgian in modern times was Stalin, whose real name was Djugashvili. I asked my friends what they thought of him. They expressed pride in the local boy who made good, but also felt he had not defended Georgia's interests.

"Stalin was a brilliant man," said one, "but after he got to Moscow, he forgot his people."

"How have things been for Georgia since Stalin died?" I asked.

"Worse," said one. "Our soccer team isn't allowed to beat the Russian team any more!"

Flying northwest from Tbilisi, I came to Kharkov, chief city of the eastern Ukraine, where I visited a show place, the Ordzhonikidze tractor factory. Completed during the first five-year plan with the help of American engineers, it has played a key role in mechanizing the collective farms.

I asked the chief engineer about wages.

"The average worker's wage is 850 rubles a month," he said. Calculating at 10 rubles to the dollar, this would come to $85. "But some of our best workers," the engineer added, "make as much as 3,000 rubles. All are on a piecework system. If one worker makes more castings than another, he gets paid more."

Foreman Earns 10 Times Workers' Pay

I asked him if the incentive system applied also to his salary as chief engineer.

"Yes," he replied. "My regular pay is 4,000 rubles a month, but if the factory exceeds its goal, as fixed in the national economic plan, I get a bonus. Last year I got a total of about 8,300 rubles a month."

"In other words," I said, "you get 10 times as much as some of the workers. That's a bigger difference than you'd find in most American factories. Isn't this contrary to the idea that under Communism everybody will be equal?"

"We don't claim to have Communism yet," he said. "We are still moving toward it."

I found that almost the whole life of the workers revolves around the tractor plant. For example, 90 percent of them live in factory-owned apartments. Sports competitions take place in the factory's stadium. The cultural commission of the trade union supervises the workers' library, arranges for lectures, and distributes theater and movie tickets. All their medical care under the state health program begins with the factory dispensary.

"In addition," said the chief engineer, "the children of the workers attend nurseries, kindergartens, and summer camps sponsored by the factory. Also, there is a loan fund from which the employees can borrow money.

"You might say," he added, "that the trade union looks after the workers from the cradle to the grave, for when a worker has a child he receives a birth allowance, when he retires he gets a pension, and when he dies his family is given a burial grant."

"Does the trade union have any other functions?" I asked.

"Yes," he said, "it tries to increase production. For example, it encourages workers

In his informal office Mayor Stepan Moskva directs the affairs of Podberezstsy. His assistant uses an abacus. Pictures of milkmaid heroines decorate the wall.

The Madonna graces a cottage in the Ukraine. Maria Petrovna Dmiterko knits in the combination living-dining-bedroom of her Podberezstsy home. On the table lies a yearbook of the University of Lvov, from which—to Maria's great pride—her daughter graduated in 1958. The Madonna is a Western version of a Byzantine icon. Until 1939 this area belonged to Poland, and for 350 years its Uniate Church was a branch of Roman Catholicism, though with Eastern rites. In 1946 Russia dissolved the Uniate organization and nationalized its property, assigning it to the Orthodox Church.

to think up faster and better ways of doing their jobs, it holds meetings to discuss methods of raising productivity, and it organizes competitions to see who can produce the most."

What he failed to say was that the unions in the U.S.S.R. are not independent organizations fighting for the rights of their members, but are completely under the thumb of the factory administration, the Communist Party, and the government bureaucracy. On questions that American unions consider most important—wages and hours—the role of the unions is only a formality.

Chair Buyers Wait All Night

From Kharkov I flew back to Kiev and took the train for the long journey west across the Ukraine to Chernovtsy, chief city of northern Bucovina.

Many of my fellow passengers—both men and women—wore pajamas night and day, this being the accepted fashion for people traveling or on vacation. Tamara appeared in Chinese-type pajamas of two-tone blue, complete with a huge fire-spitting dragon.

Until 1918 Chernovtsy was under the rule of Austria-Hungary; Romania ruled it during the period between the wars. Most of the area had always been populated by Ukrainian peasants, however, and the Soviet Union used this to justify its annexation of northern Bucovina in 1940.

Chernovtsy was in some ways the most backward city I saw in the Soviet Union. It was the only area where the peasants still make many of their own clothes. All day long in front of my hotel there was a steady procession of barefoot women in homespun linen dresses and woolen aprons.

While taking a stroll around town one night before going to bed, I noticed a crowd of about 25 people on the sidewalk in front of a darkened furniture store.

"Now don't forget, I'm number 15," I heard one woman say. "I'll be gone for just a minute while I get my husband to take my place."

"What's going on?" I asked one of the men.

"We're waiting to buy chairs," he replied.

I looked through the window. Piled high were plain, straight-backed wooden chairs such as one might find in a cheap restaurant.

"You mean you're going to wait in line all night long?" I asked in amazement.

"Of course," he answered.

And early the next morning when I drove by, the crowd had grown to about 75 people.

The Soviet Government has established a historical museum in Chernovtsy, designed among other things to demonstrate the evils of Austrian and Romanian rule and, by contrast, the great improvements allegedly wrought by the Communists.

One painting in the museum showed a group of ragged, half-starved peasants traveling across the prairie in covered wagons. A dead man lay on the ground, a candle on his breast, while others knelt in prayer over his body. This was supposed to represent the fate of prewar emigrants from Bucovina to the United States and Canada!

Collective Farm Covers 3,500 Acres

Traveling northwest across Galicia, almost to the Polish frontier, we came to the large city of Lvov. This whole area was under Polish rule until September, 1939, when Hitler and Stalin divided Poland between them.

From Lvov we drove to the Stalin Kolkhoz, a collective farm, where we were greeted by the director, Comrade Silaev (page 392), and by Comrade Gaivoronyuk, a Communist Party "instructor" for the kolkhoz.

The farm consisted of a row of cow barns and pigpens, a low-lying pasture, fields of wheat and rye almost ready for harvesting, a blacksmith shop, a mill for mixing feed, a veterinary laboratory, and a duck pond. It also included a cluster of cottages, some brick, some with thatched roofs.

"How picturesque!" I said, pointing to the old-style cottages.

"Oh, those are remnants of our backward past," said the Party man. "Soon they will be replaced."

The director explained that the farm had about 3,500 acres of land, of which 2,300 were plowland, and 280 working members—or about 12½ acres per worker. Here, as else-

Amid a Tracery of Sparks, a 275-ton Ladle Pours a Fiery Batter of Steel

Soviet steel mills last year, working at full capacity, produced an estimated 60½ million tons, compared with 85 million by American industry. But Premier Khrushchev has ordered his nation to top the United States 1958 total by 1965. Even if successful, the U.S.S.R. still would fall short of American capacity, presently 147,660,000 tons a year. Here, in the new Cherepovets Metallurgical Plant near Vologda, molten steel in the ladle has just issued from an open-hearth furnace. Refined by a heat of 3,000° F., it streams into ingot molds resting on a flatcar.

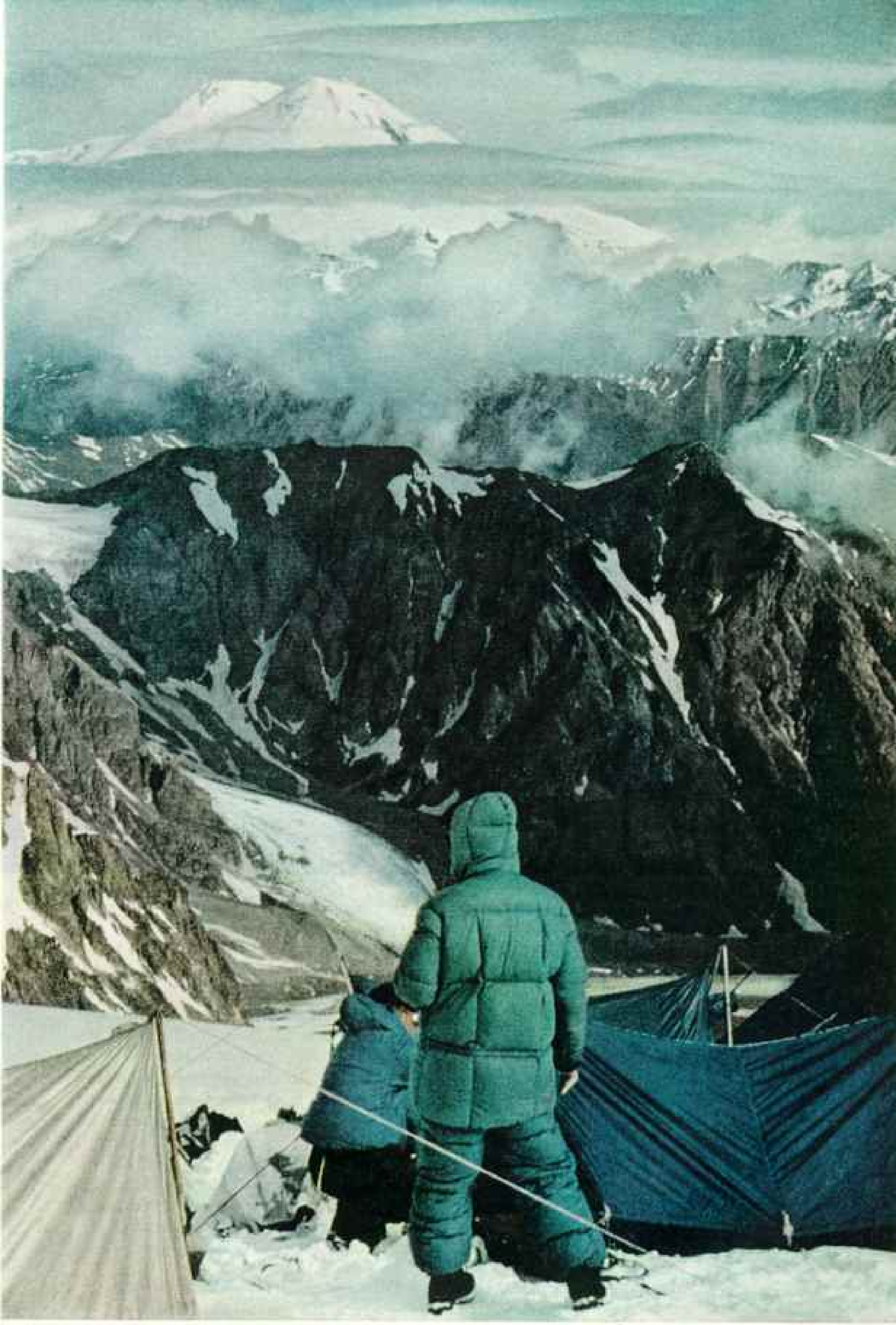
British and Russian Climbers Share Camp High in the Caucasus

This view from a bivouac of Sir John Hunt's 1958 expedition looks across Schkhielda Glacier, far below, toward the cloud-collared crater of 18,481-foot Mount Elbrus, highest peak in Europe. Sir John, whose British Commonwealth team conquered Mount Everest in 1953, led the first Western group of any consequence to climb in the Caucasus in 20 years.

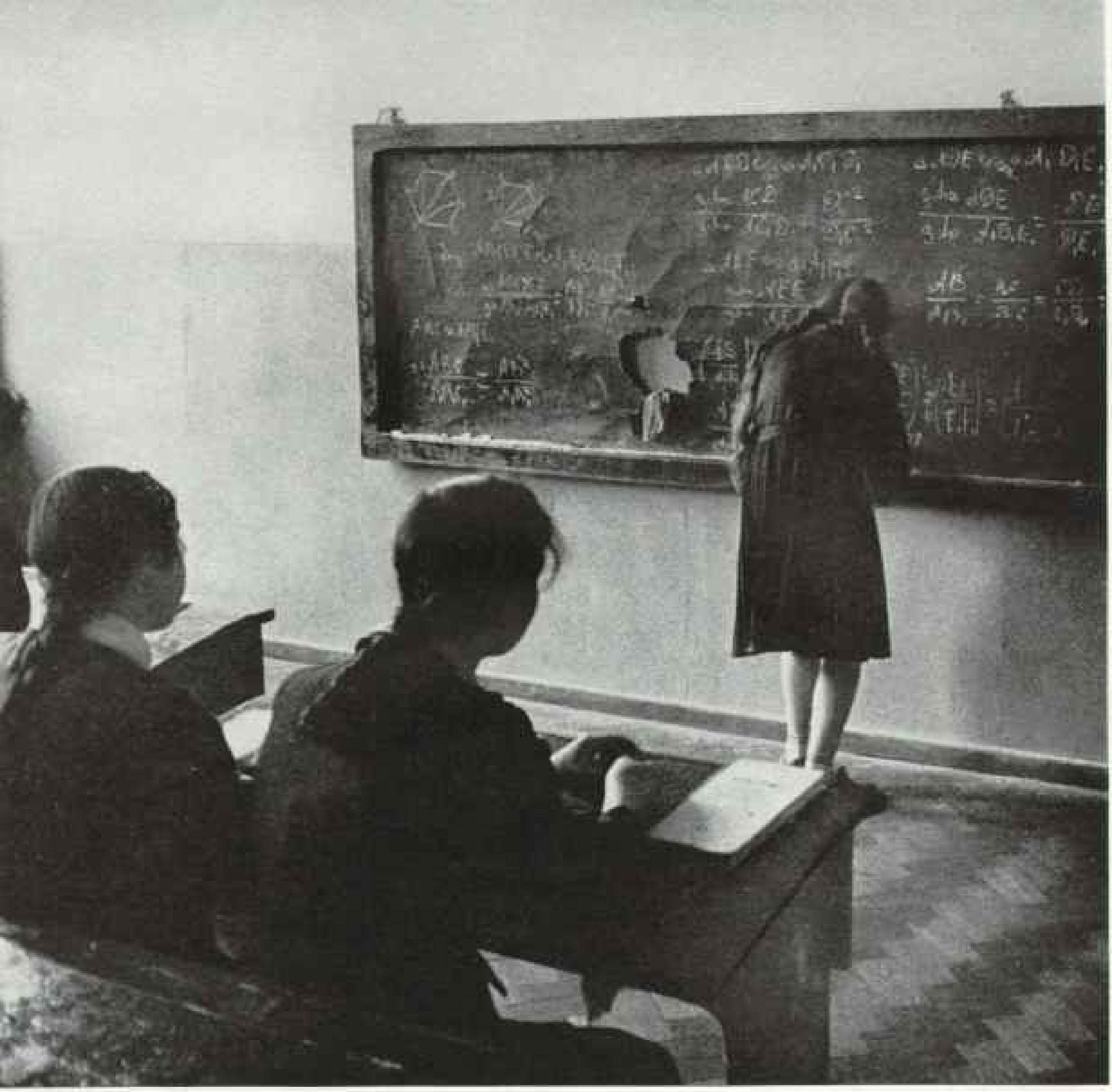
The picture shows a lull in a blizzard that marooned the expedition, together with a party of seven Russian men and a girl, for three days at the 14,000-foot level of twin-peaked Mount Ushba. Snow compelled the explorers to abandon their efforts to reach the summit, 1,453 feet higher, and so they made a perilous descent down an icefall while avalanches thundered on either side.

Lying between the Caspian and Black Seas, these mountains raise a 750-mile-long barrier of rock and ice between Europe and Asia. Six peaks higher than the tallest of the European Alps stud the range, and hundreds of glaciers grind down its slopes. Notwithstanding, repeated waves of Asian invaders braved Caucasian passes to attack Europe, and many of them settled in pockets in the high valleys.

The mountains still contain a great diversity of peoples, although Stalin pitilessly uprooted entire tribes and deported them to Siberia.



KODACHROME BY SIR JOHN HUNT © NATIONAL GEOGRAPHIC SOCIETY



where under the collective system, a lot of labor was required to farm little land.

This partly explains why agricultural production is low in the U.S.S.R., despite the fact that about 40 percent of the population works on farms. In the United States, by contrast, about 10 percent of the population, using more efficient methods, produces crop surpluses.

I noticed a row of tractors, combines, and other agricultural machines. "Where did you get the machinery?" I asked.

"Until this year a machine-tractor station served this and 10 other kolkhozes," said the director. "Then it was dissolved, and we bought some of its equipment. It gives us more freedom to plow and harvest when we want."

"How do members of the kolkhoz get paid?"

"The profits are divided up among the members on the basis of the kind of work they do and the number of days that they work."

"Is this their only source of income?"

"Oh, no," the director replied. "Each family has a private plot of about an acre to farm independently of the kolkhoz. They raise vegetables, fruit, poultry, and a certain amount of livestock, and sell their surplus in the free market. Previously there were compulsory deliveries to the Government from the private plots, but these have been done away with."

"In other words," I asked, "each family has a small private farm on the collective farm?"

"That's right," he answered, "but the size of the private plot can't be bigger than half a hectare,* and each member must work a certain number of days for the collective."

