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THE NATIONAL GEOGRAPHIC MAGAZINE

As 2,000 Ships Are Born

BY FREDERICK SIMPICH

BUILD ships faster than our enemies can sink them! That's America's job.

We must get guns, planes, tanks, and food to our Allies and fighting men overseas to win this war. Everybody knows that.

Besides bridging the oceans to help our Allies, we need more and yet more ships to move our own troops, to supply our own new bases from Iceland to the South Sea, to carry oil and supplies to the fleets, and to import needed strategic materials.

When this war started, we had about 1,100 oceangoing ships of over 2,000 gross tons. More than 200 of these, including well-known big ones like the *America*, *Manhattan*, *Washington*, *President Coolidge*, and *Lurline*, have already been taken over by the Army and Navy as transports, tankers, supply, and auxiliary ships.

By 1943's end, says the U. S. Maritime Commission, we must have about 2,000 new tankers, freighters, and cargo-passenger ships. Approximately 100 of these were already in service as 1941 ended. Nineteen hundred are under construction and contract for production in 1942 and 1943.

No nation in history ever faced so colossal a shipbuilding task in so short a time—and this pace will continue until the war is won. Tentative schedules extend into 1945.

From Bath, Maine, clear around to Tacoma, Washington, old and new shipyards are busy building new ships and fixing old ones, including many Allied vessels hit and hurt by bombs and torpedoes. Day and night from these swarming yards rise the roar and racket of rivet guns, the creak and groan of giant cranes, the clang of forging shops, the thud of trip hammers, and the hiss of welding torches.

Heading up this giant task is the hard-working U. S. Maritime Commission. It is charged by law with subsidizing the building and operation of ships. Another enormous job, the training of new officers and sailors, is in the hands of the U. S. Coast Guard. To man these 2,000 new ships will call for at least 15,000 more officers and a minimum of 60,000 more seamen. That is a story of stupendous effort and infinite painstaking, to which this narrative will return (pages 581-585).

First, let it be said just how a ship is conceived, born, and then raised to its full stature.

In Naval Architects' Minds Ships Are First Conceived

"You've drawn plans for lots of ships," I said to Naval Architect Sydney Vincent, at the plant of the Newport News Shipbuilding & Dry Dock Company, on Hampton Roads, Virginia. "Can you shut your eyes now, before you make any plans on paper, and conjure up in imagination an ideal finished ship?"

"What kind of ship? Various trades call for different designs."

"Well, say a freighter of 7,000 tons cargo-carrying capacity, to make 16 knots."

"For what kind of cargo? Ore, bananas, molasses, or what?"

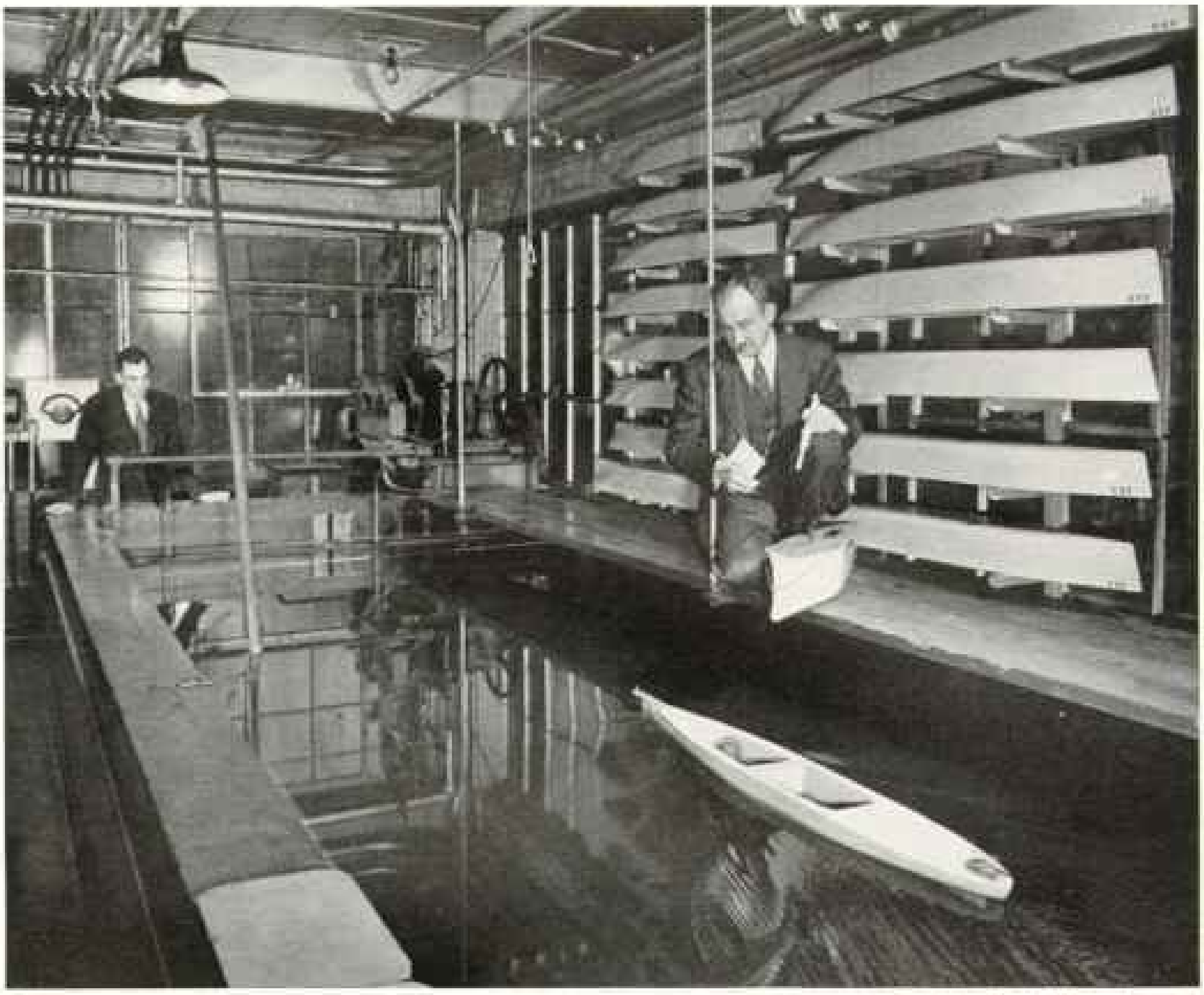
"Say dry cargo, like machinery and boxes of merchandise."

"Will it have to quit the sea and make port up shallow rivers?"

"No, all deep-water harbors."

Vincent reached for his slide rule and a scratch pad, and figured. Then he quickly sketched a trim-looking little freighter to scale, so much length by so much beam, to draw so much water. He even sketched in her fat stack, the masts and propeller, then a plume of trailing smoke and a few realistic waves.

"But that's just a beginning," he said, "to show you how we actually commence work,



Staff Photographer B. Anthony Stewart

He Tests a Model to See How a Real Ship of the Same Shape Behaves

This looks like play; actually, it's serious work for Sydney Vincent, Naval Architect of the Newport News Shipbuilding & Dry Dock Company. Lessons learned here about speed, roll, needed power, best lines to adopt, etc., are applied later when the full-sized ship is built. Sometimes 25 or 50 models are studied in this testing basin before the desired type is evolved.

after a shipping man has given us the operating conditions for a proposed ship. We must first know a lot of facts about what he wants the ship for, besides where it's expected to run, and what it must carry. If competition is keen, he may want a faster ship; if he wants to carry passengers and competing vessels have swimming pools, he'll also have to have a pool, or possibly two, etc.

"Kinds of things carried on ships are almost unlimited, but may be classified roughly as passengers, and liquid or dry cargo. Passengers, again, may be divided into first and second class and steerage, or all cabin class.

High Speed Is Costly

"Dry cargo may be bulk, such as grain, ore, or coal; it may be packaged freight, refrigerated meats or fruits, or heavy items like steel and machinery. Pieces of cargo may vary in size from a crated bicycle to a railroad locomotive, a 70-foot motorboat, or nowadays an airplane. So the ship's holds, the size of her hatches, and the size of winches on deck for handling cargo must all depend on what she's going to carry.

"When we design a ship, then, her basic characteristics and intended use must be settled before her type, dimensions, arrangement, and power plant can be selected."

"Talk about speed," I suggested.

"The shape of the hull, or 'lines,'" said Vincent, "affect speed. You saw that this morning when we were playing around in our ship-model testing basin. It's easier to drag a canoe through the water than a square block of the same weight.

"But to propel a vessel at high speed requires a surprising increase in power. To double a vessel's speed requires not merely double the power, but at least eight or ten times as much.

"Take a very fast ship of say 30 knots

Tri-Boro

A Waterfall of Sparks—the Night Shift Repairs the *Manhattan*

Towed up to Brooklyn after running ashore on the Florida coast in January, 1941, this famous liner, now the Army transport *Wakefield*, was repaired and converted for military use at the Robins Dry Dock & Repair Company. Fireworks result when the burners apply their torches. Figures marked in chalk on the plates indicate the patterns of holes to be cut out (page 559).

speed; it might require 100 percent more power to drive it at 33 knots, a speed increase of only 10 percent.

"Competition may demand high speeds, especially among competing passenger lines, but high speed is very costly, both to build and to operate."

"What about stability?" I asked.

"A ship is stable when it tends to float right side up. Its stiffness, or tendency to return to the upright after rolling, depends on the height of its center of weight and on its width, or beam.

"If a ship is too narrow—has too little beam—it may capsize; if it is too wide, it will return to the upright during a storm so violently as to cause very unpleasant rolling. The beam must therefore be suitable within narrow limits.