After a tour of the village, Comrade Direc-

* Half a hectare is approximately 1¼ acres.

ERICH LESSING

Sixth-grade girls in Tbilisi, Georgian S.S.R., wrestle with the intricacies of geometry under the schoolmaster's stern eye. Classes meet six days a week, nine to ten months a year, and teachers assign copious homework.

School children must study a foreign language for three or six years. English and German are now the most popular choices.

tor announced that dinner awaited us in one of the peasant homes (page 380). A smiling man and his wife led us to a table loaded with dishes of borsch, sour cream, cottage cheese, *golubtsy* (minced meat rolled in cabbage leaves), *pirozhki* (meat pies), and *blinchiki* (pancakes filled with cherry preserves).

I noticed two bottles filled with a colorless liquid. We had hardly sat down when I found a glass of vodka thrust into my hand.

"To peace and friendship between Russia and America," said Comrade Galvotonyuk, the Communist Party man, raising his glass.

I drank that one down and tried to forestall further toasts by asking questions.

"Who makes the decisions about what kinds of crops you're going to grow?"

"All decisions are reached democratically by the members of the kolkhoz," he said.

This reminded me of a conversation I had had the year before with an official in one of the ministries. He talked with surprising frankness about so-called "kolkhoz democracy." When I asked him if the Government gave advice to the kolkhozes on what to plant, when to plant, and so on, he replied:

"We don't advise them. We tell them!" At this he let out a big laugh.

It seemed best not to describe this incident to my kolkhoz hosts. Instead it had become my turn to make a toast.

"May all the peoples of the world live in peace, freedom, and democracy," I said, and the glasses of vodka were emptied. I shook hands with everybody, thanked them for their hospitality, and left while I could still walk.

In my private conversations with Soviet citizens I heard many references to the system of universal free medical care. In Lvov I visited a hospital to see the system at work.

Dr. Natalia Fedorovna Krainyaya, the director, greeted me cordially and handed me the white hat and coat all visitors to Soviet hospitals must wear.

The wards, containing from 6 to 12 beds, were clean and sunny. I was permitted to look in all but the maternity ward. Even fathers, I was told, have to wait 10 days before seeing their new babies.

Most U.S.S.R. Physicians Are Women

I noticed that most of the physicians were women (page 404). "Is this typical of the U.S.S.R.?" I asked.

"Yes," said Dr. Krainyaya, "about three-fourths of our physicians are women. So is the Minister of Health of the U.S.S.R. We feel that because medicine does not involve heavy physical labor, it is more suitable for women than, for example, work in a coal mine."

"How much are physicians paid?" I asked.

"A beginning graduate, fresh from medical school," she said, "gets a minimum of 800 rubles a month. Every five years there is an automatic raise of about 100 rubles a month. A physician can get more by working at a hazardous job or by working extra hours. My own income is 2,100 a month."


30
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"A salary of 800 rubles a month for a doctor seems awfully low," I said. "That's no more than the wages of some women workers in a textile factory I visited."

"What's wrong with that?" she replied. "Work in a factory is more strenuous, and the hours are longer. This is a workers' state, and we feel that workers should be paid as well as professional people."

"But," I insisted, "other professions are paid much better than workers. Engineers I've met earn 4,000 to 8,000 rubles a month."

This seemed to bother her a bit. "Some of our physicians," she said, "have very high incomes. For example, university professors and specialists get extra pay. In addition, some receive private patients after hours."

"Then private practice still exists?"

"Yes," she said, "but on a very limited scale, because medical care is available for everyone free of charge. People will pay money only for an outstanding specialist."

"With a starting salary of only 800 rubles," I said, "it must be difficult to find young people who want to be doctors."

"Not at all," said the director. "In the Soviet Union we are graduating twice as many physicians each year as does the U.S.A. As a result, we now have a ratio of 17 physicians per 10,000 of the civilian population, whereas you have a ratio of only about 13." *

The picture as she presented it was impressive, but I couldn't help wondering if there were hidden flaws. Fortunately I ran into a friendly physician on a train one night and asked him if I had been given the whole story.

"In general," he said, "we have a good medical system. But sometimes physicians have a pretty hard time. For example, when a student graduates from medical school, he must go wherever the Government says for his first three to five years. That usually means a village, or some place like Siberia or central Asia, where facilities are primitive.

"What makes our work hectic," he added, "is the norms set by the Government. In an out-patient clinic, for example, a physician must see six patients an hour—10 minutes per patient. Then he has to spend more than half of that 10 minutes filling out papers.

"But," he shrugged, "the pressure has decreased in the last few years as more and more physicians graduate. I'm still glad to be a physician, because I know I'm helping people, regardless of the political system."

Uzhgorod Speaks Many Tongues

My next stop was Uzhgorod, on the other side of the Carpathian Mountains. This is the most scenic region of the entire Ukraine. Unfortunately I could see little of it, since it is classed as a frontier area and foreigners are not permitted to leave the city limits.

Yet Uzhgorod itself proved to be a fascinating provincial town. It lies in a pocket in the Carpathians where Hungary, Czechoslovakia, Poland, the Soviet Union, and Romania meet, and its population is a strange mixture of nationalities.

My waiter was Romanian, my driver Slovak, the hotel maid Ukrainian, and the Intourist representative Russian. A large minority of the population is Hungarian. In the cheerful little garden restaurant behind my hotel I could eat Hungarian goulash, drink Tokay wine, listen to a gay gypsy band, and watch local couples dance a hearty czardas.

As an American professor, I was given an interview with the rector, the equivalent of

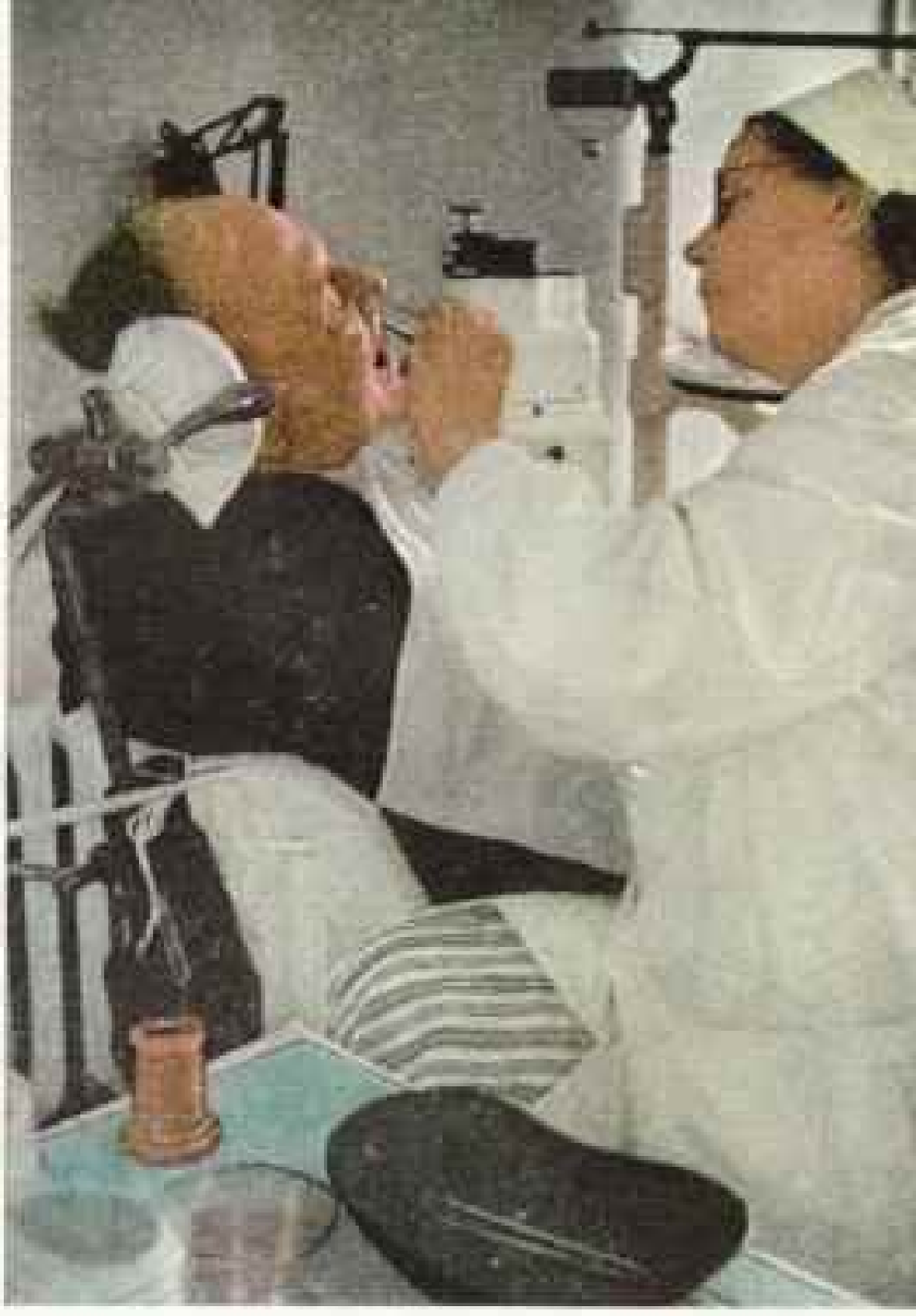
* This ratio is confirmed by the report of a five-man team of doctors from the U. S. Public Health Service who toured Russia two years ago. Figures, however, do not tell the whole story. As their report pointed out: "The Soviet physician labors under many handicaps. The State insists on medical services to all of its citizens but gives the physician a limited budget, insufficient laboratory personnel and equipment, and a patient and administrative load far in excess of that which any physician can handle adequately and still practice a high quality of medicine."

Boy Meets Girls in a Minsk Park; Propaganda Looks over Their Shoulders

Wherever the Russian turns, he hears his Government's voice shouting from billboards in parks, factories, and schools, orating on television and radio, and haranguing in his newspaper. Propaganda exhorts the citizen to greater effort and hammers home the message of Soviet superiority. These girls, giggling at the prospect of a date, ignore posters that claim tremendous gains in coal, petroleum, electric power, and metals.

Chess is a Russian passion; boards and players blossom in every park. Soviet chess masters, who receive state salaries and all the free time necessary to polish their game, lead the world. Attendants on airplanes and trains can always provide the traveler with a chess set, or the next most popular game, dominoes.

404 SUPER ANTICYCLONE OF THUNDER (ABOVE) AND ROSE CYCLONE BY BURTON DOUGE © NATIONAL GEOGRAPHIC SOCIETY



A woman dentist in a Kharkov clinic works on an American patient, Dr. Homer L. Dodge, president emeritus of Norwich University in Vermont.

Women in White Perform an Eye Operation in Lvov

The Soviet Union boasts that it has one physician to each 613 persons, compared to one per 756 in the United States. The Russians also claim that their medical schools graduate 16,000 physicians a year. The U. S. Public Health Service figure for the United States is 6,800. Russian doctors, however, receive only six years of training, while their American counterparts get nine.

Under socialized medicine, Soviet citizens pay nothing for doctors, hospitals, drugs, or ambulance service. But like factory workers, most doctors have norms. They can devote only a few minutes to each patient—and paper work pre-empts much of even that brief period.

The physician's prestige is vastly lower than in the West. His starting salary, 800 rubles a month, equals that of the average factory worker. He can seldom look forward to the high pay lavished on engineers, scientists, and professors. As a result, men prefer other professions, and about three-fourths of Russia's doctors are women.

president, of the recently opened University of Uzhgorod. He was Ivan Ivanovich Lenarskii, a pleasant, intelligent man of about 55.

Professor Lenarskii said he was proud of what the Soviet Government had done to spread education among the people.

"Take my case," he said. "Both my father and mother were illiterate. My father could write his name only by copying it letter by letter. But after the Revolution I got a scholarship to the Academy of Agriculture in Moscow, where I eventually received my degree of Doctor of Science. Now I am helping to bring about the same kind of educational transformation in the Carpatho-Ukraine."

Rector Lenarskii receives 8,000 rubles a month—10 times the pay of an average factory worker. A university professor, he added, receives about 5,000. In addition, professors are paid for scholarly articles, book reviews, and other publications.

Walking about Uzhgorod one night, I noticed a large bulletin board with the inscription, "Cartoons About the Enemies of Peace." Behind the glass was a collection of political cartoons clipped from a Soviet magazine—all of them directed against the United States.

One showed two fat American capitalists sitting on oil drums in a Moslem country. "If any of these Arabs try to take our oil," said one capitalist, "we'll drop some atom bombs on them."

A second showed a barbaric-looking American soldier sitting in a Paris cafe with his feet on the table, a bottle in one hand and a pistol in the other, while a French man and woman looked on disapprovingly. "If you don't like having the American army in France," said the soldier bully, "just try to throw us out."

Other caricatures showed American soldiers murdering civilians in Korea, "Wall Street monopolists" counting their profits from war goods, "partisans of peace" being beaten up by police, and German Nazis being rearmed with American munitions.

This was only a sample of the vicious anti-American propaganda that is constantly spread by the Soviet Government—while at the same time it urges "peace and friendship among nations."

The time had come for me to leave the Soviet Union. We drove in the dark at 4 a.m. to Chop, the frontier station where I had to pass customs before boarding the train for Czechoslovakia.

When I entered Russia, the customs inspection was quite superficial, but Chop was another story. The woman inspector searched slowly through all five of my bags. Whenever she came across written matter, she handed it to a man near by who looked it over with great care. He seemed to take special interest in a copy of the NATIONAL GEOGRAPHIC, which he thumbed through page by page.

"Do you have any notebooks?" he asked. I showed him the spiral booklet that I had used as a diary, and he took a look at that also. But apparently he found nothing "subversive," so I passed through unscathed.

Peace Doves and Barbed Wire at Border

Tamara stood on the platform as the train pulled out. We waved to each other, and, almost inadvertently, we both smiled. Despite our differences, I reflected, we had only been doing our respective jobs as best we could: she in accordance with her principles, I in accordance with mine.

At the frontier the train stopped for several minutes while armed guards made a meticulous search beneath each car to make sure that no one was hiding on the undercarriage.

Looking out the train window, I noticed a huge sign made by placing white stones on the rail embankment. In the center were two white doves of peace, and over them the words, "FOR PEACE AND FRIENDSHIP."

A few yards away was the frontier itself, with two high barbed-wire fences, bordered by a grassless strip of plowed earth, on the far side of which was a third fence. In the distance was a watchtower, and silhouetted in the top I could see a guard with a rifle in his hand.

Stalingrad Electrician Bolts a Switch That Will Carry 300,000 Volts

Heeding Lenin's dictum, Russia puts high priority on electric power. Last year she produced 233 billion kilowatt hours, against the United States' 721 billion. However, the Russians put more of their output, about four-fifths, into heavy industry and military production. A major flaw appears to be equipment; United States utility men report Soviet steam turbine design 20 to 30 years behind.

Stalingrad Hydroelectric Plant will boost production capacity by 2,530,000 kilowatts. This technician adjusts the hinged blade of an air switch atop a twin stack of insulators.

E. KHALEIA

AN IMPORTANT NEW MAP FOR YOUR
GEOGRAPHIC ATLAS FOLIO:

Western Soviet Union

RUSSIA, an old adage goes, is not a state, but a world. And within its borders the Soviet Union—the globe's largest unbroken land mass under a single flag—offers a breath-taking geographical sweep.

Reindeer forage for moss on frozen northern coasts, while, more than 2,000 miles to the south, melons ripen in the hot sun of Georgia. From its western extreme near Kaliningrad, the U.S.S.R. stretches some 6,000 miles eastward to Bering Strait. The 209,000,000 people of the nation are equally varied—Russians, Mongols, Tatars, Eskimos. A Soviet census lists 149 separate languages spoken by peoples of the U.S.S.R.

Map Covers Half of Europe

With this issue of their magazine, members of The Society receive the twelfth map in the Atlas Series—the **Western Soviet Union.** This new 10-color chart, Plate No. 45 in the Atlas Folio, will soon be available in larger wall-map size as well.

The map vividly conveys the immensity of the U.S.S.R., which in all covers 8,650,000 square miles. Its western part alone encompasses half the European Continent. Beyond the Urals, Soviet territory sprawls across a third of Asia. A subsequent Atlas Map will depict this eastern section of the U.S.S.R.

While compiling the present map, Chief Cartographer James M. Darley wrote to the Institute of Geography in Moscow to request a certain Soviet chart. It arrived promptly, along with a letter from Academician I. P. Gerasimov, Director, stating: "Our Institute is a constant user of your Magazine, which is in great demand. The maps published by The Society are very highly regarded."

With his request Mr. Darley had enclosed a catalogue of National Geographic Society publications, offering the Russians their choice of the 90 books and maps listed. Their reply: "Please send the book by Dr. Gilbert Grosvenor, *The National Geographic Society and Its Magazine.*"

Thirteen of the Soviet Union's 15 constituent republics appear on the present map. The largest is the Russian Soviet Federated Socialist Republic. Embracing 75 percent of the nation's area, it holds 117,000,000 inhabitants, more than half the Soviet Union's total population; its borders extend all the way to the Pacific Ocean.

For 42 years under the commissars, as under the tsars, Russian territorial expansion has continued. Near the map's western edge, a jagged red line running from the Barents Sea to the Black Sea shows 1938 boundaries as compared to those of today. In 1940 the Soviet Union absorbed Latvia, Lithuania, and Estonia. Among the spoils of World War II were 117,232 square miles of territory annexed from Finland, Germany, Poland, Czechoslovakia, and Romania.

Since the days of the 15th century princi-

Red Army Men Pose Proudly Before Tsar Peter's Bronze Charger

Until the Revolution, no Russian left a greater mark on his country than Peter the Great. Gifted with volcanic energy, this farseeing but brutal tsar crushed all opposition in order to modernize his backward realm. As a young man, Peter toured Europe in search of technical knowledge and even worked as a shipwright. He simplified the Russian alphabet and established the first Russian newspaper. By conquest he won access to the Baltic and built St. Petersburg, now Leningrad, as a "window on Europe."

In 1782, more than 50 years after Peter's death, Catherine the Great unveiled this monument in Leningrad as a gesture of pride at having continued his modernization.


PETRO
CATHARINA

Is It Molotovsk or Severodvinsk? The Society's Cartographers Make Sure

Recurring Soviet purges complicate the mapmaker's task and strain his deadlines.

In the case of Molotovsk, just west of Archangel, checking confirmed that the town no longer honors V. M. Molotov, demoted foreign minister. Russian sources decree "Severodvinsk," and The Society's map carries it thus.

The Western Soviet Union map was ready for the lithographer when Moscow re-established the Kalmyk A.S.S.R., northwest of the Caspian Sea, as an autonomous republic. Swift work added this final revision.

Here, in The Society's Atlas Map section, Chief Cartographer James M. Darley (right) checks Russian charts with Mrs. Meredith Fuller, who positioned place names on the map, and Paul Danyluk, whose Ukrainian parentage and knowledge of Slavic languages proved valuable in preparing the latest supplement for members.

pality of Muscovy, one of the great driving forces behind Russian expansion has been the need for outlets on the sea. In its 30,000 miles of coastline, the Soviet Union has only one major port with unrestricted, year-round access to the open sea—Murmansk, 170 miles north of the Arctic Circle. Thanks to an offshoot of the Gulf Stream sweeping into the southwestern Barents Sea, the Murman coast remains ice-free throughout the year.

The map shows many of the 503 new cities and more than 1,350 smaller communities founded by the Soviet Government in the past 30 years. Among them is Dubna, site of the world's most powerful atom smasher, where 1,800 scientists and technicians are at work.

Russia's explosive urbanization is typified in the mushrooming capital. Sixty years ago Moscow claimed about a million inhabitants; today it houses 5,000,000 residents and normally holds another 1,000,000 transients.

Moscow alone accounts for eight percent of the entire Russian industrial output. The city doubles, too, as capital not only of the nation but also of Moscow Oblast, or administrative district—the area surrounding Moscow outlined in pink on the map.

This great manufacturing complex draws power from the world's largest hydroelectric installation, at Kuybyshev 530 miles to the southeast. Harnessing the Volga's water, the Kuybyshev station generates 2,100,000 kilowatts, six percent more than the United States' Grand Coulee Dam.

World's Longest Oil Pipeline

Tiny derrick symbols on the map show new oil fields in Tatar and Bashkir that have enabled the country to triple production since 1950. Starting near Tuymazy, in the Bashkir A.S.S.R., the world's longest pipeline—a ticked black line on the Atlas Plate—runs 650 miles to the edge of the map east of Kurgan. Ultimately, this 28-inch pipeline will run 2,300 miles to Lake Baikal in Siberia.

Of the Soviet Union's immense land area, only 800,000 square miles—about ten percent—is agriculturally productive. Most of this cultivated land lies in the rolling plains of the

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To hold the Atlas Maps, more than 200,000 members have ordered the convenient Folio, available for $4.85. A packet of seven maps issued in 1958 may be ordered for $3, single maps for 50¢, from National Geographic Society, Dept. 21, Washington 6, D. C.

This map is Atlas Folio Plate No. 45. Plates previously issued: Northeastern United States (No. 6), Southeastern United States (8), North Central United States (9), U. S.-Canadian National Parks (13), Alaska (18), Southern South America (28), British Isles (31), Germany (35), Poland and Czechoslovakia (38), Greece and the Aegean (40), and Lands of the Eastern Mediterranean (47).

NATIONAL GEOGRAPHIC PHOTOGRAPHER THOMAS J. ABERCROMBIE

Ukraine, known as the breadbasket of Russia.

To the south, the Ukraine ends in the Crimean Peninsula, jutting like a wedge into the Black Sea. The Crimea is rich in history: At Balaklava, in 1854, the British Lord Cardigan led his incredibly brave cavalry in the tragic charge of the Light Brigade; in 1945 Allied statesmen met in a fateful conference beside the palm-fringed waters of Yalta.

Between the Black Sea and the neighboring Caspian Sea tower the wildly beautiful Caucasus Mountains. In the shelter of this 750-mile-long range lie the subtropical lowlands of Georgia and Azerbaijan. Here roses bloom in the forests, and sun-swept vineyards produce ruby wines.

The Azerbaijan S.S.R. slopes down into the world's largest inland sea, the Caspian. Fish abound in these waters, and the huge sea furnishes 35 percent of the total Soviet catch. However, this great marine larder has been shrinking alarmingly. Since 1930 the Caspian has lost eight feet of water.

To counteract this ominous trend, Soviet engineers have devised a spectacular plan to reverse the flow of three large rivers that now empty into the Arctic Ocean.

The Pechora and Vychegda will be diverted from their northerly courses into the southward-flowing Kama River, and the Sukhona into the Volga. Both the Kama and the Volga feed the ebbing Caspian.

INDEX FOR JANUARY-JUNE, 1959, VOLUME READY

Index for Volume CXV (January-June, 1959) of the NATIONAL GEOGRAPHIC will be mailed upon request to members who bind their copies as works of reference.

Florida Sands Yield a Secret of the Sea

Ken and Pat Libby, children of the author, find a mermaid's purse on St. Augustine Beach. Their father spent two years studying the strange birth process of its maker, the humble clearnose skate.

Gulls, clamoring for a handout, flock around the children.

Within the rubbery purse, a baby skate grew like a chicken in an egg. After the embryo hatched, the sea washed the case ashore.

Children's curiosity about a strange object on the beach produces a remarkable set of photographs of how a skate is born

Miracle of the Mermaid's Purse

By ERNEST L. LIBBY, Marine Studios Staff Photographer

"DAD, what's this?" my children asked. They handed me a small, dark, horned object they had found on the beach.

I wonder how many youngsters, beachcombing after Atlantic storms, have stumped their dads with a mermaid's purse!

"Well, now," I hedged, "it's certainly an empty egg case. But what hatched out of it I don't know."

"Thanks anyway, Dad," said Ken and Pat.

Mermaid's Purse Launches a Sea Search

For some years now I've been photographer for the Marine Studios at Marineland on the Florida coast, 18 miles south of St. Augustine. More than half a million visitors annually come to see our thousands of sea creatures, from sinister sharks to tiny blennies, living in our huge salt-water oceanariums.*

Ronnie Capo, skipper of our collecting boat, was leaving with his nets to catch candidates for our famous trained-porpoise act. I showed him the children's mermaid's purse, or sea purse, as it is sometimes called.

"I'm a father in bad standing," I said. "Bring me some of whatever lays these things."

He grinned and put to sea.

Two weeks later my phone rang.

"I left some clearnose skates in the receiving tank for you," said Ronnie. "Already they're laying mermaid's purses."

In the library of our marine biologist and curator, F. G. Wood, Jr., I looked up the clearnose skate. Science, I learned, knows this flat, mottled fish as *Raja eglanteria*. It is related, wondrously, to the shark family.

Thus the harmless little clearnose can claim as distant cousins the whale shark, the strong-toothed mako, and white man-eater. Closer cousins are the rays, including the strange sawfish, the guitarfish, and the gigantic manta.

Most of the cousins bring forth their young alive. Other skates, however, lay their big, plump eggs in mermaid's purses. But if you find a purse on a beach from Florida to the Carolinas, chances are it was manufactured by a clearnose; the other purse makers are scarce hereabouts.

Beneath one of the huge Marine Studios oceanariums I have a small studio crowded with camera gear and salt-water aquariums. I put the fresh-laid purses and my new skates into one of these photo tanks.

Day after day I haunted my sanctum. Above my head the people tramped from porthole to porthole, peering into the oceanarium at marvelous creatures of the sea.

I heard the laughter of children as a hogfish, a chunky charmer with a split-level head, stared back at them through the glass. Through the steel tank wall came the booming voices of drumfish.

I watched my skates and they watched me. Soon they knew that my approach could mean fresh shrimp. Folding their wings into inverted U's, they stood hopefully on their back fins and poked their snouts out of water.

Far greedier than their husbands, the little mothers among them sometimes darted out of water like jet-propelled pancakes and grabbed my fingers. Thus one learns: Clearnoses have powerful, toothy jaws, and their mouths shoot out from their undersides when they bite.

"Let's Candle a Skate's Egg"

Curator Wood let himself into my private world.

"Let's candle a skate's egg," he suggested.

The dark-brown mermaid's purse is made of keratin, the basic stuff of hair, horns, and fingernails. Light came blood red through the case we chose, and we saw in silhouette a buglike embryo atop a round yolk (page 414).

"Put some time in on this, Ernie," said Woody, much interested. "Try and find a way to photograph these embryos as they develop. I think you might turn up something of real scientific value."

Ronnie Capo, whose tremendous stock of

* See "Marineland, Florida's Giant Fish Bowl," by Gilbert Grosvenor La Gorce, NATIONAL GEOGRAPHIC, November, 1952.

KODACHROME (ABOVE) AND ANSCOCHROME BY ERNEST L. LIBBY © NATIONAL GEOGRAPHIC SOCIETY

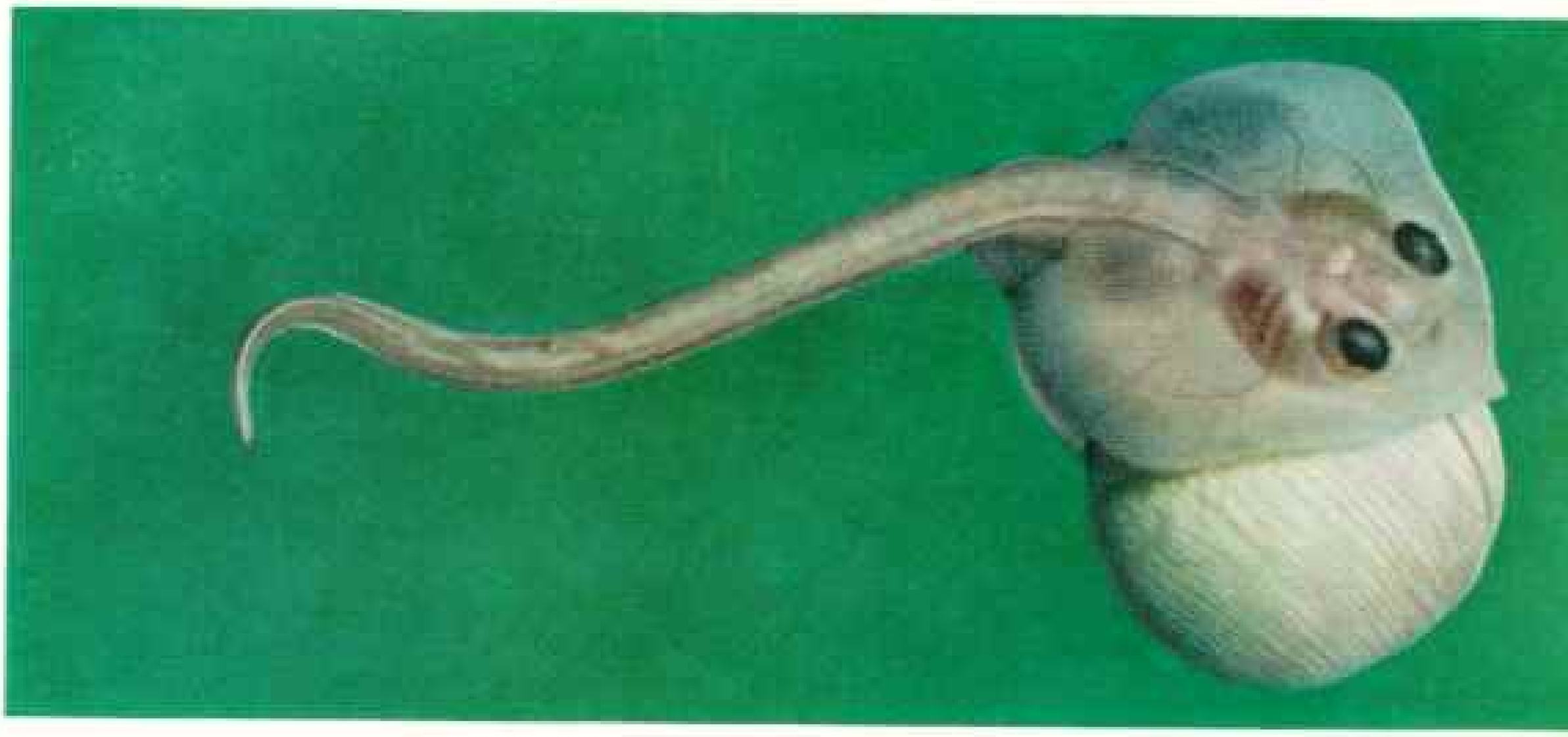
Egg laying begins. Seen in its glass tank, this clearnose is about to shake free the horned case. Translucent patches on each side of the snout give the fish its name. The tail helps it to steer.

Strong light silhouettes an 18-day embryo skate in its secure small world. At the beginning it was a dot on the egg yolk. Threads on the horns at left anchor the egg case to sand and shell.

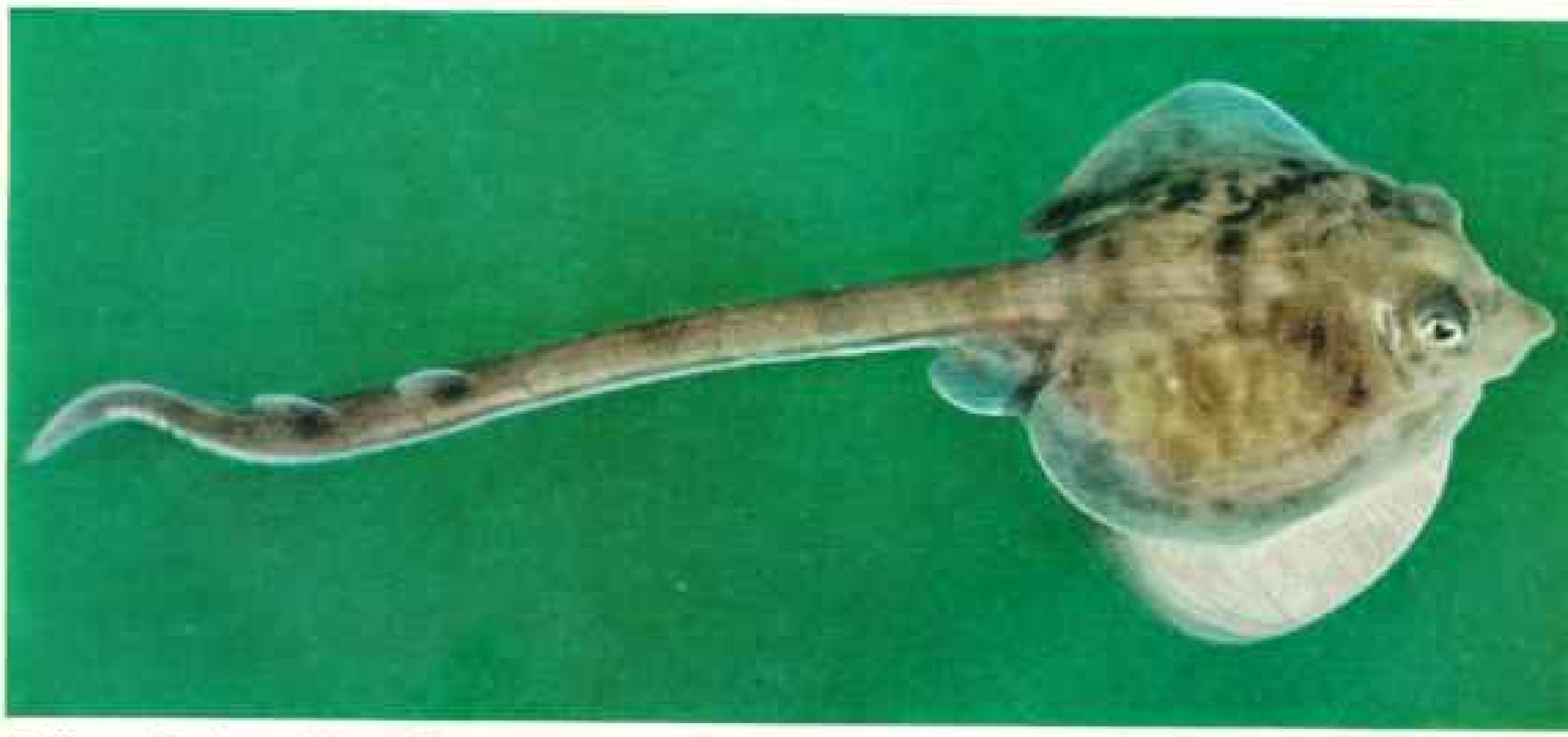
Born Prematurely, a Skate Sits Tied to Its Built-in Feed Bag, the Egg Yolk

For photographic models, Mr. Libby freed clearnoses from their purses well in advance of their normal term. He found that those three weeks old or more survived the shock and thrived in his aquariums. In nature this 24-day youngster would live about 40 days more in its protective case, then swim away hunting for its next meal. The umbilical cord conveys food from yolk sac to fish. Embryonic gills sprout like bushy red hair.