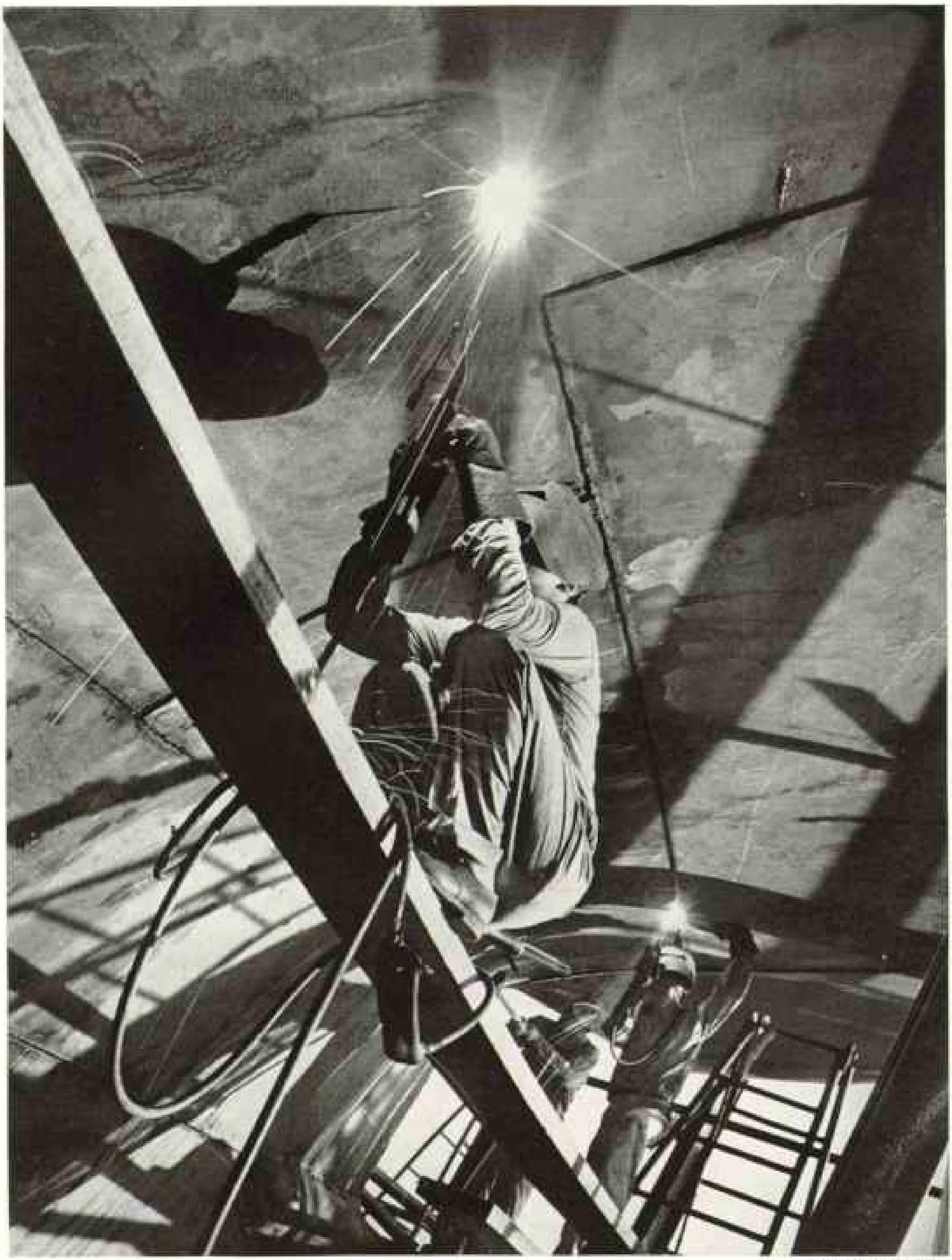
"By trial and error we work this out. Then we begin experimenting with models in our testing basin, first in calm water and then in artificial waves, until we perfect the shape of the miniature hull to get the required speed with the least power and also good behavior, for passenger comfort in waves.

"We tried out 55 different miniature hulls for the new *America* before the final one was selected. With it we then got not only the desired stability, but also the needed speed with about 10 percent less power and fuel than ordinary ships."

40 Tons of Plans for One Battleship

"What a lot of paper work," I said, "before you begin to hammer and weld!"

"Several thousand plans, many of them 10 or 15 feet long, and the specifications," agreed the naval architect. "All of the plans and blueprints for the new battleship *Indiana*, built here, weighed about 40 tons and would fill three or four boxcars! The specifications



Robert Yarnall Richie

Overhead Work Is the Most Difficult of All Fiery Tasks for the Electric Welder

This "man in the iron mask" must protect his eyes and face with a helmet, and wear gauntlets to keep sparks from falling down his sleeves. Holding up his heavy gun at just the right angle to fuse the seam calls for stout muscles, steady nerves, and good eyes. Where big sections are finished before they are swung into place, welding is much easier because it can all be done as "down welding" (opposite). Welders are paid more for overhead work.

for even an ordinary tanker or freighter fill a book about the size of a big city telephone directory" (page 558).

"When the plans are all done, who gets them first?"

"They go to that big room over there—the mold loft."

This loft, we found, looked like a dance hall; it was more than 600 feet long. On its floor was a life-sized diagram of the ship to be built (page 559). From this big picture loftsmen were making templates, or patterns, of almost every piece of the hull, or frame, that would go into the new ship. Made of thin wood or paper, these life-sized patterns may cost up to $100,000 for a ship of only 10,000 tons. If you're building more ships of the same kind, you can use the patterns over and over.

As fast as finished, these big, clumsy-looking patterns were carried to the fabricating shop, usually near by.

You've seen tailors cut a suit from paper patterns? Well, that's exactly how a ship's plates are cut, from steel sheets marked off after patterns made in the mold loft.

To this fabricating shop come also other plans and blueprints showing how the ship's ribs, frames, and many other metal parts shall be made. Some such parts are rolled out cold; others, emerging white hot as billets from near-by furnaces, are hammered into shape; some, which have to be bent, are twisted around stout "dogs" on a bending slab.

Propeller shafts, sternposts, and some other heavy pieces are made in a forge room or foundry. Even with oil-heated furnaces at 2,000 degrees Fahrenheit, it may take 24 to 48 hours to heat a 50,000-pound billet white hot, so it can be worked.

Anchors, chains, and propellers, of which more later, are usually bought from other makers.

Huge Sections Installed Ready-made

Prefabricating is a long step in mass production of ships (pages 564, 566, 568, 569). In this shop we saw men putting together big bulkheads, rudders, sections of deck and frames. Thus ready-made, these big pieces—some weighing as much as a dozen automobiles—were hauled away to where giant cranes waited to swing them into place on the rising vessel.

Men who receive such big pieces and guide them into place are called "erectors." Working in the growing hull are also ship fitters, drillers, welders, riveters, and other ship constructors. To guide these men, so they may set all the sections together as in a jigsaw puzzle, each piece is plainly numbered.

That "man in the iron mask" is the welder. Sparks of molten metal fly from his torch like stars from a Fourth of July pinwheel (opposite page). The helmet he must wear to save his eyes. Only through its colored glass windows dare he look at the brilliant, steel-melting flame of his torch.

Welding Revolutionizes Shipbuilding

These welders profoundly affect shipbuilding. In the modern *Queen Mary*, commissioned as recently as 1938, there are more than ten million rivets; in many of Uncle Sam's new boats, not a rivet! Welding makes ships lighter, stronger, and *faster* in the water, since no rivet heads add to friction with the water and the plating is flush.

Welding is a method of fusion by which the edges of two plates, for example, instead of overlapping and being riveted, are melted together. To do this the edges to be fastened are brought by an electric arc to a heat high enough to melt and fuse.

To help this fusion, additional molten metal is poured along the crack. This additional metal comes in the form of small round rods called electrodes. The welder carries a pack of them as an Indian carries a quiver full of arrows. To work, he takes an electrode out of the quiver, sticks it in a gunlike holder, and turns on the current through an electric cable that trails after him.

To start operations, he touches rods, or electrodes, to metal being worked, thus setting up an arc. Then he takes the rod away about one-eighth of an inch and lets its melting tip-end fall on the seam. He determines the exact gap, or arc, by the type of electrode, its diameter, and the amount of current used.

One reason welding is stronger than riveting is that, in welding, no row of holes has to be punched in the plates.

Most electric welding is done by hand, though automatic machines are used for certain types of work.

Welding makes shipbuilding move faster, especially in the case of certain tankers. In their sides the plates are much more regular in design than on other types of ships; so they are easier to pre-assemble, or prefabricate.

Since this prefabrication, or massing of large sections of a new ship, is done on the ground with the material lying flat, it is easier for workmen to get at it. Also, more men can work at once. Welders can ply their arcs more easily when the sections are flat than if the pieces were upright in place on the rising ship.

They call this "down welding," as distinguished from "overhead" work.

The Ionian Company

Ships Are Launched Sidewise When They Must Slide into Narrow Waters

Here the *Alcoa Polaris*, built in Long Beach, California, makes a big splash as she slips into an estuary. She is a C-1 cargo ship, with a 10,000-mile cruising radius. Many ships of the Alcoa line, belonging to the Aluminum Company of America, bring bauxite from Surinam (Netherlands Guiana).

Since welding started, as much as 50 percent of a ship may be prefabricated. This method of speeding up has been worked out by American shipbuilders. Much time is saved. Record time to date for building a welded tanker hull is 76 days, against 200 days when all riveted.

Ships built in American yards today are 85 percent welded, on an average. A small percentage are 100 percent welded.

Pioneer in welded tanker work was the Sun Shipbuilding & Dry Dock Company of Chester, Pennsylvania. In some of their all-welded ships there may be only 200 rivets now, where there used to be over 1,300,000.

But many ships are still all or partly riveted. The riveters work in crews. To one man, holding an empty bucket, a red-hot rivet comes flying like a comet. Neatly he grabs it in midair, in his bucket, like a baseball in a catcher's glove. With tongs he puts it in the right hole, and two others, a riveter and a "holder-on," pound it into shape, the former using a pneumatic hammer that rattles loud as machine-gun fire.

Measured in decibels, what din is worse than shipyard racket? But listen carefully and you learn to detect where each noise comes from, and who makes it. It's like identifying the sounds of different instruments in a brass band. One pleasant shipyard noise hints at a wild goose call; it is the honk of the hoarse radio voice whose long and short blasts form signal calls to different yard bosses.

There are lion roars, too, and jungle grunts; compressed air nozzles snarl like coyotes, and a little gas pump whistles like a snipe.

Take a look now through the whole busy shipyard. It's more than adventure; it's a sublime spectacle, like a scene from Creation.

As on magic carpets, you see all the pieces that go into a growing ship come flying through the air. Everything, big and little, even the 30-ton prefabricated bulkheads, floats into

Staff Photographer J. Baylor Roberts

"We Shall Not Stop Work for a Single Day"

After their shift, tired workers at Tampa, Florida, file out through guarded gates. Each drops his identification tag into a box. At dozens of yards, from Portland, Maine, to Tacoma, Washington, shipyards are working around the clock, fulfilling one of the three "high purposes" enunciated by President Roosevelt in his Washington's Birthday address to the Nation.

place through the free air, swung along by traveling cranes.

How much of a ship, you say in astonishment, is not built in a shipbuilding yard! Pumps from one distant city; valves, anchor chains, and propellers from others. Engines and gears from here and there, hoists from Wisconsin, lifeboats from Indiana; compasses, radio sets, and deck winches from still other scattered places.

"Nothing, seemingly, but the hull is built here; all else flies in!"

Cranes that swing these parts into place are of two kinds. One, an overhead type, straddles the growing ship like a big spider. The other, a long-armed whirling tower, prowls like a juggernaut about the whole yard, picking up a piece of ship here and there, then rocking along on its own railroad tracks that lead back beside the ways where the new ship is growing.