BOOKBROWSE (ABOVE) AND ABOVECOURSES © NATIONAL GEOGRAPHIC SOCIETY



Shoe-button Eyes Bulge at 44 Days. Wings Now Spread Above the Yolk



56 Days: Rations Almost Spent, Junior Faces Life in a Leopard Coat

fish lore lies in the practical realm of how do you catch them and what do you do with them afterward, was greatly impressed.

"Gosh, Ernie," he said, "studying a fish as useless as a skate makes you a pure scientist, like the fellow who studies ways to cure a disease nobody's got.

"People won't eat a clearnose. It's a nuisance in a shrimp trawl and on a fishing bottom. You can't even show it to tourists; it hides in the sand with only its popeyes out."

Ernest Libby, pure scientist, set to work. Technical problem No. 1: how to photograph a thing that lives in a keratin suit. Indicated method: undress it.

I snipped the end from a purse and poured its contents carefully into sea water. They soon disintegrated.

At this age—a day or two—a clearnose's egg apparently cannot stand salt water; so I reasoned its case must be watertight.

Sure enough. Tests on other fresh purses proved it. But the case we had candled was three weeks old and definitely *not* watertight: water had dribbled out when we picked it up.

Woody and I opened it and put the embryo with its egg-yolk anchor into a quiet aquarium. The skate-bug inside not only survived the abortion but grew and thrived.

Baby Skate Meets Salt Water

Our discovery made possible my sequence photographs of a living clearnose as it would look inside its shelter from three weeks old until emergence at nine weeks (page 415).

The fellow at the bottom of the page would have emerged in another week had I not freed him. Thus the photograph is not completely natural. At this stage an unhatched skate is wider than his purse, and his wings are folded until he slips through the opened seam in the end of the case (pages 418-9).

Younger than three weeks, a skate embryo is so transparent that it does not show well against its background of attached yolk. In trying to take its picture, however, I learned that the twentieth day or thereabouts is a critical one for a little clearnose.

On this day the skate apparently gets its introduction to salt water. The albuminous egg white that initially surrounded the yolk finally disappears, probably absorbed, and this frees a tiny hole in each of the purse's four horns. At about the same time, in all likelihood, the purse seam begins to split.

To be sure of enough oxygen-bearing sea water, the skate starts its pumps. The tip of the tail seeks one of the orifices, flutters, and sets up a current exhausting eventually through the other three holes.

The embryo by this time has developed a tangled skein of external gills for extracting the life-sustaining oxygen from the current (page 415). The infant meantime is growing a set of internal gills. Eventually his outer breathing apparatus will disappear.

Now I had seen the miracle in the mermaid's purse. I had watched a tiny creature that would otherwise have fallen immediate prey to some prowler of the deep begin life equipped with its own fortress. I had seen how nature times matters so that her children may grow up to perpetuate their kind: The sea enters the mermaid's purse when it must, and only then, and the clearnose takes to the open sea when he is able to cope with it, not before.

Abigail Gets a Husband

I had as yet no understanding of how the egg was given the spark of life and placed within the purse. I asked Ronnie for more skates, and he filled my tanks.

One of them I christened Abigail. Abigail laid infertile eggs. I put a male into her tank.

Hardly had the honeymoon begun when Clarence—that was Abigail's husband—sailed out of the tank during my absence and expired on the studio floor. But Abigail began laying fertile eggs and went on laying them all during the laying season, thus suggesting that skate husbands need not necessarily spend too much time around the house.

It was Monday. Abigail was due to lay eggs the next day. I could always tell. Every four days her back humped slightly. Prowling her tank, she found a spot she liked; she hovered, and—it happened.

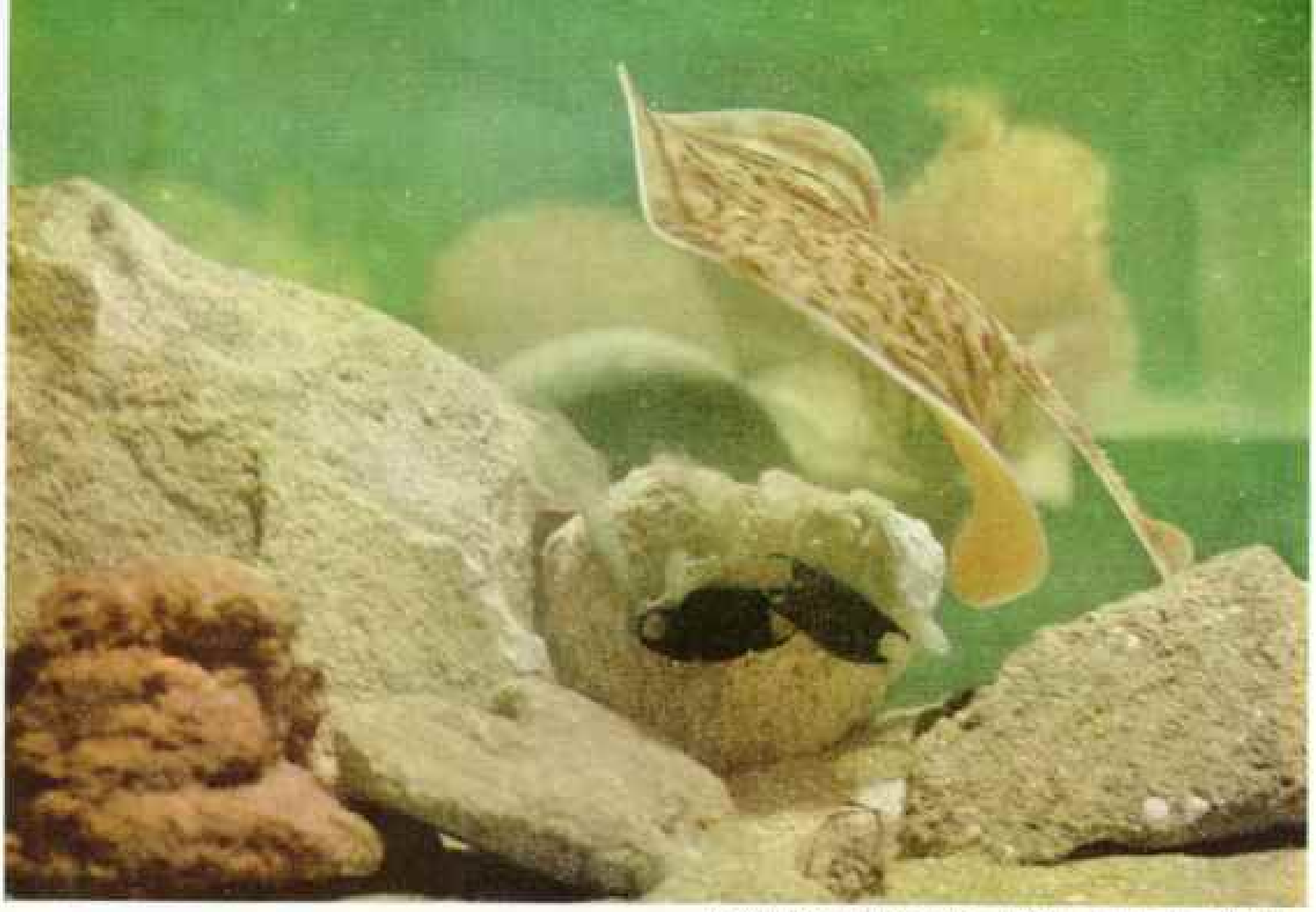
At such times I had only to focus my camera on the same spot, test my lights, and stand by for half an hour. Abigail would come back and lay another egg. Click! went the shutter.

But this particular Monday night an octopus in the next-door tank pulled down Abigail's circulating sea-water hose, flooding the studio and suffocating Abigail.

Sadly I watched Cliff Townsend, our assistant curator, perform the post-mortem.

"She was a factory!" he exclaimed, pointing his scalpel at eggs from pea-size to thumb-size in Abigail's twin production lines.

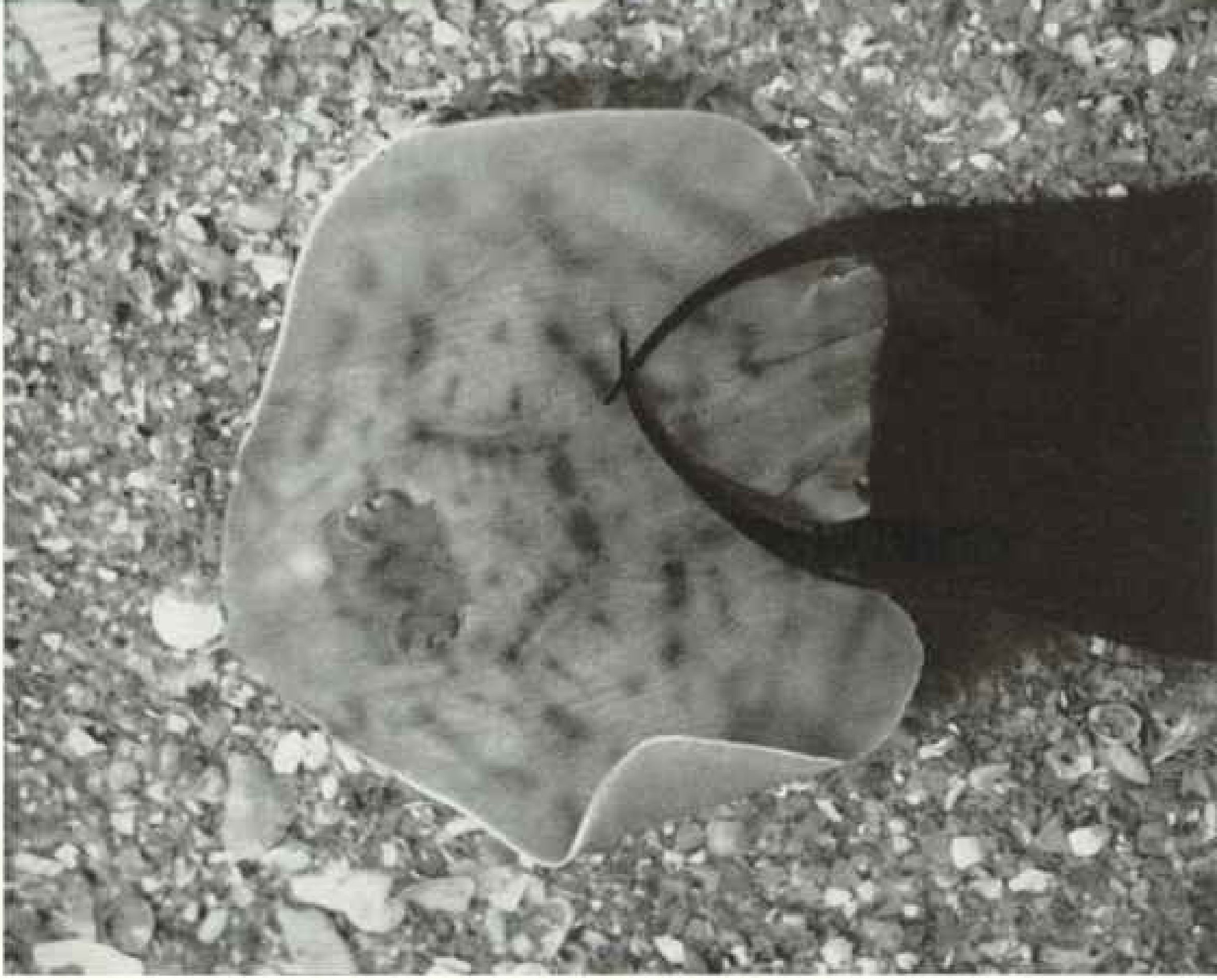
"But here's something interesting. Look, not a sign of a case around the eggs she would have laid tomorrow. Think how fast her purse-making department must work!"



ANSCOCHROME (ABOVE) AND KODACHROME © NATIONAL GEOGRAPHIC SOCIETY

After one mating, a clearnose lays two fertile eggs about every fourth day during a nine-month season. This one chose for her nest the rocky corner of a tank in Marine Studios.

Eyelike nostrils in a ghostly face scent food but do not serve the respiratory system. Gill slits on the skate's underside mark the true breathing apparatus. Diver at left looks for egg cases.



A Baby Leaves the Purse with Its Wings Folded Like a Rolled Pancake

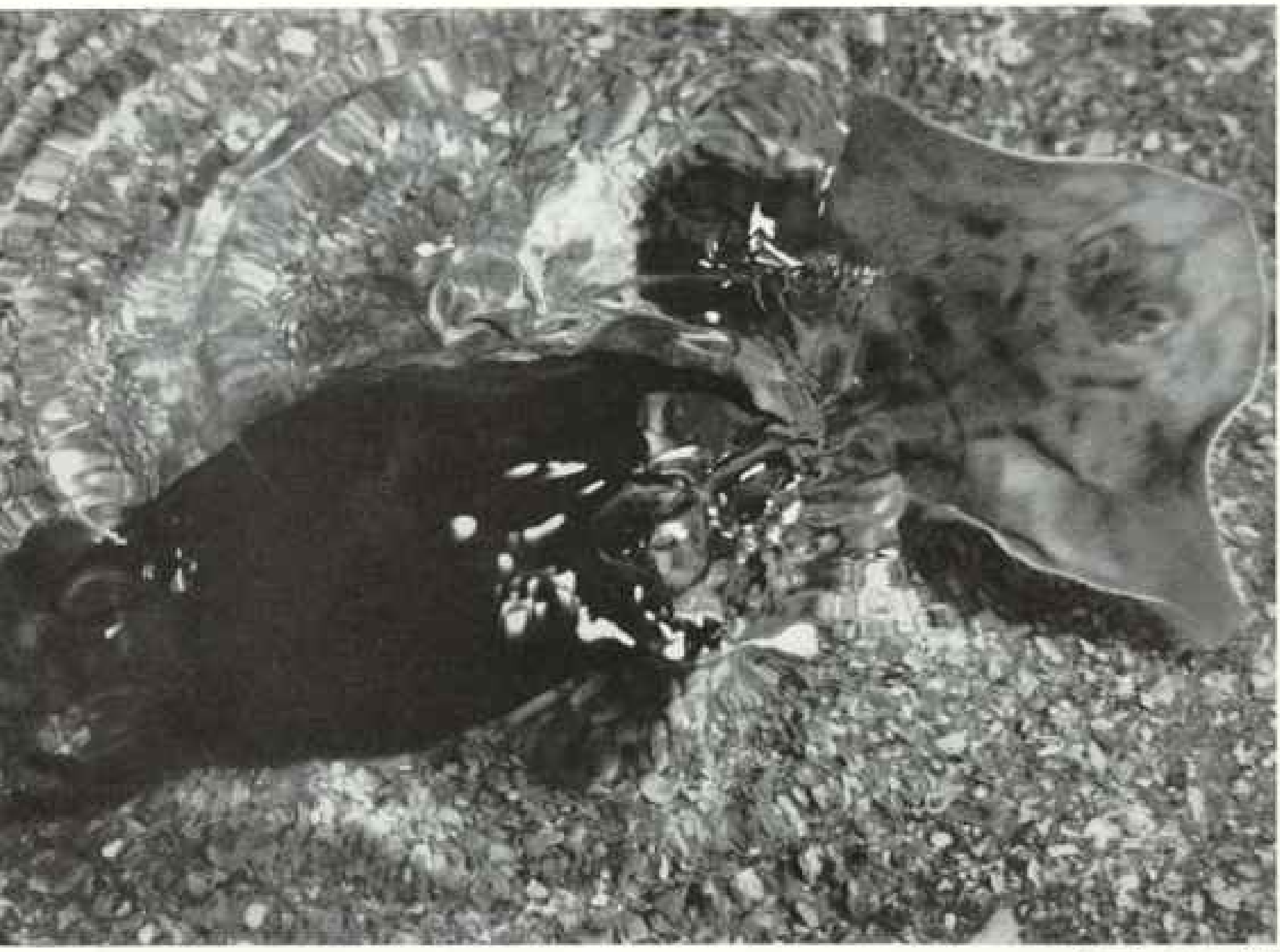
These photographs show how a clearnose 3½ inches across the wings develops within an egg case a third that wide.

The protecting purse always splits at the end opposite its anchor lines, thus not entangling the emerging baby. Here horns hold the still-folded wings.

Fully developed wings unfold before the tail clears the case (opposite, lower).

A final kick of the tail frees the prisoner.

The author found his premature infants stronger at hatching time than those born naturally, presumably because they had had more exercise.



Equally wondrous is the skate's breathing system. Oxygen-laden water comes in through two spiracles on top of the head, and spent water leaves through slits on the underside.

Fascinating! And so practical. Were the breath current reversed, the bottom-hugging skate would choke its gills with sand.

Clearnoses have beautiful white scalloped "eyelids," coy as a beauty queen's lashes.* They will close tight. I am not sure whether they guard against sand or overly bright light. Maybe both.

Sally Baskin, teen-age daughter of Tom Baskin, the Marineland Motel operator, is a pretty pixie who knows and loves the tiny creatures of beach and surf. She spends hours watching the inhabitants of my tanks.

"She has little paws!" she cried out one day as she watched Abigail.

They do look like paws. They are in truth paddlelike segments of the pelvic fin, and they power the skate on the ocean floor.

Wings—actually the pectoral fins—furnish the swimming drive. The long tail helps in steering. It is ridged with spines, and perhaps it also discourages fainthearted predators.

The largest clearnoses weigh little more than six and a half pounds. I have no evidence on longevity. Some of my clearnoses are thriving after two years. So far death has visited my tank through accident, not old age.

On the public fishing piers that jut seaward from Florida beaches, and on the bridges around St. Augustine, people catch skates when they would rather catch bass. Annoyed, they throw the clearnoses onto the sun-seared walkways, where they quickly gasp away their small lives.

Tribute from a Youthful Trader

Sometimes, if it is not too late, I drop them quietly back into the ocean. You see, I am not really a pure scientist at heart. If you need further proof, a practical application for my research has already been found.

I learned about it the other evening. Young voices came through my living-room window.

"One ole mermaid's purse isn't worth two rare conch shells," said a neighbor's son.

"This one is," said Ken. "It came from the research lavatory of Dr. Ernest Libby, world's greatest authority on clearnose skates."

* See "Nature's Alert Eyes," by Constance P. Warner, National Geographic, April, 1959, page 563.

Spotted eagle ray, cousin of the skate, appears to fly in water like a bird in air. Black angelfish hover over a cabbage, part of Marineland's varied diet for its denizens.

LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF

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COVER: *Navy Demon jet's afterburner spouts fireballs in a blazing burst of speed (page 528)*

Molecular model of ethylene oxide—one of the basic building blocks in Union Carbide's chemistry.

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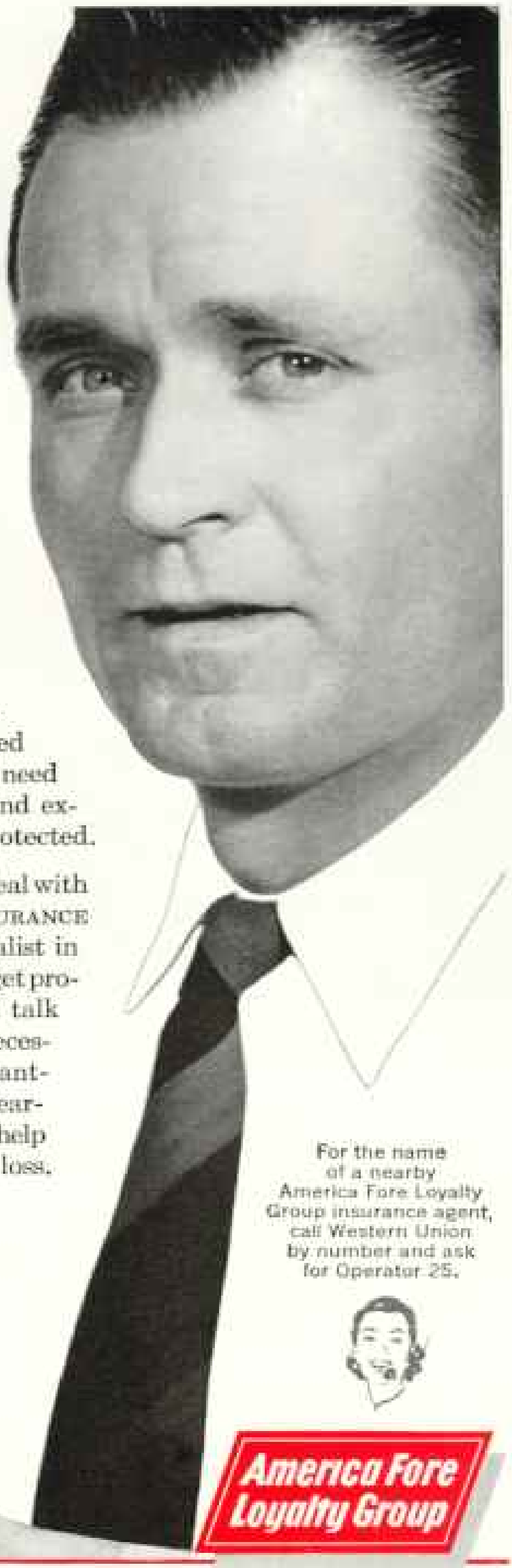

...I *do* know that I can't afford to lose the money I've put into my home, my savings or other things I own, to satisfy a claim for some accident.

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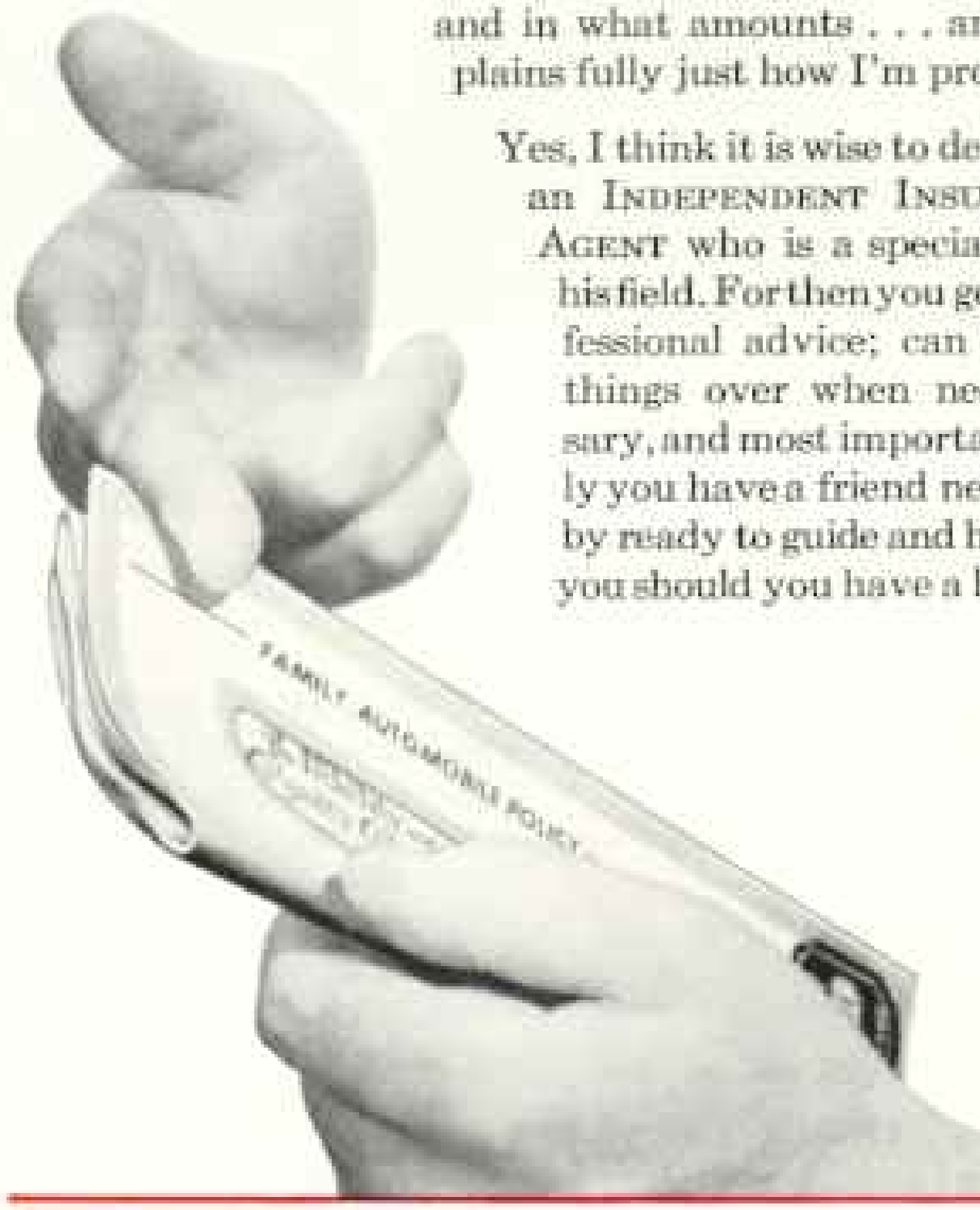
Yes, I think it is wise to deal with an INDEPENDENT INSURANCE AGENT who is a specialist in his field. For then you get professional advice; can talk things over when necessary, and most importantly you have a friend nearby ready to guide and help you should you have a loss.



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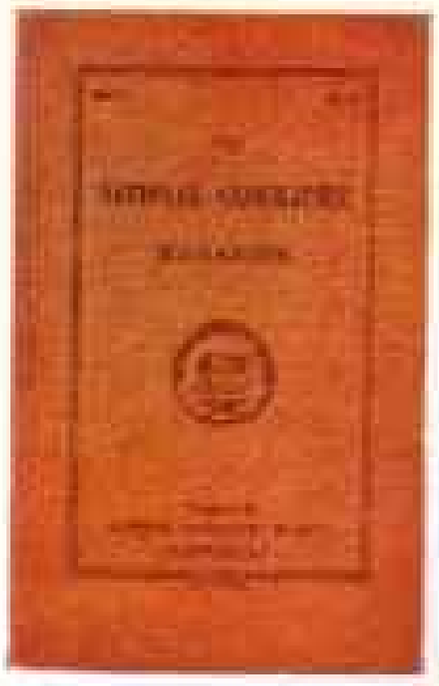

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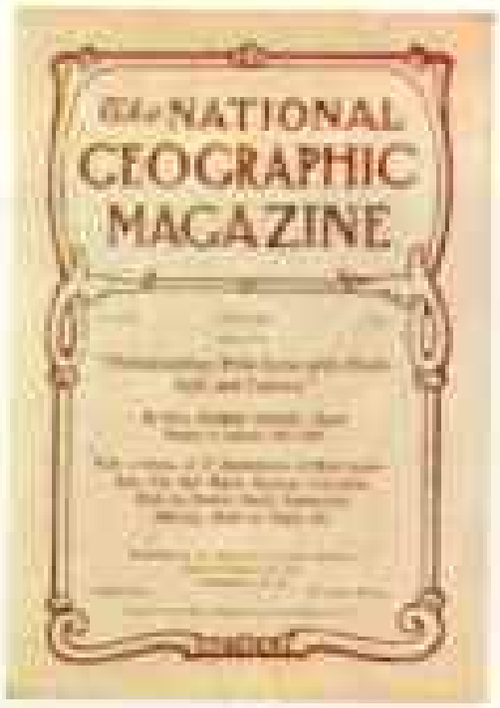

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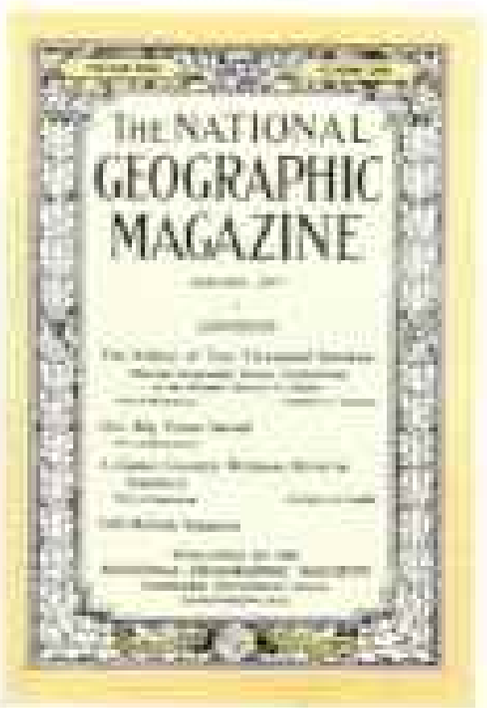

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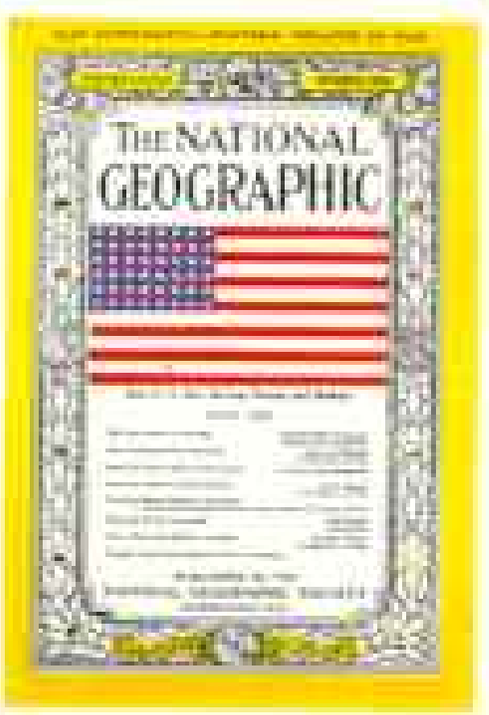


1942

NEW LOOK ON A FAMILIAR FACE

The Editor shuffled through a pile of NATIONAL GEOGRAPHICS on his desk recently, looking for one of his own articles. By the time he found it, he was wishing for some easy way to tell one issue from another.