It's a dirty, breath-taking climb up one of these tall, teetering cranes. As it crawls clumsily along, you feel like a fly riding on a bucking dinosaur. But what a view!

Look down from here into the half-finished hull of a ship (pages 560, 564, and 568). Over it men swarm like ants on a cake. That long steel hull, you can imagine, is like a skyscraper's skeleton laid flat on the ground.

Ship bulkheads and compartments hint at the floors and rooms of a skyscraper. But the difference is that the cloudscratcher will stand on end, when done, on solid ground, but the ship will lie flat on its belly, on a liquid foundation of sea water.

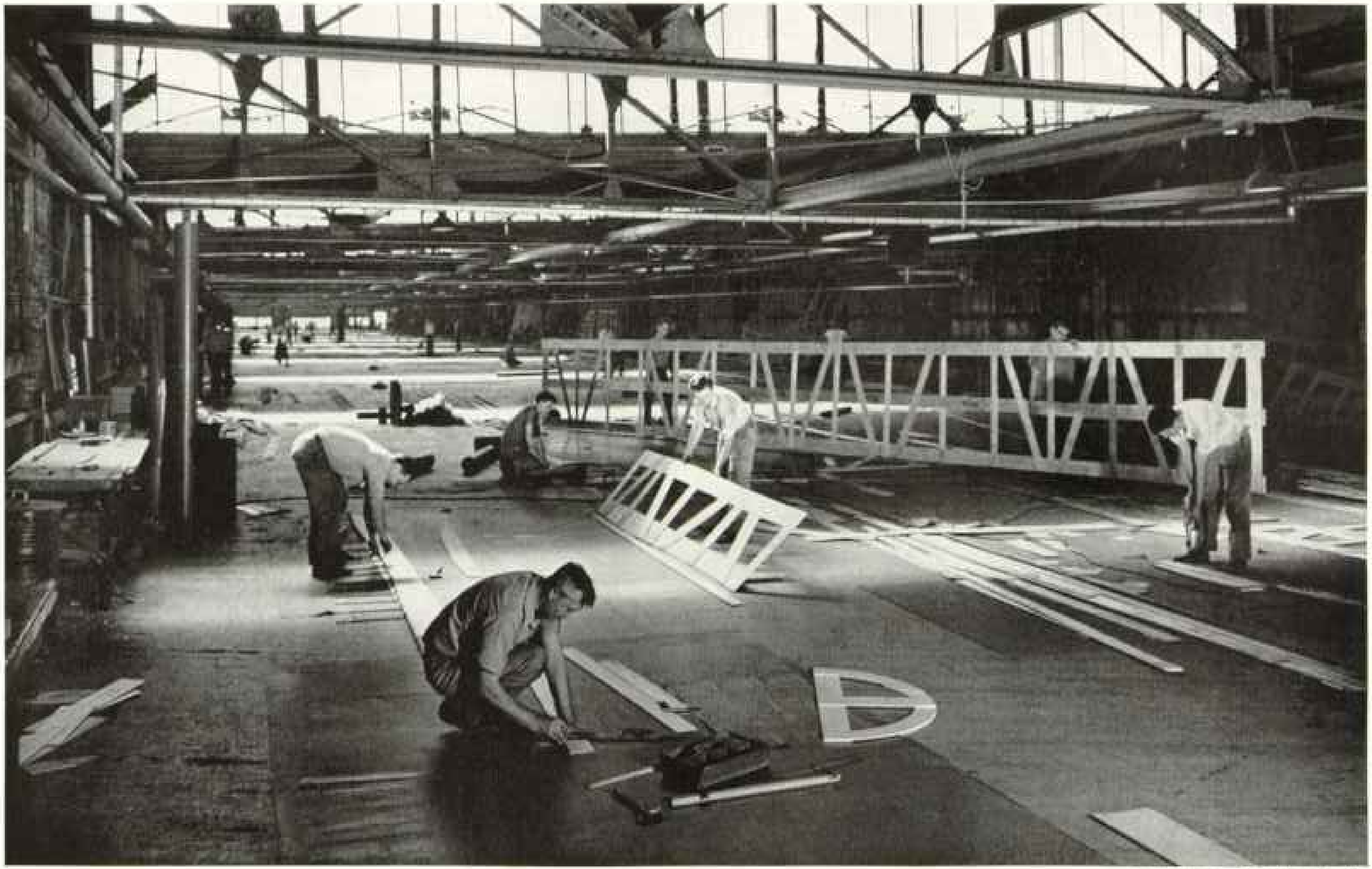
It stays on its belly, too, all its long adventurous life. But how it gets around! Some ships have covered 2,000,000 miles and more.

All this you think of as a ship nears completion and men begin to put in engines, shafts, pumps, etc. Miraculously, in the last

Staff Photographer B. Anthony Stewart

Every Shipyard Uses Corps of Draftsmen, Since the Complete Plans for a Single Big Ship May Fill Three or Four Boxcars

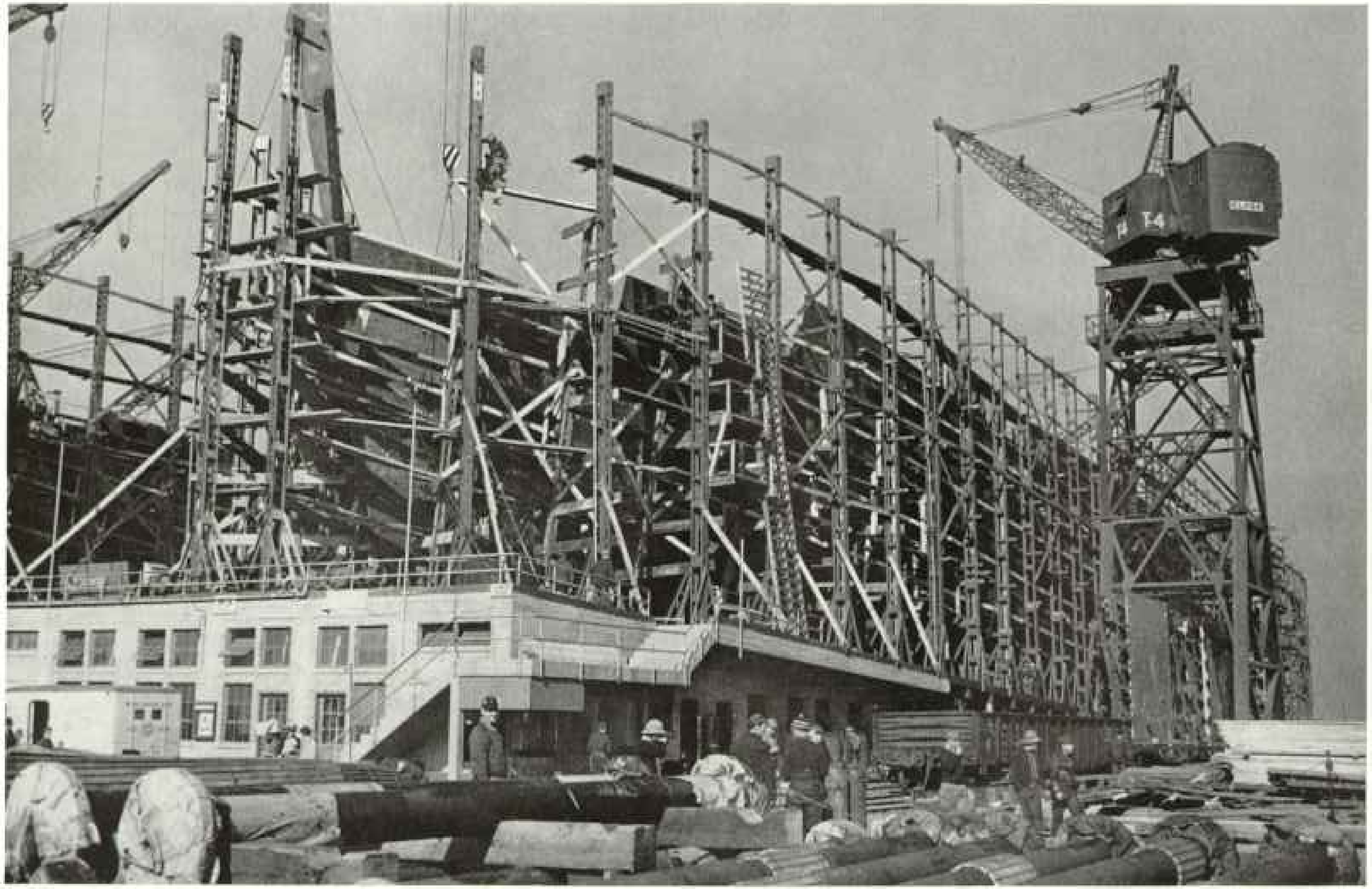
It's hard to draw plans for a hull, because of its many curves. In the foreground, draftsmen work out the plating of a future vessel by studying the model lying upside down (pages 553 and 562). From the drafting room plans go to the mold loft (opposite), where life-sized patterns are made, or to the shops.



Staff Photographer R. Anthony Stewart

On This 600-foot-long Mold Loft Floor a Life-sized Drawing of the Proposed Ship Is Laid Out

Blueprints, fresh from the hands of the draftsmen (opposite page), first come here. From them, and from measured designs drawn on the floor, white wood or paper templates are cut. These are used as a tailor employs patterns for cutting cloth for a new suit. Each is laid over a steel plate and copied in chalk marks. Then the plate is cut, numbered, and worked into bulkheads, deck sections, etc. (page 553).



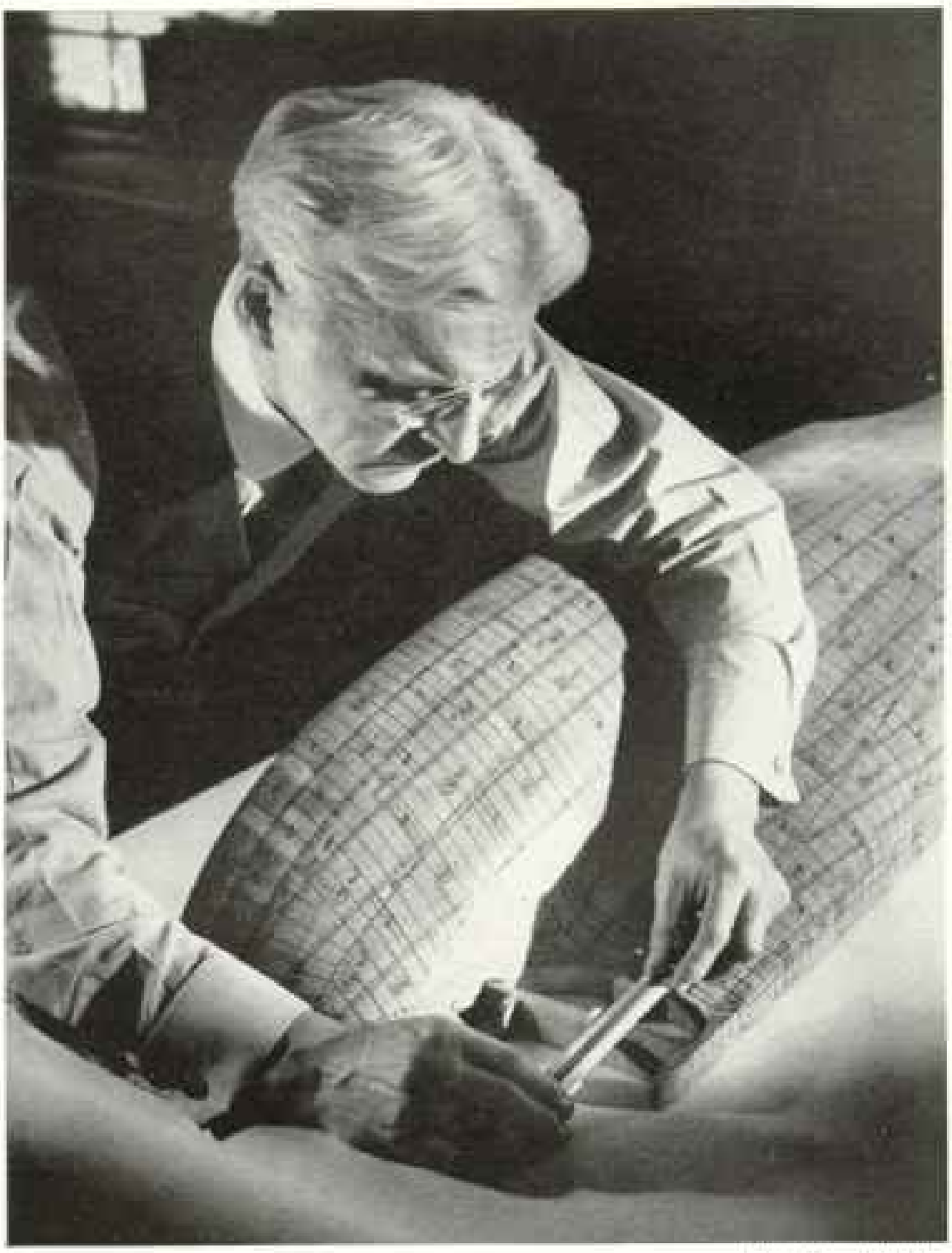
Inside This Scaffolding, or "Staging," Men Build the Hull of a New Liberty Ship

Measuring (overall) 441 feet long by 57 feet wide, these "ugly ducklings" are of about 7,190 gross tons. Their relatively slow speed permits them to use reciprocating steam engines. These are more easily and quickly built than are the power plants for the faster ships which use turbine or Diesel engines.

Staff Photographer R. Anthony Stewart

When "the Ghost Walks," as Here at Robins' Brooklyn Yard, Workers of All Races Line Up to Draw Their Wages

Whole armies of men are now at work building ships in the United States; this host will rise to 850,000 or more as production speeds up to two and three ships a day. Think what weekly pay rolls—millions and millions!



Robert Yarnall Richie

Draftsman Measures a Model to Make the Ship's Blueprints

The numbered patterns marked off on this 110-inch miniature hull show exactly the shape, location, and relative size of the plates, bow and stern structures, etc., which will go into the vessel. Scale of the wooden model is one-quarter inch to the foot; so the finished ship will be 440 feet long.

weeks, you see the vessel mature like some stupendous animal, a mechanical monster to which man's genius gives the power to swim around the world, the power to see with searchlight eyes, to hear through wireless, and thus to speak, sending its own voice and call signal to world's end.

The Launching of a Ship

Like an animal, too, the ship has ribs and a backbone. Electric wires are nerves. Big pumps form her heart; literally miles of pipes, big and little, are veins and arteries, while oil, water, and steam form the blood that circulates and gives her strength to work.

When a ship is about 60 to 80 percent finished, she is launched. Woodwork in cabins, saloons, and decks; lighting fixtures, kitchen or galley ranges; telephones, bathroom equipment, furniture, carpets, etc., mostly fireproof or treated to be fire-resisting, are put on later. So, often, is much deck machinery and other items. This is called "outfitting."

To build a ship, men must work on dry land. They couldn't build one in the water. So they usually build it on a slanting cement platform, down which run long pieces of heavy wood called "ground ways."

Because a ship is so tremendously heavy, men must plan from the start how they're going to get it into the water when they're ready to launch it. You all remember what a pickle poor old Robinson Crusoe got into when he built his boat too far from the water!

The ship's keel, the first piece in her bottom, is laid first. It rests on keel blocks—short, thick pieces of wood laid flat on the cement platform. Downhill, beside the keel blocks, run the long ground ways.

Between these ground ways and the ship's hull, as it is built up, is laid another set of long timbers, called "sliding ways." These help form the ship's cradle, and this cradle slides into the water with her when she is launched (pages 556, 565, and 570).

To make her slide down easily, tons of grease are put between the ground ways and the sliding ways.

To keep the ship from sliding downhill into the water too soon, as she gets heavier and heavier, she is often held back by steel tie

plates, which anchor her cradle to the ground ways. To launch her, when all is ready, these are burnt out with acetylene torches.

What a Roman holiday when she finally takes to the water! On a flag-draped platform near the bow of the new ship you see the brass band, the chosen lady who is to say "I christen thee" as she breaks the champagne bottle against the new ship's nose, plus all other speechmakers and invited guests.

Now it's only split seconds that count. Everybody holds his breath. When the tie plates are almost burnt in two, the ship suddenly gets lively and is raring to go, and the plates begin to tear apart. Instantly the signal is given to the sponsor, who says her lines as she smashes the beribboned bottle.

Now the crowd roars! Workmen, after months of labor on a new ship, run along the ways and throw their caps in air, while others, riding in the bow of the ship as she slides down, also wave and yell and slap each other's backs. From all over the vast shipyards comes the scream of steam whistles. Truly, a dramatic spectacle.

Here in a few seconds you see the culmination of months of work. Man's mighty animal, big as a skyscraper, wallows down voluptuously into her element. For she is "her" now. In the beginning the hull was but a number, to identify it among others; once afloat, sex is given, and the ship becomes a "she" for life.

This instant of launching is one of the most critical in the ship's life. During this one-half minute of transfer from land to water, she grunts and trembles and feels the ecstasy of birth strains—strains as great as any that the worst storm can ever make her feel.

Staff Photographer B. Anthony Stewart

Eyes on Dials, an Engineer Listens for Signals from the Bridge

His hands on the throttle wheel are ready to send the ship "full speed ahead" or "astern," just as orders reach him. Back of his head you see the bridge telegraph. A bell rings when he gets an order. He acknowledges it by pulling his own controller around to the proper point.

Once started down the ways, she is utterly beyond all human control until she is picked up in midstream by waiting tugs. In rare cases, as where waters are narrow, anchors or drag chains may be used to slow down the moving hull.

The Saga of the *Queen Mary*

To grasp what monstrous creatures ships can be, look at the *Queen Mary*. Such giants, some owners frankly say, may be good general advertising for the line, but directly they can't earn much money. They cost too much to build and run. Some say the day of these gigantic ships is past, and the *Queen Mary*, for example, as a type of ship is obsolete.

Staff Photographer B. Anthony Stewart

Tall Traveling Cranes Wobble about the Yards, Lifting Prodigious Pieces of Prefabricated Ships

Each section flies through space, swung by mammoth cranes to its appointed place. Little is hauled or carried by hand. Stagings about the ways rise beyond the piles of plates, bulkheads, deck sections, and stern structures. More than two ships a day is now the schedule of the U. S. Maritime Commission.

P.P.C.

He Launches Many Ships, but Never Sees a Launching

Harold T. Bent, of the Newport News Shipbuilding & Dry Dock Company, is in the "trigger pit," beneath the ship's hull. Most ships being launched are released by burning anchor plates in two with torches. Sometimes, however, they are launched by a hydraulic trigger as shown here (p. 562).

Staff Photographer R. Anthony Stewart

No Hand Touching Either Wheel, This Ship Will Steer Herself

The quartermaster is quitting his old-fashioned wheel (left). The mate sets the course; then he, too, can leave the automatic steering wheel (right), controlled by the Sperry gyro repeater compass, at which he is looking. Only in harbor, or when passing ships, changing course, etc., need the wheel be used.

Staff Photographer B. Anthony Stewart

Not Pieces of Portable Houses, but Sections of a New Steel Ship

To save time and space, 20- or 30-ton bulkheads, stern structures, or deck sections are cut from plates and welded together some distance from the shipyard. Arriving there, each numbered piece fits into place, as in a big jigsaw puzzle (page 555).

But her size shows what puny man can do.

Somewhere, today, under another name and color, the *Queen Mary* is helping the United Nations win the war. But, just for interesting comparisons, look at these astounding facts:

The *Mary's* rudder, of 160 tons, nearly equals the tonnage of the *Mayflower*.

Three railway locomotives could run abreast down one of her gigantic funnels!

One of her anchors weighs as much as ten average-sized automobiles!

Her generators make enough "juice" to meet the lighting and public-service needs of a city of 150,000 people.

Keyed to lower bass A, the reverberations of her loud sirens can be detected from 50 to 100 miles away.

She has icebox space enough for 15,000 average homes.

She has *three acres* of deck space for recreation.

It takes over half a million pieces of china, glassware, and silver to set her tables, and it would take 80 Pullmans or coaches to haul her crew and all passengers when she's full.