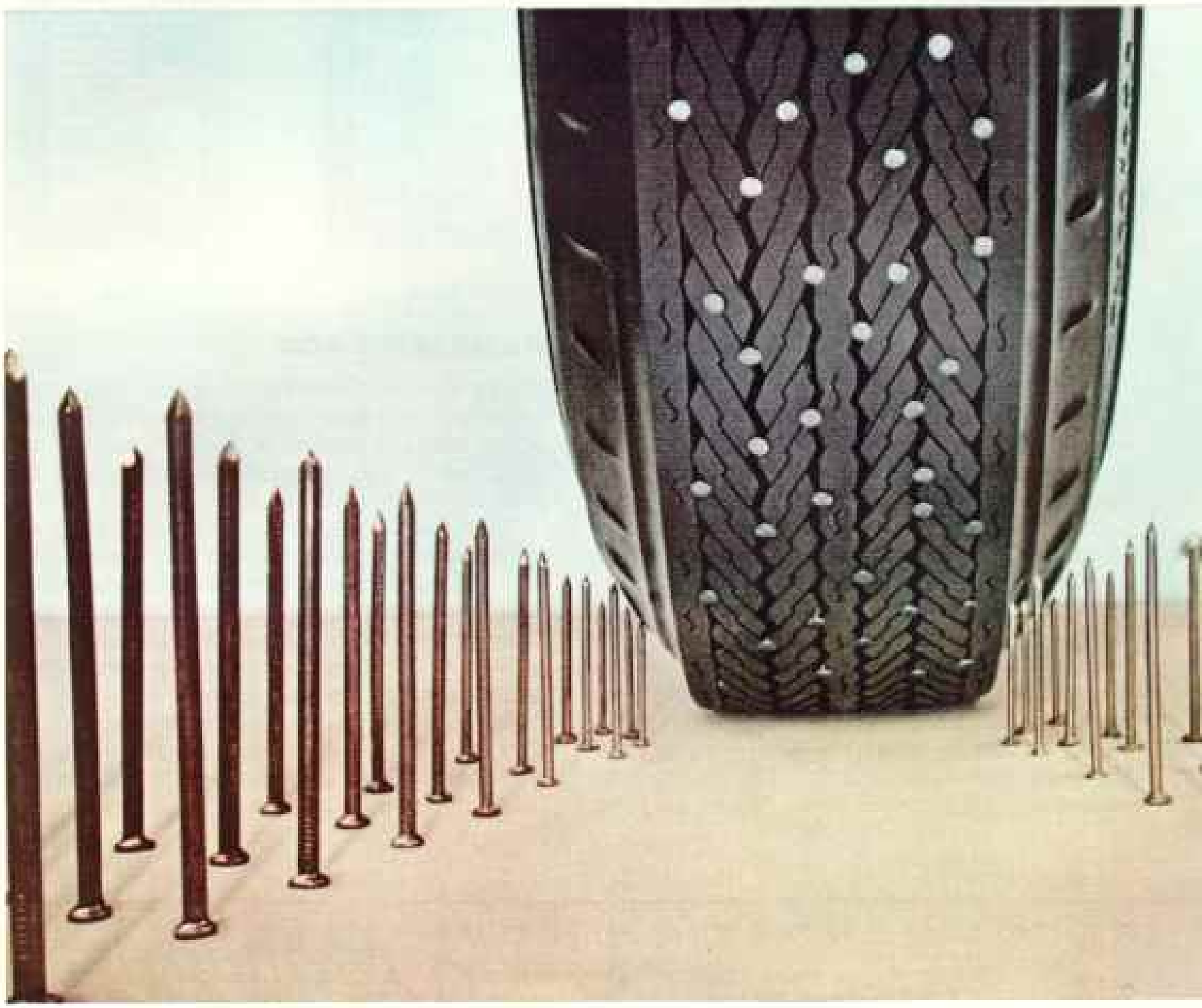
"Why don't we put a picture on the cover?" he asked. Thus began a study of ways in which a photograph could be added without altering the magazine's famous trademark.

This month's picture—a Navy Demon jet fighter, keynoting the lead article—is not the first to appear on the GEOGRAPHIC's cover, nor is this the first time the cover has been changed.

The earliest copies of The Society's magazine were, by today's standards, dry monographs bound in reddish-brown paper. When, in 1899, young Gilbert Grosvenor became Editor, the magazine took new form and new life. Photography brought readers a fresh picture of the world, and the early use of color film made that picture vividly beautiful.

With the GEOGRAPHIC of February, 1910, the gold-framed cartouche of oak and laurel leaves first appeared. For nearly 50 years this cover has been a familiar face, and a famous one. During World War II bond drives the Stars and Stripes waved from the cover. The new 49-star banner appeared in July of this year.

Beginning with this issue, members can look forward each month to a picture within the golden frame, an advance peek at the array of colorful, informative stories inside.



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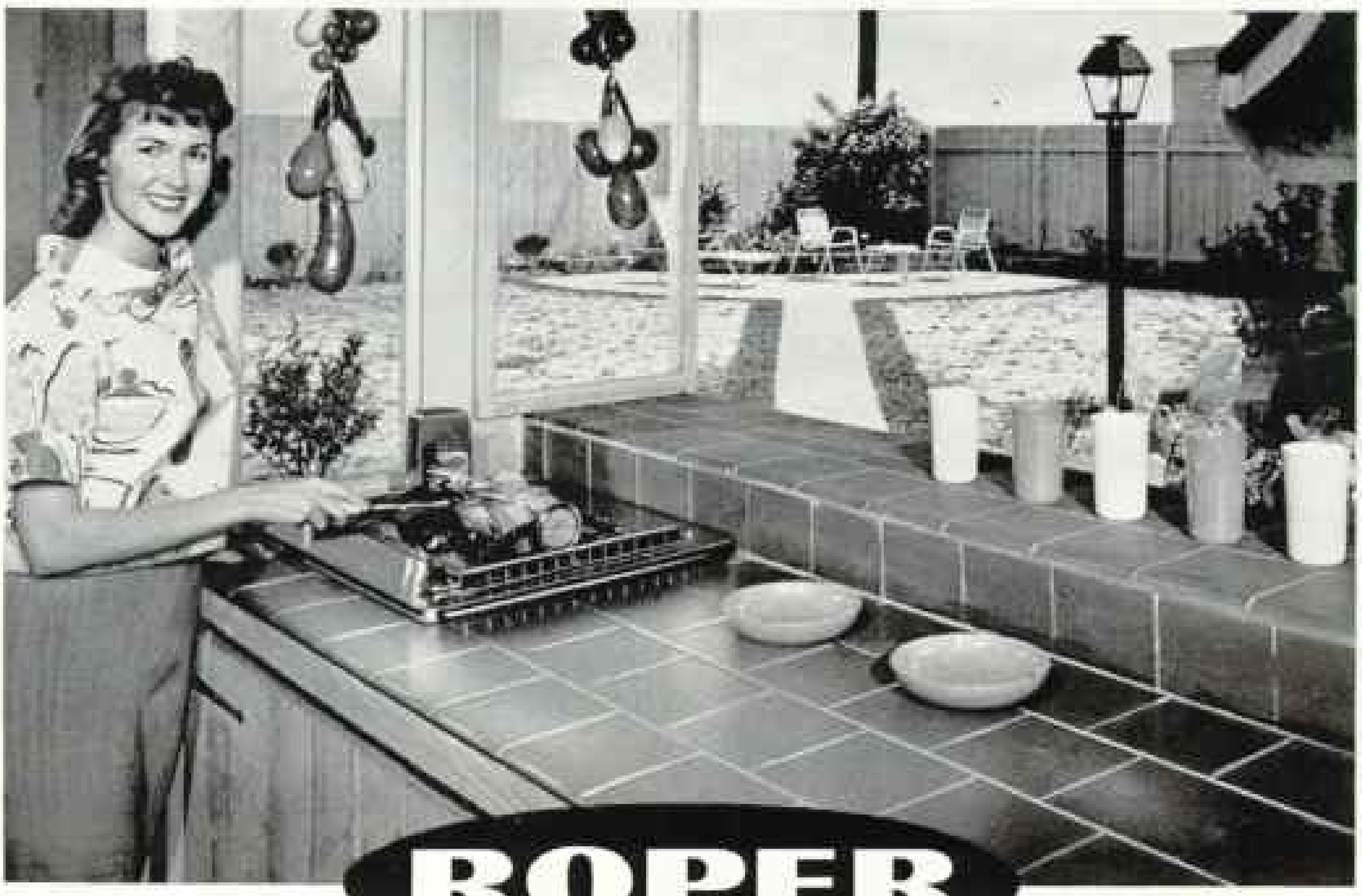

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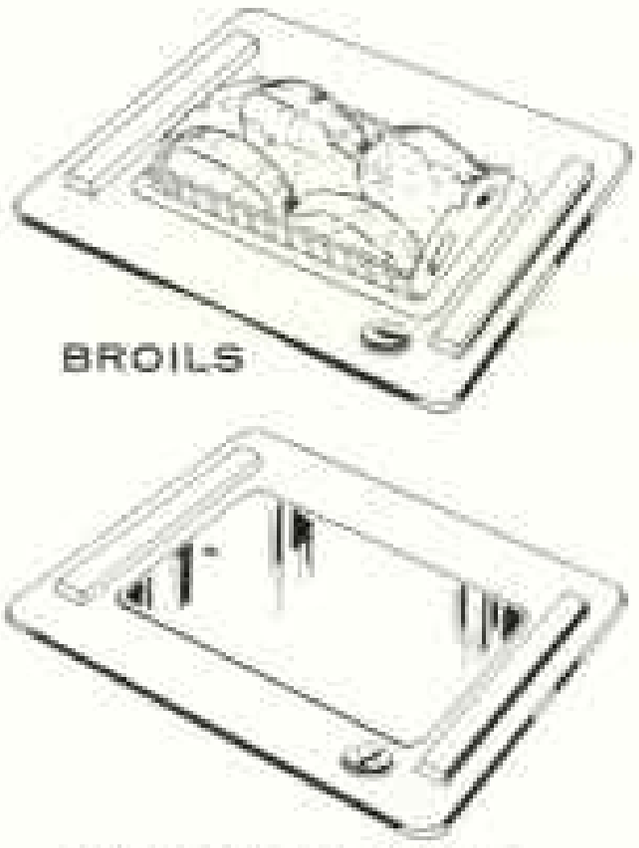

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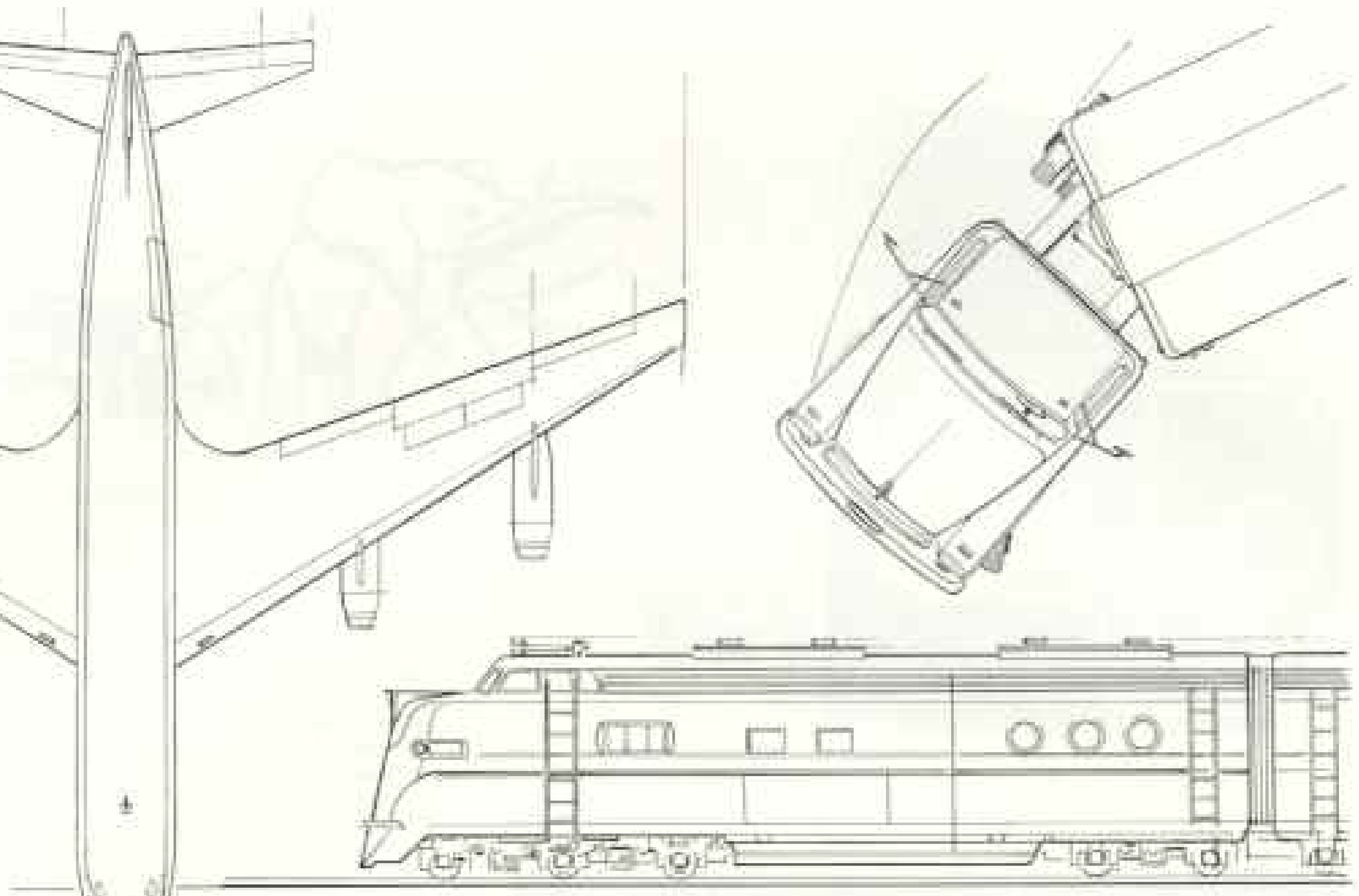

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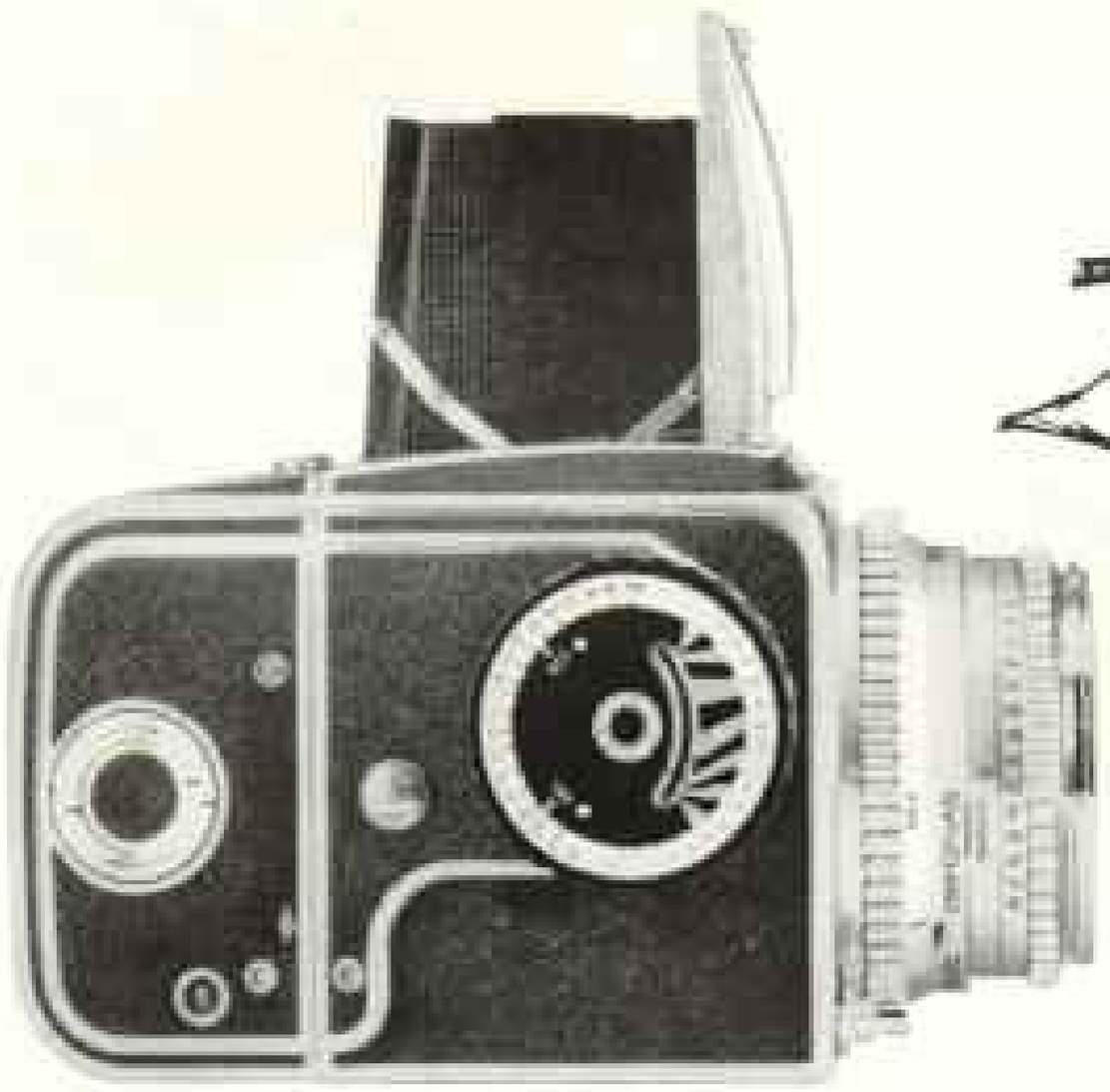

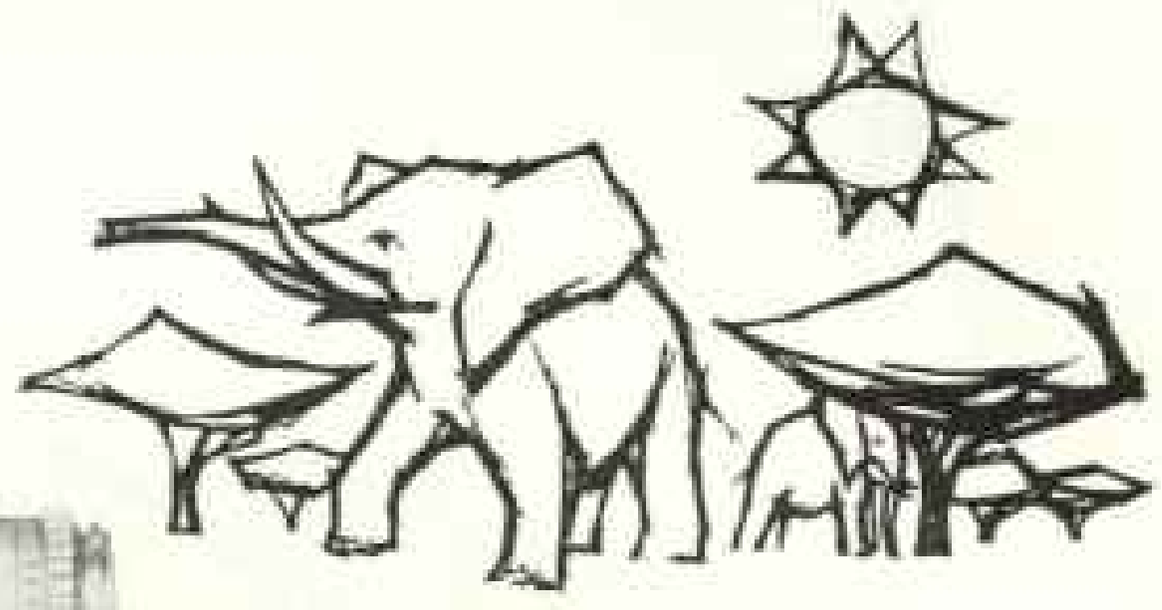

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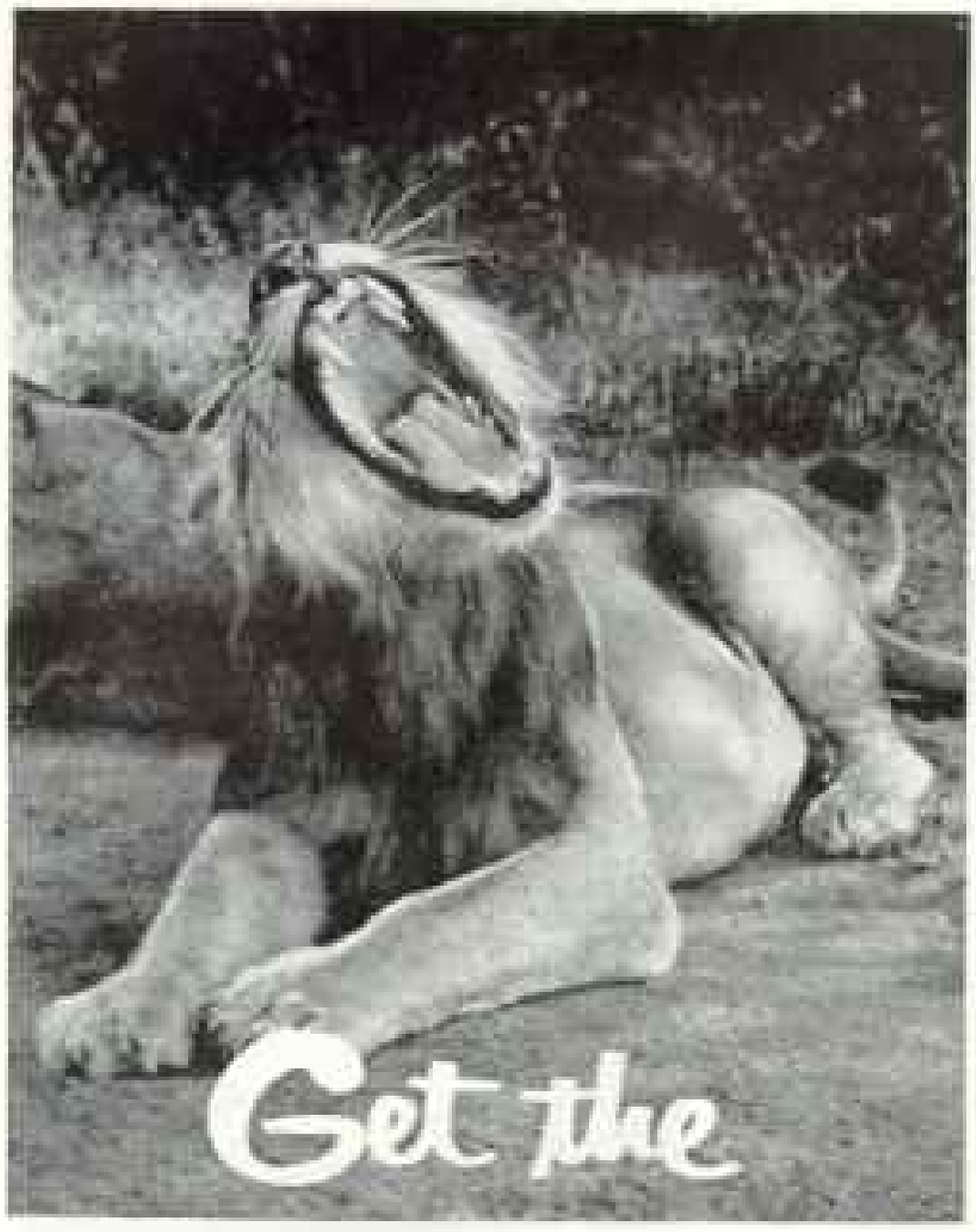

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No. 3 (continued from NGM May issue)

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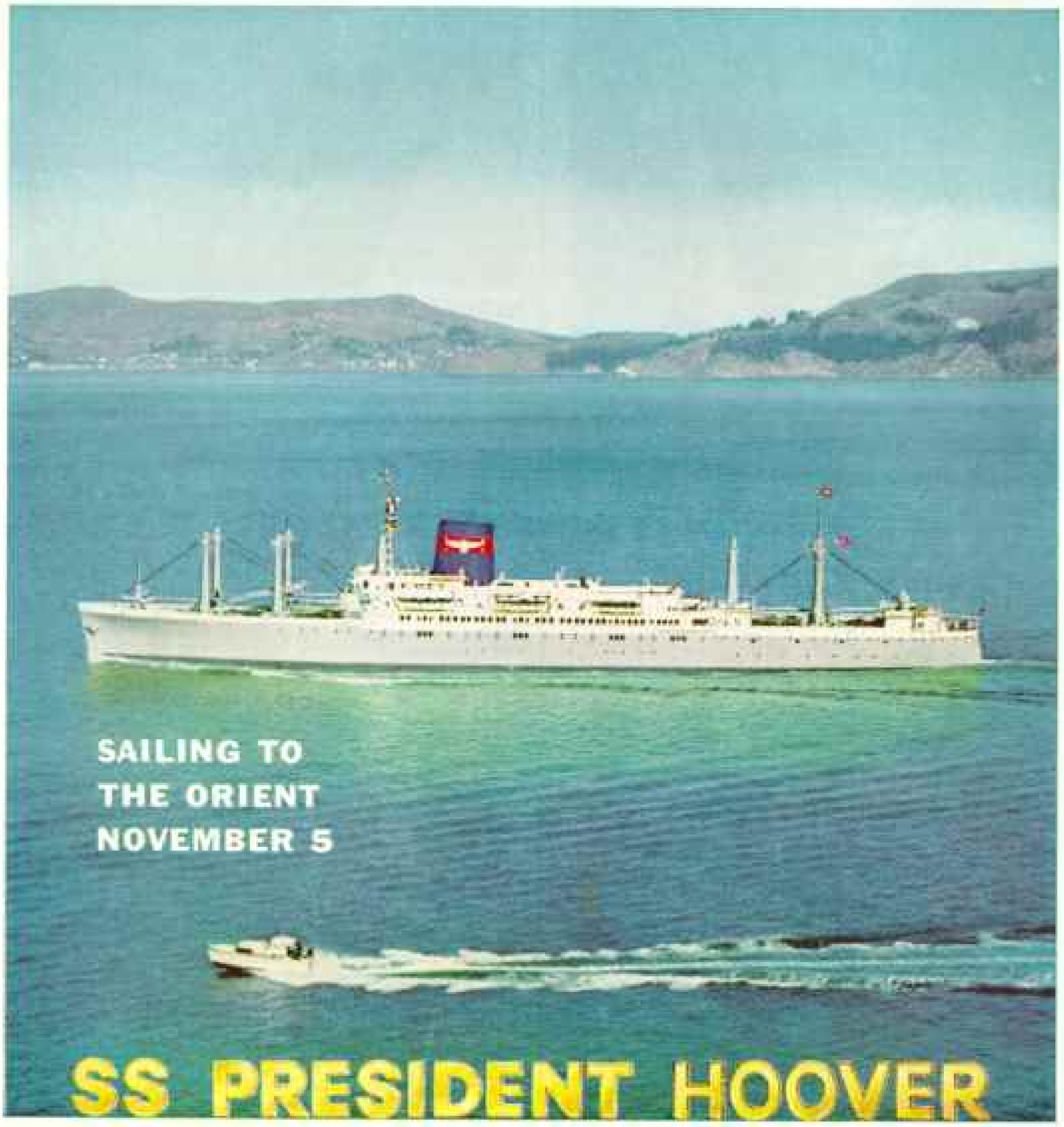

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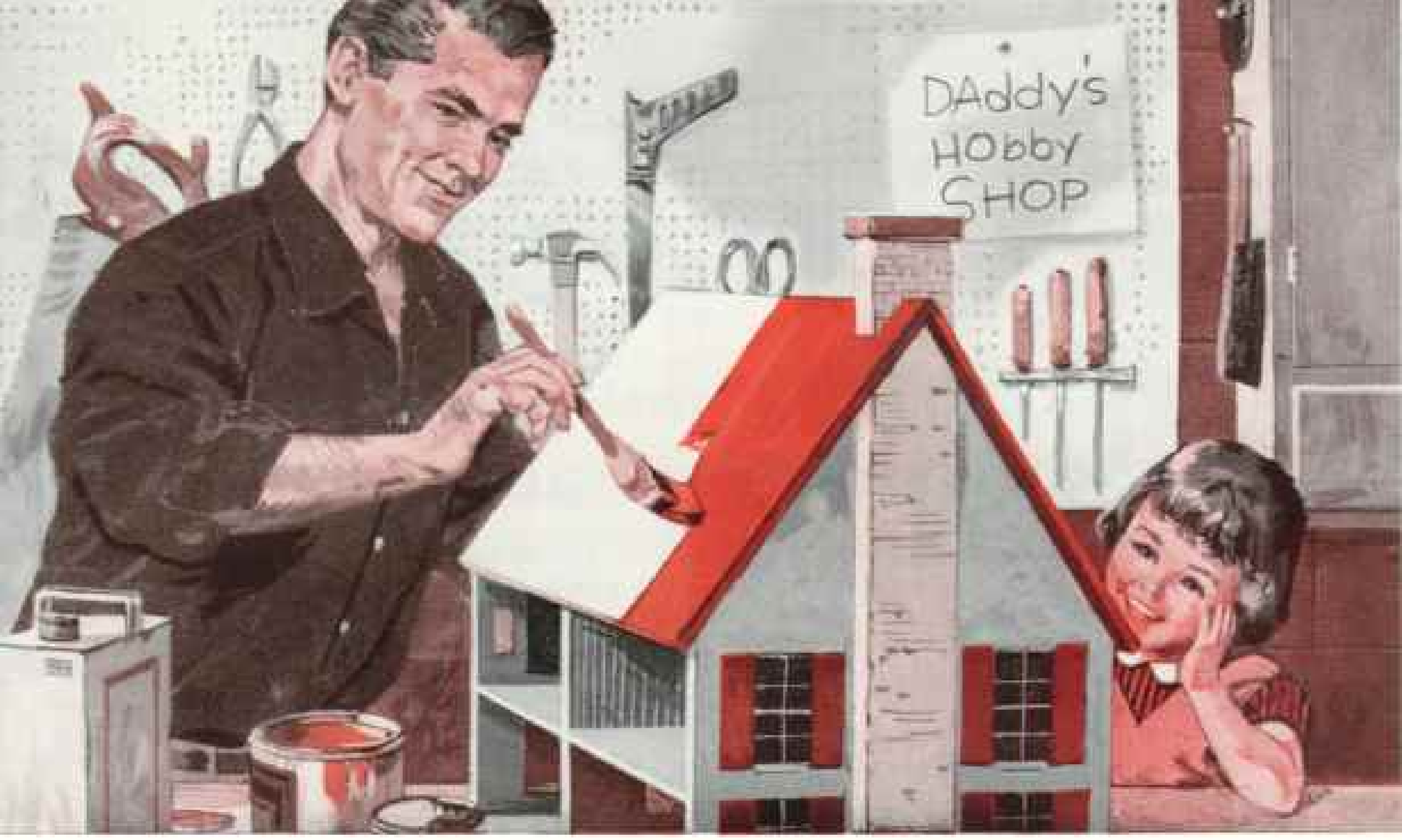

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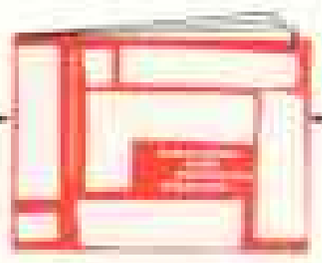

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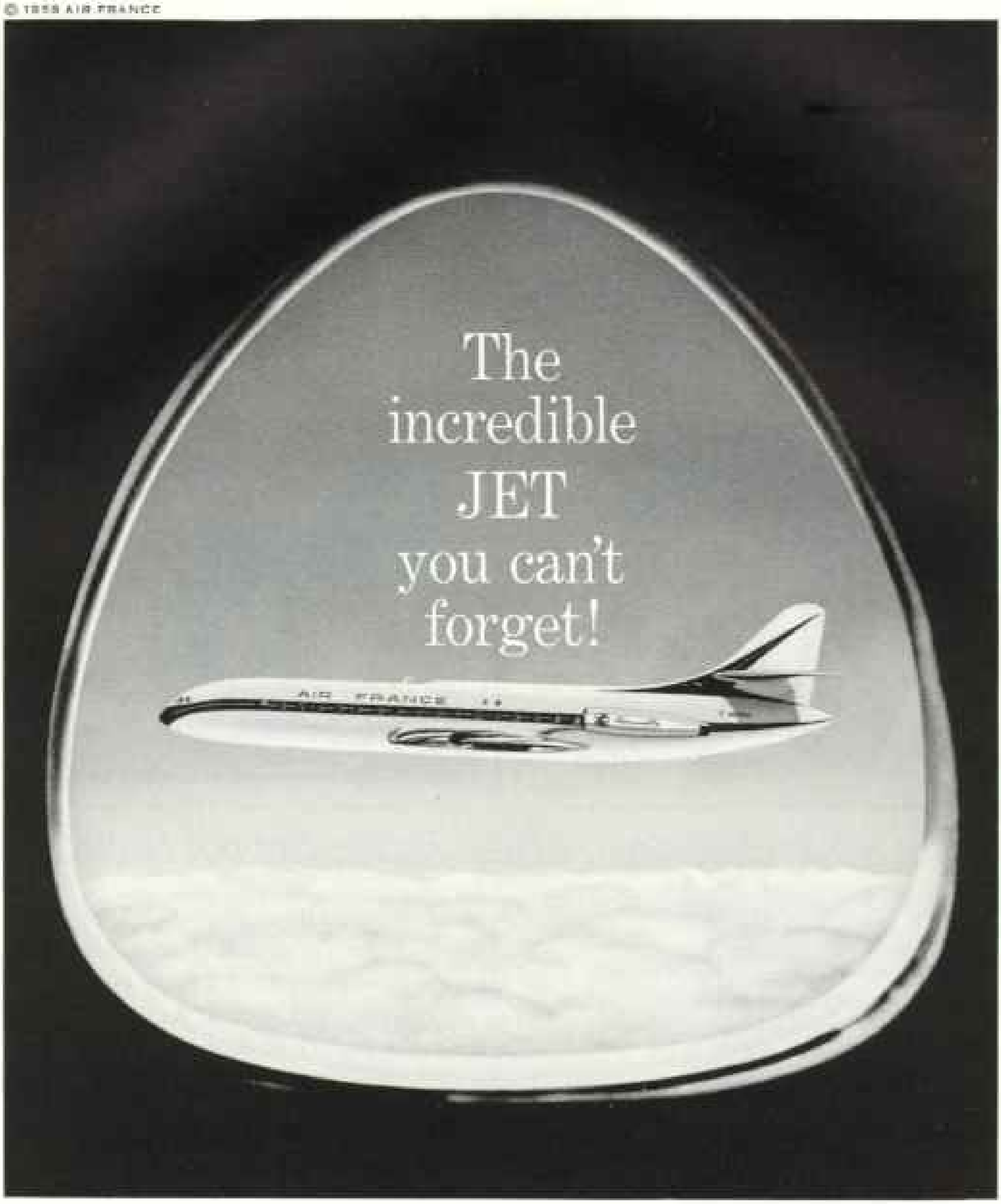