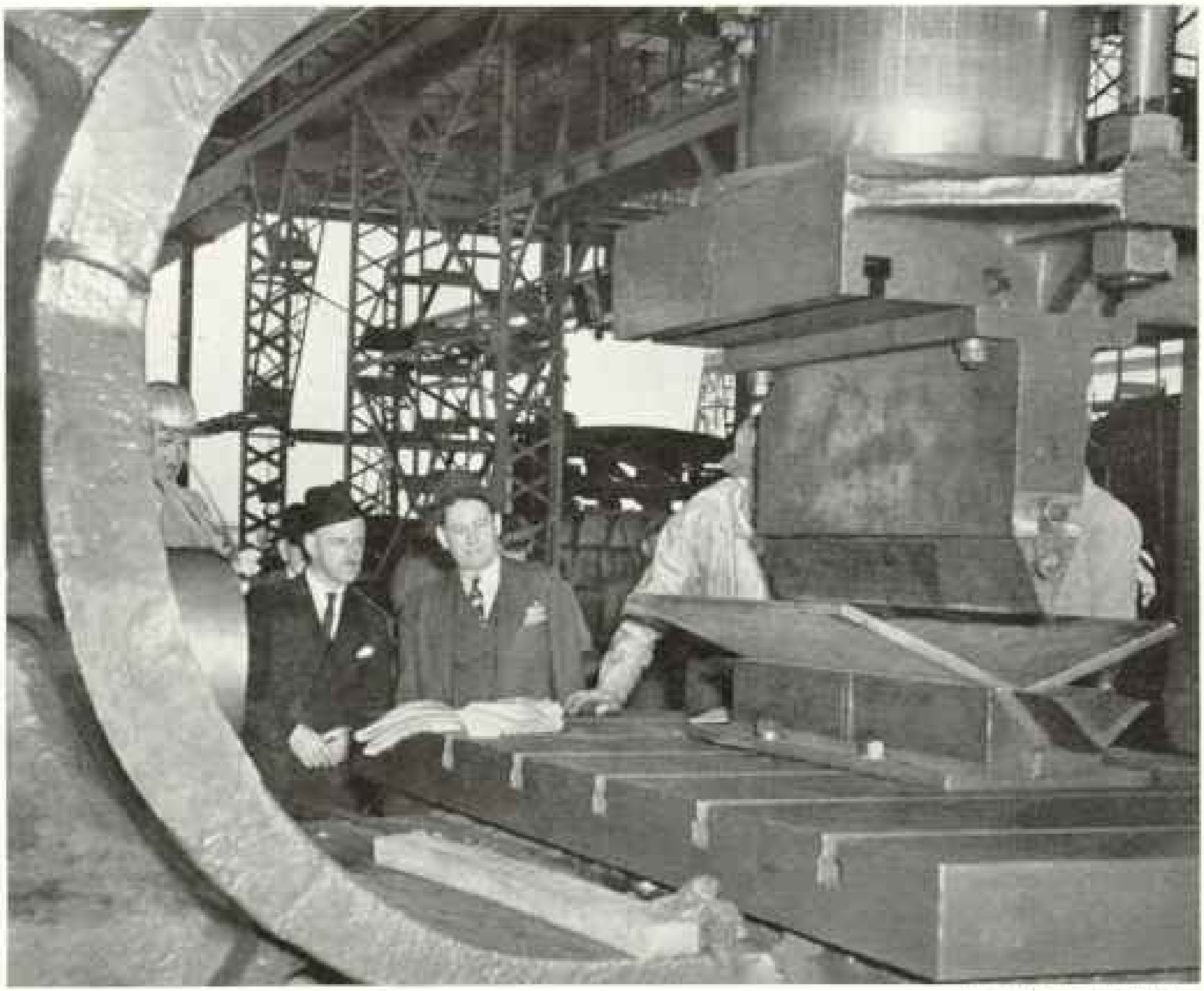
Her linen closets carry 384,000 towels, sheets, tablecloths, napkins, and pillowcases, besides other items; and on one round trip she may use five tons of ham and bacon, 60,000 eggs, and 50,000 pounds of potatoes! All this I saw, on the *Mary's* maiden voyage.

Yet her functions are just the same as those of the ever-so-much smaller, brand-new type C-3 *President Polk*, of the American President Lines, on whose maiden voyage, from New York through the Panama Canal to San Francisco, I am sailing as I write.

Even Small Ships Are Well Equipped

On the *Polk* is every safety and lifesaving device seen now on the largest ships.

Besides the old standard compass, there's the gyrocompass, which works through a "re-



U. S. Maritime Commission

A 400-ton Hydraulic Press Crimps a Steel Plate as Easily as You Bend a Playing Card

At left is Percy Lister, member of the British delegation chosen by Mr. Churchill to inspect American industrial plants. He watches the press crimp a diaper sheet, a heavy plate that goes on the after portion of the keel. Next to him is Russell J. Carroll, of the Richmond Shipbuilding Corporation, Richmond, California.

peater" on the bridge. Through an "iron mike," or automatic pilot, it steers the ship mechanically. I saw them set the ship on her course; then the quartermaster, or man at the wheel, went away on some other business (page 565).

While officers worked in the chartroom, we ran straight ahead, often hours at a time, with nobody touching the steering wheel. That's only in open sea on fine days, of course, and the lookout is continually alert to see that all's clear.

At night, or in thick weather, one or more officers are always on the bridge, and there's always a lookout in the bows. On some ships the old crow's-nest is no more.

Then there's that useful instrument, the fathometer. By sonic action, in which a sound impulse is sent down to the bottom of the sea and reflected back again, it shows on a dial just how deep the water is, in fathoms.

Off the southwest tip of Cuba, for example, are many shoals. Steaming over these, and checking our course, the navigator showed how, every minute or so, the fathometer would flash a reading, say 19 fathoms, or 34, or 22 fathoms. Checking these against corresponding depth figures on the local hydrographic chart showed our exact position, minute by minute.

Yet another safety device in navigation is the radio direction finder, similar in principle to that used in planes that fly on beams. It does not ordinarily guide the ship straight on a beam, as in the case of planes; rather, it is used to locate the direction of a radio station on shore to get a bearing. When the navigator can get two such bearings, he can work out his exact position by triangulation.

The "course recorder" automatically draws a line on a long sheet of paper, showing the exact direction of the ship's track in any given interval; it serves to check up on the man at the wheel, to see if he is holding the vessel

Robert Yarnall Richie

A New Bulkhead Is Lowered into Place as a Tanker Rises and Takes Shape

First the keel was laid on temporary wooden keel blocks. Then came other plates, and the ship's bottom began to take form. The troughlike extension pointing toward you is the beginning of the extreme stern. In the far background a main bulkhead has already been swung into place, and erectors are at work on it.

From Manufacturers Record

The Stern of a Ship Is Swung and Welded in Place as a Unit

This shipbuilding corporation in the deep South has developed a ship assembly plant. To smaller firms it farms out contracts for making different parts. These it moves whole to its yards for assembly and erection. The company employs multiple-operator welding machines which greatly speed up its output.

Staff Photographer B. Anthony Stewart

Crowds Cheer as the *Patrick Henry* Slides into the Sea at Bethlehem Yards Near Baltimore

Christened by Mrs. Henry A. Wallace, wife of the Vice President, the "Pat" started prematurely, interrupting a speech by Rear Admiral Emory S. Land, Chairman of the United States Maritime Commission. Workmen here laid the keel of another Liberty ship even before the newly launched one had been caught by waiting tugs (p. 560).

Staff Photographer R. Anthony Stewart

An Alarm Bell Rings! The Mate Jumps to Look. Smoke from Vent 27 Means Fire in Cargo Space 27

He runs to a valve, turns on carbon-dioxide extinguishers, and smothers the fire. Compare this automatic alarm with old methods, when watch officers pulled corks from vents over cargo holds and sniffed for smoke. Now electric eyes spot smoke, bells yell "Fire!" and gas smothers the blaze.

true on the course given him by the navigator. The graph it draws is so exact that, should a collision occur, or should the vessel run down a lightship, the courts that hear the ensuing lawsuit will admit the graph made by the course recorder as conclusive evidence.

On the bridge, too, are instruments for controlling the required current to make magnetic mines ineffective by demagnetizing the hull, for showing the rudder's turns, for automatically closing all fire-screen doors in passageways or cutting off the air blasts in ventilating systems, should a fire break out.

Fire and Smoke Detectors

Most ingenious of all, however, are the fire- and smoke-detecting systems.

One of these, the Zonit, flashes a telltale signal the minute fire breaks out, say in cabin 29, in the bar, or in the dining saloon. In all such quarters thermostats are set in the ceiling; when the temperature rises high a warning bell rings on the bridge and in the engine room.

Fires anywhere in the ship's hold are instantly shown by yet another system, called the Richaudio. This machine is so delicate that even one puff of a cigarette will start its alarm bell ringing; then, by the complementary Lux system, the fire is smothered so silently with carbon dioxide that passengers may never even know there has been a fire.

On the *Polk*, Captain F. W. Dutton kindly gave a demonstration, to show the infallibility of this amazing system of smoke detection. But look, first, how the thing is made and how it works.

To begin with, back in the 1870's, to guard against fires officers on watch would make regular trips to holes bored in the decks over each compartment. There they'd take a sniff to see if they could smell smoke. If they did, steam was at once turned into that compartment to extinguish the fire.

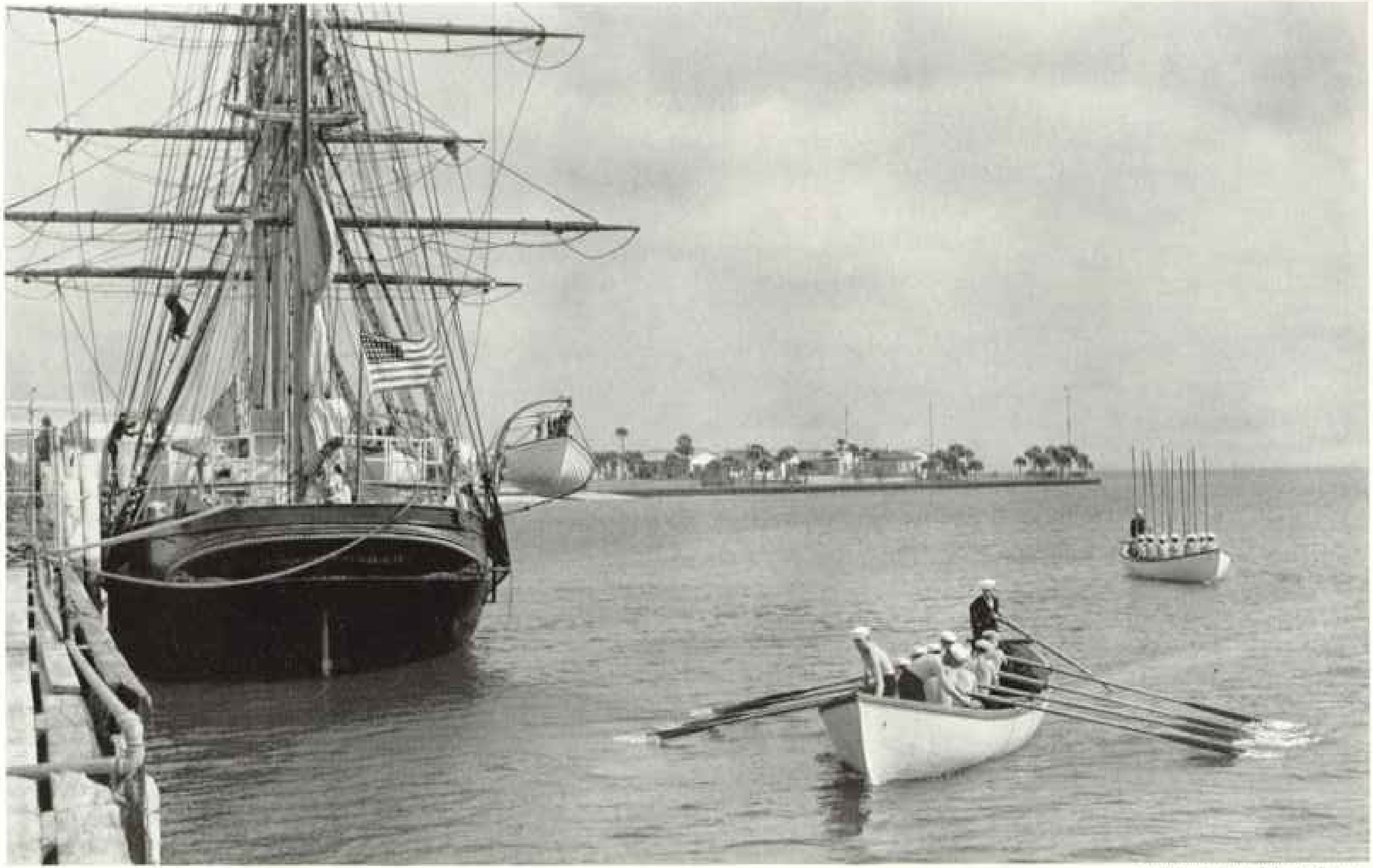
Today's up-to-the-minute way of finding and putting out fires on shipboard is based on this same old smell-and-squirt principle, except, as the magicians would say, you now "do it with mirrors."

From every storeroom and cargo space a small pipe leads to a cabinet on the bridge which holds an "electric eye." Any slight smoke passing this eye rings a bell here on the bridge and another in the engine room, or

Palmer, O. E. M.

Norfolk Navy Yard Workers Swarm for Lunch beneath Heavy-duty Cranes

At left, in her war paint, a destroyer is berthed; in background, a battleship of the Atlantic Fleet; at right, two ships in for overhaul. To American yards many British and some Russian ships have come for repairs.



Staff Photographer J. Baylor Roberts

The *Joseph Conrad*, an Old Ocean Roamer, Returns to Her Original Calling of Training Seamen

This full-rigged ship, built in Copenhagen in 1882 as the *Georg Stage*, served for many years as a Danish school ship. Later Alan Villiers bought her and sailed her around the world (see "North About," in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1937). Now this little veteran, only 110 feet long, is a seagoing study hall and classroom for the United States Maritime Service School at St. Petersburg, Florida (page 582).

wherever an alarm is needed: there's a vent here, too, where the watch officer can sniff, as of old.

Also, as the bell rings, up comes the smoke through a numbered vent on a panel like the old-fashioned hotel's push-button panel that slammed down the number of a traveling man's room when he rang for ice water.

Instantly, then, the watch officers know just where the fire is. After quick inspection, carbon dioxide from storage cylinders is shot back through the same pipe that brought up the smoke, and the fire is put out. This gas, unlike steam or water, does not wet any cargo or cause rust and damage. Freed from its storage tank, it expands 450 times in volume and smothers the fire.

Cigarette Puff Reveals a Stowaway

On a new ship in one yard this system was being tested. An inspector was dubious when they told him how delicate it was.

"I'll call you on that cigarette puff test," he challenged.

So he went below, found a cargo space where smoking was forbidden, and lit up. In no time at all the carbon dioxide not only bounced back at him through the little pipe, but a man from the engine room, unaware of the monkey business going on, dashed in with a hand extinguisher and gave the doubting Thomas another baptism.

Said a sailor on the *Polk:* "One such alarm uncovered a stowaway, calmly smoking a cigarette in one of the cargo holds. We put him in the brig. Next morning he sent back his breakfast because his eggs weren't turned over! Then the mate put him on bread and water."

This Richaudio system is not used in the cabins, etc., because every time a passenger lit a cigarette he would turn in an alarm. That's why the cabins use the Zonit thermostat system.

Even the *Polk's* big streamlined smokestack is full of machinery!

High up there, in that part of the ship which might be last to go under should she sink, is an emergency radio office; also a Diesel engine, with a tank of fuel, to run not only the vital radio but to generate enough juice to operate other machinery on board, including submersible bilge pumps, and to supply current for emergency lighting.

That means pumps that can be worked even when they're under water, which might happen were the ship struck by a torpedo, or in a bad collision where she was taking water that had to be pumped out to keep her afloat.

Full government-approved lifesaving equipment is also carried. This includes not only rafts, life preservers, rockets, Very pistols, line guns, and nonsinkable lifeboats kept constantly stocked with food and water, but also some lifeboats of a new type. They are self-propelled and some have a radio sending set.

Handles or levers, like those seen on handcars, are set within reach of each seat; passengers, old and young, who couldn't handle the long, heavy oars, may lay hold of these handles, push them back and forth, and thus turn the propeller. By this Fleming system a lifeboat can make from two to three knots.

Ships Talk with Flags

Besides their radiotelegraph sets, ships communicate when near each other with powerful lights or with flags. Visual signals were used even in early Egyptian times, when religious and national symbols were embroidered on sails.

House flags as used now to designate ships of a certain line, such as Grace or Moore-McCormack, were first used in the Middle Ages when Mediterranean trading fleets carried the banners of their sponsoring princes.

International flags for mercantile signaling in code were developed by the famous Captain Frederick Marryat early in the 19th century. They steadily improved. The code in use now was adopted at the Washington International Radiotelegraph Conference in 1927, and compilation was completed in London in 1930. This code is in two books, one for handling radiotelegraph messages, and the other for sending and receiving visual signals.

There's a flag for each of the alphabet's 26 letters, and 10 for the numerals, and three flags to indicate repetitions. The numerals save time in signaling numbers, latitude or longitude, time, etc.

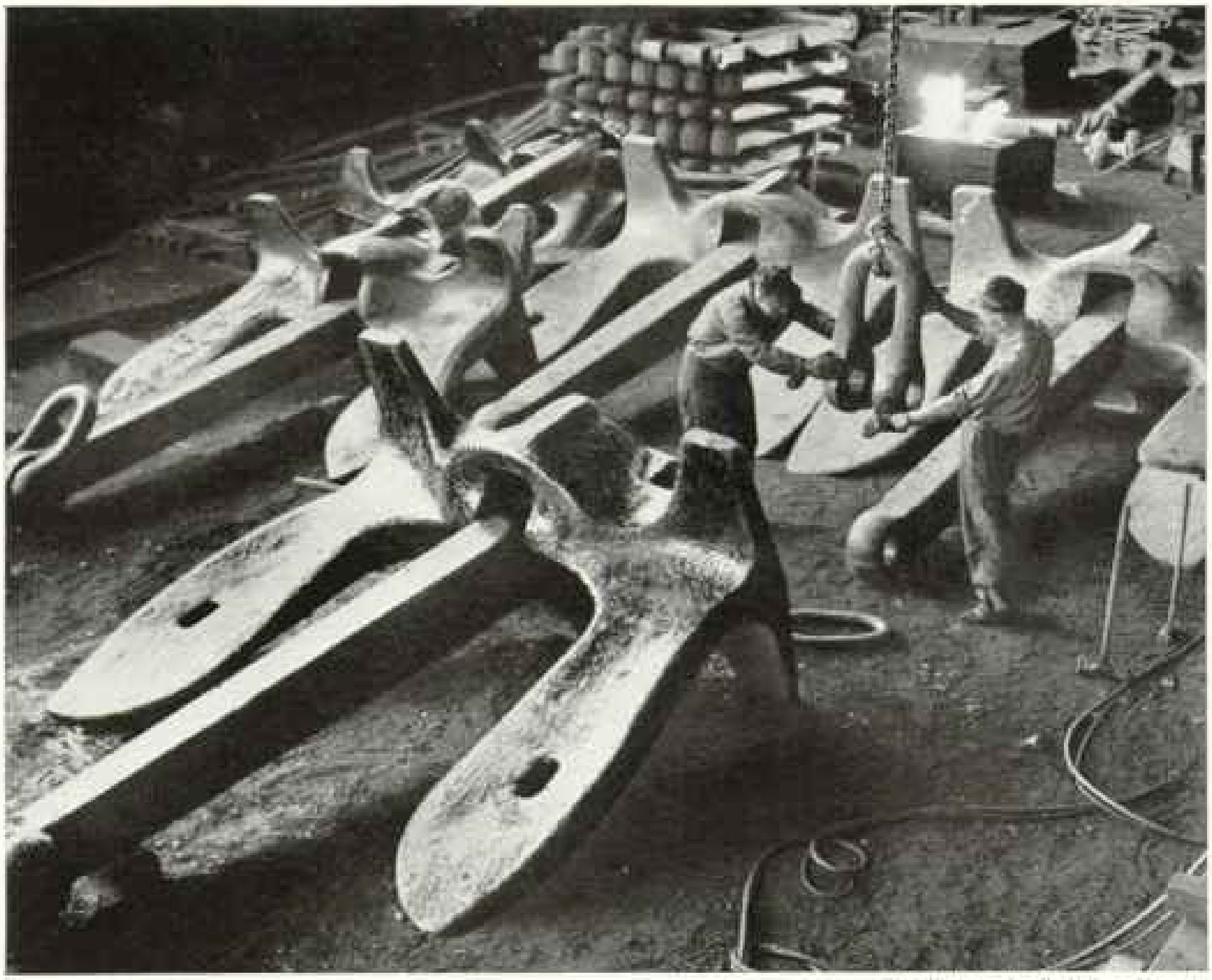
To make sentences, two or more letter flags are shown on a line, one after the other. N-O, for example, means "Burning fast. Remove passengers and crew"; R-Y, "Crew have mutinied"; or KZN-JOJ-CTV, "Pirates have murdered the captain." A few single-letter signals also convey established messages.

Hundreds of New Tankers Being Built

We shall have 600 tankers; that will be by far the world's largest fleet. "Oil cans of the sea," sailors call them.

Launched by Bethlehem Steel Company, the *S. S. Caddo* shows the latest in tanker design.

Built for Socony-Vacuum Oil Company, with the usual separate forecastle, midship navigation bridge, and poop connected by the customary catwalk, she looks like any other conventional tanker (pages 576, 584).



Staff Photographer R. Anthony Rowan

Workmen Fit the Shackle to a Merchant Ship's Mammoth Anchor

To hold the big vessel in a blow, these 10-ton stockless anchors must be carefully and strongly built. Forged steel shank, or long center piece, is fitted to the crown by a ball-and-socket joint. Clearance is allowed for washing out mud and sand which might clog up the anchor.

But go through her, and you are astonished. Crew's cabins, with no more than two sailors in each, are better than the captain's quarters were on many of our ships two decades ago.