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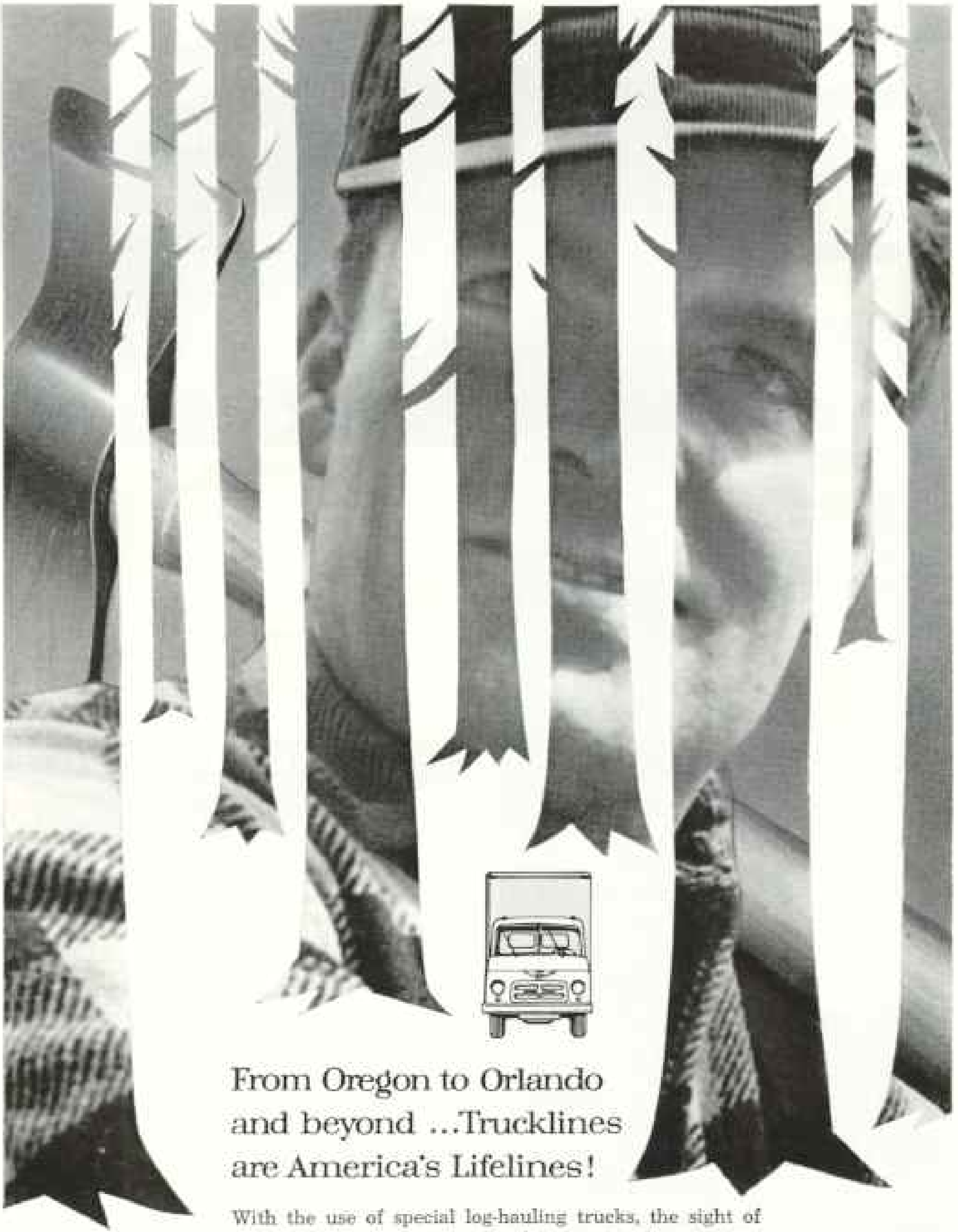

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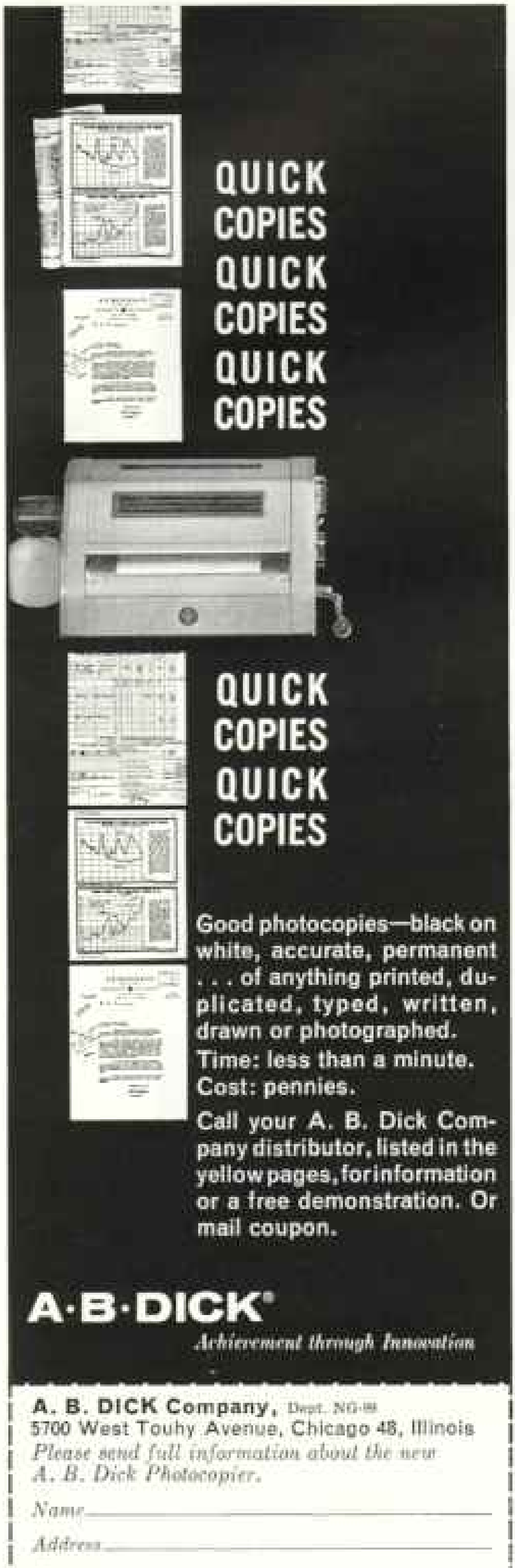

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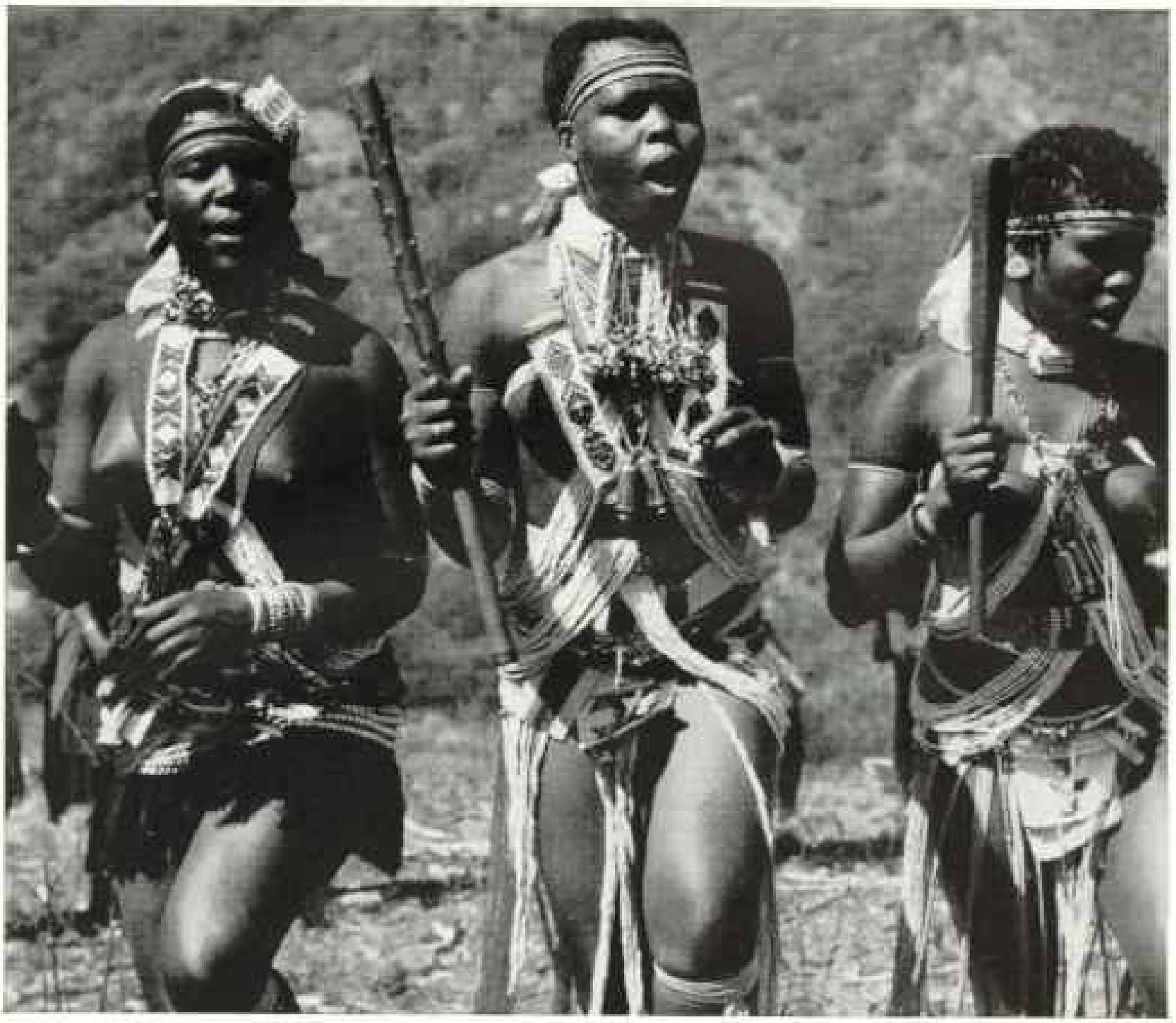

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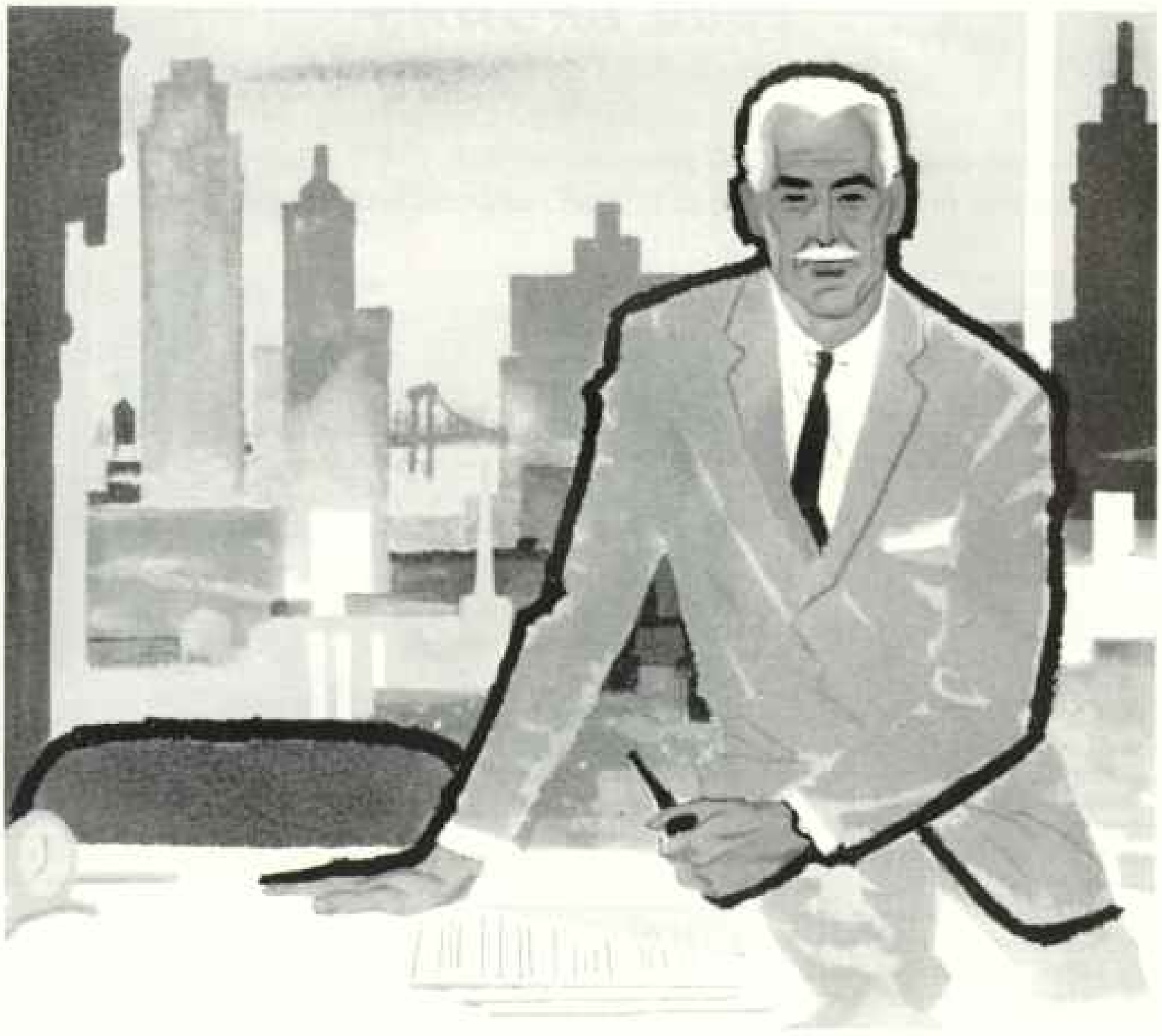

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When the postmen of this country set forth with mail for the owners of the American Telephone and Telegraph Company they visit a tremendous number of homes. The quarterly dividend, for instance, is delivered to over 1,625,000 share owners.

Dividends are important to the Smiths and the Browns and the Joneses and all the other A. T. & T. share owners. They are important to telephone users too.

Without dividends on stock and interest on bonds there would be no investors. And without investors there would be no telephone service as you know it today. The money they entrust to us goes into more and better service for you.

The distribution of the A. T. & T. dividend to so many people in 22,000 communities is in itself a factor in the over-all economy of the country. Yet the total, though considerable, is small compared to other sums that flow out from the business.

Last year, for example, the Bell System paid more than twice as much in taxes as it paid A. T. & T. share owners in dividends. It thus provided nearly a billion and a half dollars for the support of city, state and federal governments.

Wages, of course, are the biggest item. In the Bell System they are billions of dollars more than the entire net income of the business. In 1958 Bell System wages totaled over $3,700,000,000 . . . the nation's largest business payroll.

THE POSTMAN RINGS 1,625,000 TIMES with A. T. & T. dividend checks. Women are the largest group of share owners and own the most stock. . . . In addition to direct owners of A. T. & T. securities, millions of other people have an important, beneficial interest through the holdings of their insurance companies, pension funds, mutual funds, unions, savings banks, etc.

Thousands of other jobs in other companies were made possible by our large purchases from outside sources.

Last year the Bell System's manufacturing and supply unit, the Western Electric Company, bought from more than 30,000 firms throughout the country. Nine out of ten were small businesses, each with fewer than 500 employees. This year again we expect to buy over a billion dollars worth of raw materials, parts and services from other companies.

It is altogether natural and logical to expect big figures in a business that serves more than 55,000,000 telephones and handles over 200,000,000 calls a day.

The important thing is to relate the size of the figures to the size of the need and the job. And to realize how the very size of the business contributes to the prosperity of millions of people and the economy of the whole country.

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