Each man has his own clothes locker and also a private safe-deposit box. Each cabin has a writing table with a hooded reading lamp. All living quarters have hot and cold water and ice water for drinking; mechanical ventilation brings 15 full changes of air every hour.

The crew's dining room is just opposite the officers' mess, and both are served from the same highly modernized galley.

On the *Cedro's* bridge we saw every up-to-date navigating and safety device used now on passenger ships.

For hauling many different kinds of oil or oil products at one load, her cargo space is divided into 24 compartments. When loaded full, she can haul 129,000 barrels of fuel, and her pumps can load or unload her in 16 hours.

Loaded with gasoline, a tanker becomes literally a floating powder keg. One tiny spark could set it off.

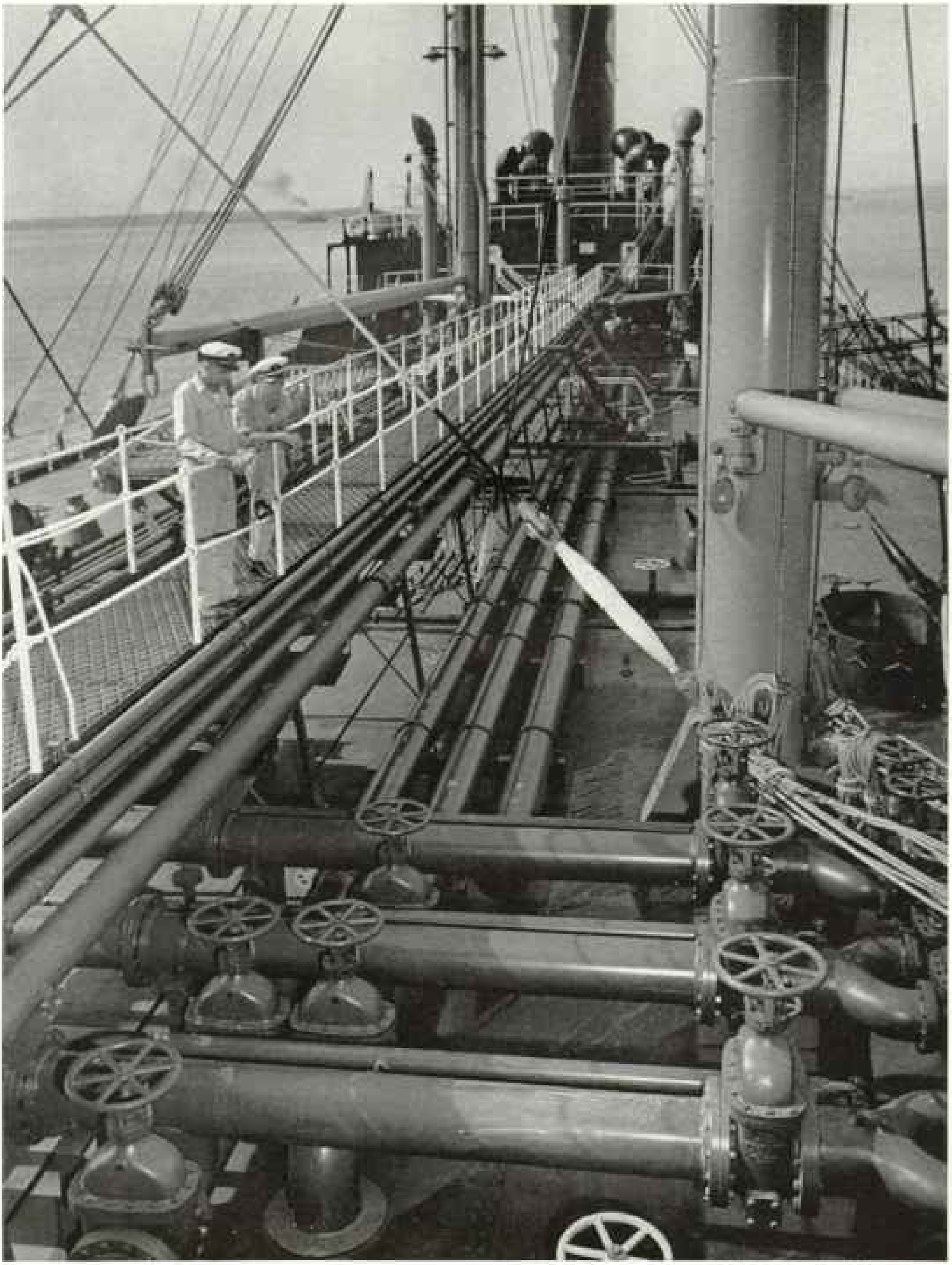
Ship's Pumps Work Like Human Hearts

Water, oil, and steam circulate through a ship just as blood through the human body. Pumps are vital to every ship, from freighter to "battle wagon."

Look at the 27,000-ton *America*, now the Navy's *West Point*. It takes more than 100 pumps to serve her. Four big ones force water into her boilers; after steam has expanded through her two turbines, it is caught again and condensed, and then pumped back into the boilers for another use.

To condense this exhaust steam, cool sea water is taken in through "sea chests" in the ship's sides, pumped through the condenser tubes, and then poured back into the sea.

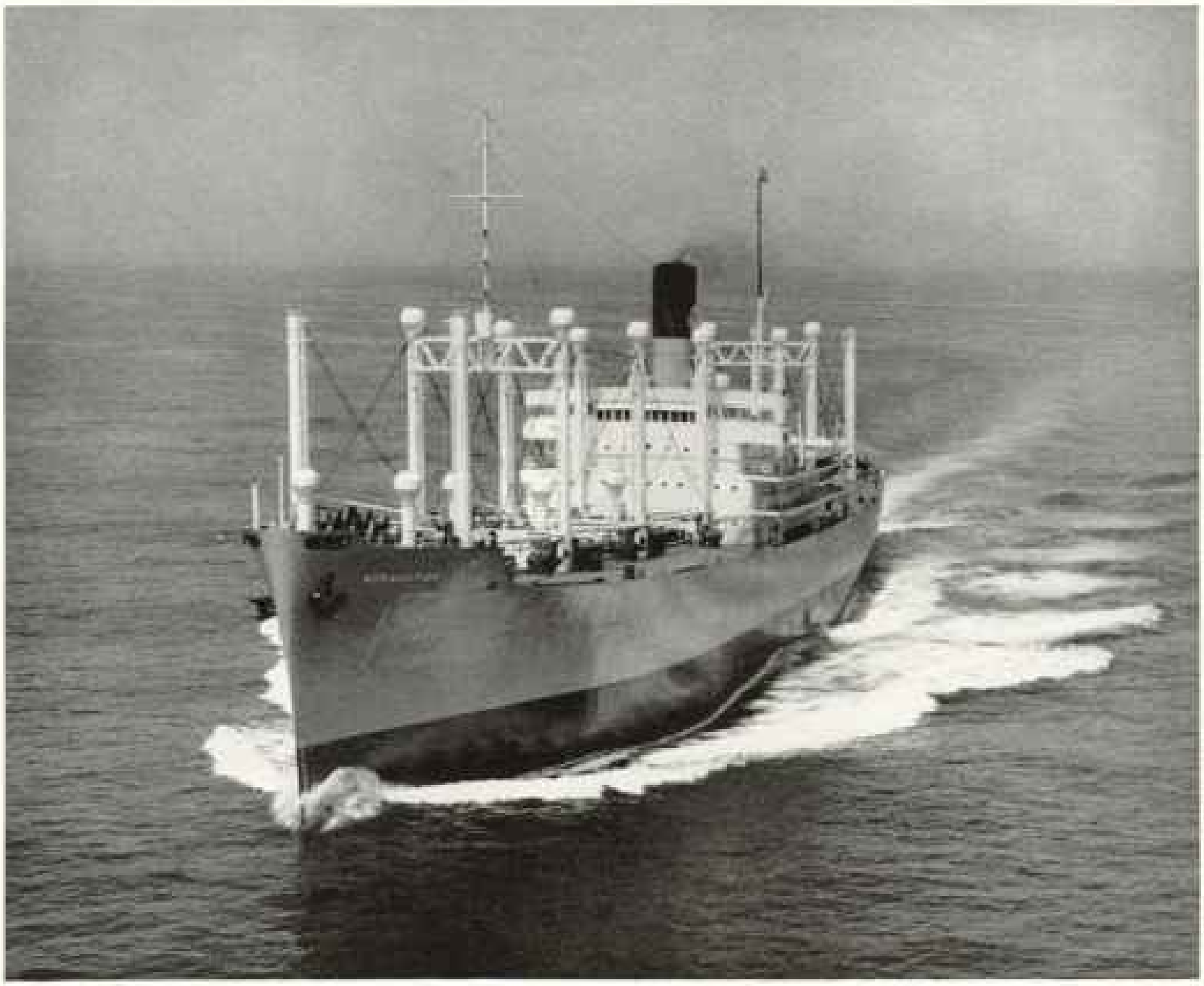
At full speed the motion of the ship scoops up this salt water; but, when the ship runs slowly or is turning around, a big pump draws up sea water at the rate of 18,000 gallons a



Staff Photographer B. Anthony Stewart

"Seagoing Oil Cans" Carry Fuel and Lubricants to the Navy's Fighting Ships

Scores of valves and pumps, endless pipes, and many compartments for gasoline, fuel, and lubricating oil make the modern tanker complex and highly explosive. Down the catwalk from the bridge, you see the after superstructure, containing the crew's comfortable quarters and the boiler and engine rooms. This 501-foot tanker, *Cadiz*, carries 5,418,000 gallons of oil, enough to heat for one year about 3,000 average homes in Washington, D. C.



Bjorner Bjorke

Gracefully This New C-3 Moore-McCormack Ship Glides through the Swells

Her many masts, known as "king posts," permit use of more derricks and swifter cargo handling. Each is hollow, and ventilators at top carry fresh air down into holds. With a cruising range of 15,300 miles, this Diesel-propelled, all-welded ship of 7,680 gross tonnage has a normal speed of 16½ knots, and five cargo holds.

minute. That would be water enough to supply a city of about 300,000 people. Should any one of these pumps fail, the ship would be in trouble; so alternate ones are installed.

Multitudes of other pumps work on this big ship. Some serve the electrical plant; others are for fire fighting, for salt water flow through the bathrooms, for the refrigerating and air-conditioning plant, the swimming pool, ice-water fountains, and for pumping out the bilges should the ship spring a leak.

Steamships Developed Slowly, Like Automobiles

The first "steamship" to cross the Atlantic was the *Savannah* from Savannah to Liverpool in 1819 in 29 days, 11 hours. It had paddle wheels, sails, and one cylinder.

Screw propellers had been tried out by many inventors in France and England in the 18th century. Colonel John Stevens, of the United States, also made a number of experiments. Part of the propeller of his 1804 boat is in the U. S. National Museum at Washington.

But the propeller was not generally adopted until Captain John Ericsson, a Swedish army engineer, promoted it. In 1836, working with an Englishman named Smith, he took out a patent on it in London, and it was used on the Thames in 1838.

On April 3, 1845, the British Admiralty tested the then-little-known screw propeller against paddles. The warship *Alecto* had paddle wheels; the warship *Rattler* had the newfangled screw propeller.

These two ships were lashed together stern to stern, and pulled at each other in a tug of war. With both engines working at full power, the *Rattler*, with the propeller, towed her rival astern at a speed of two-and-a-half knots.

That settled it. In a few years the screw propeller superseded paddles.

Ericsson was a member of a firm of shipbuilders in New York which was one of the

ancestors of the present-day Todd Shipyards Corporation. He built the *Monitor* which checked the *Merrimac* and started the use of revolving gun turrets.

By 1910 the reciprocating steam engine, having reached a high degree of perfection, was being largely supplanted by turbines. Oil was replacing coal as a fuel for raising steam, and steam itself was being challenged as a motive agent by the development of the internal-combustion engine.

Steam turbines propel most of the new standard types of merchant ships being built now for the Maritime Commission.

In a turbine the steam turns a big rotor set with many fine blades, instead of being used to move a piston back and forth in a cylinder. The result is a performance just opposite to that of your electric fan. As your fan turns, it creates a current of air. But as steam is turned against the blades of the turbine, they whirl before its power, and turn the ship's propeller shaft.

Turbine engines work best at from 4,000 to 10,000 revolutions a minute. But a ship's propeller pushes her forward with most efficiency when it turns far more slowly. So, between the engine and the propeller shaft they place a set of reduction gears; these permit the engine to exert its maximum power, yet reduce propeller speed 15- to 80-fold (p. 581).

Making these gears is a costly and laborious feat of shipbuilding. Though tons of steel are handled, and some gears are twice a man's height, they must be machined with all the precision of a fine watch or microscope. Teeth in such gears are cut to an exactness of 1/10,000th of an inch. To avoid expansion or contraction in the process, the room is kept at a constant temperature.

More Ships Wrecked Than Now Afloat?

Since Sir Francis Drake helped sink the Spanish Armada, what a host of boats have gone to the bottom!

"Are there more wrecks on the ocean's floor now than there are ships floating on its surface?" I asked Mr. John D. Reilly, president of the Todd Shipyards Corporation.

"That's an interesting speculation," he said. "There probably are. Since this war started, more than 15,000,000 tons of shipping *—counting Axis, Allies, and neutrals—have been sunk. That's a lot of ships. Still, the average vessel is scrapped when it's old, not sunk.

"You have to remember, too, that ships, like people, must be doctored. They last longer when they're kept in good repair. The repair and conversion of ships of every classification form a large part of our business."

Mr. Reilly pointed to the example of the Robins Dry Dock & Repair Company, Erie Basin, Brooklyn, the corporation's largest subsidiary in the East, whose graving dock is the most capacious privately owned one on the eastern seaboard.

"At our Robins yard," he continued, "not only are we patching up British craft of all types and sizes that have been damaged by bombs or submarines, but also we are working continuously on United States merchant vessels in for general overhaul, conversion, or voyage repairs, and on ships for our Navy."

"Do you run a school or schools for the training of welders, fitters, loftsmen, etc?" I asked.

"Yes. Two of our most important are the one for welders at the Todd-Bath Iron Shipbuilding Corporation, South Portland, Maine, and the Hull Design and Construction School at Robins Dry Dock & Repair Company."

Some 37 ships, not counting Navy craft, were in for repair the day we saw the Todd-owned Robins shipyard in Brooklyn. We saw skilled workers doing everything from grinding a razor edge on tiny turbine blades to fitting on a new 15-ton propeller.

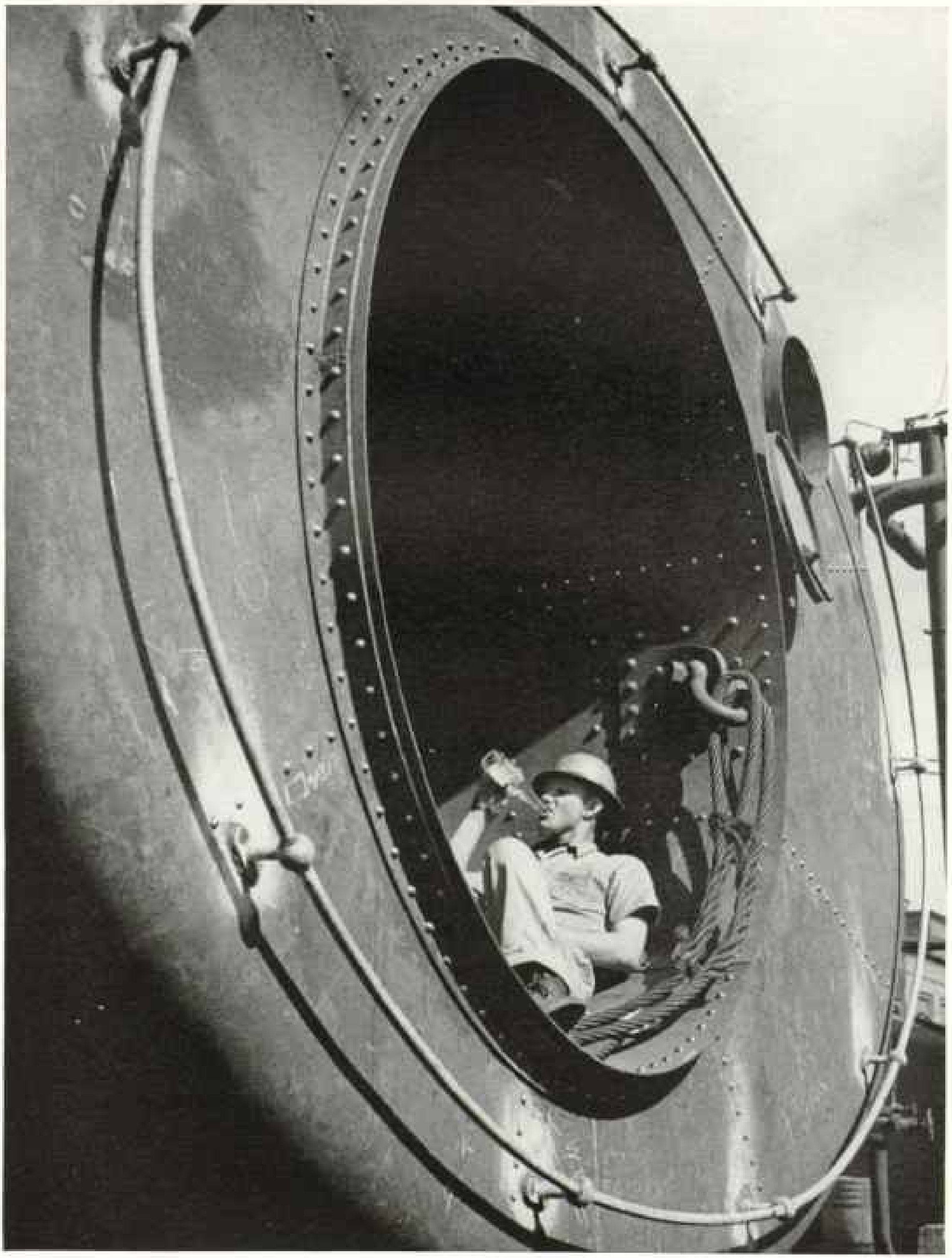
In one banklike vault, no longer than your kitchen, which workmen nickname the "jewel box," we saw some million dollars' worth of dies and cutting wheels. So hard is some of the steel they have to cut, and so delicate the operation, that diamonds are used in place of knives. Some tiny pieces of metal, which have to be ground to 1/4,000th of an inch, are held in place by magnetism. Try as we would, we couldn't pull a bit of steel loose from the magnetized table top, though the piece itself was smaller than a lead pencil.

To this yard, for repairs, ships come now even from Russia. The chief engineer on one Soviet ship was a woman, and many others were in her crew.

Watch a ship in a dry dock as the water is pumped out. She settles down easily, touching more and more of the graving dock's timbers that are to hold her upright when the water is all out; settles down gently, like a setting hen on a nest of eggs, touching them all but breaking none.

Speed at which big dockyard pumps throw water is incredible. A fair-sized lake in a city park could be emptied by these big pumps in a few hours. One set we saw pumped 3,900,000 gallons in an hour.

* Ship sinkings are reported in gross tonnage, which expresses a ship's internal cubic capacity in terms of tons at 100 cubic feet to the ton. Deadweight tonnage is a gauge of cargo-carrying capacity. It is computed by subtracting displacement tonnage light (the actual weight of the ship) from displacement tonnage loaded.



Staff Photographer R. Anthony Stewart

A Workman Lunches in the Top of a Big Smokestack Waiting to Be Placed

Some funnels are surrounded by vast housing in which are set emergency radio units so operators may continue sending in time of emergency even after much of the ship is under water. Many stacks also have fuel tanks and a Diesel engine generator for running submersible pumps that can continue to pump water after boiler and engine rooms are drowned out and for providing emergency lights to enable the crew to carry on.

Staff Photographer B. Anthony Stewart

Chain-making Demands Infinite Pains and Careful Forging

Hemp-fiber ropes were used for anchoring British naval ships until about 1811. Then iron "chaynes" came into use. Later cast steel replaced wrought iron, and now much forged alloy steel chain is used. Some naval vessels carry 2,160 feet of chain, weighing, with the anchors, up to 244,000 pounds.

This Robins yard in Brooklyn works at dizzy speed. Trained men here can chip and paint a ship in less than 24 hours.

Here you see, too, how important paint is to a ship—how badly she needs new paint, after the action of wind and sea water has left her sides and bottom rough and rusty.

Paint Makes a Ship Run Faster

When a ship's bottom is fouled from sea grass and barnacles, it often takes 10 percent more fuel to keep her going at normal speed than if she were clean. How important paint, then, is in war, when a bit more speed might help her dodge a torpedo!

Waste of fuel is progressive, too, with the growth of grass and shells. So poisonous antifouling paint is used on the ship's bottom, from her keel up to her load line. This is put on last, after a previous coating of anti-rust paint. The poison in this paint includes mercuric oxide, arsenic, or copper sulphate. Paint makers keep their exact formulas secret.

When painting a ship's bottom in dry dock, you see men working with brushes with 20-foot handles, long as a billposter's paste mop, so they can reach up the sides of the ship.

How fast they work! I saw them painting a C-2 cargo ship that had docked at noon; they gave her three coats in all, and by 7 o'clock that night she had moved to her berth for loading. Drying between coats is unnecessary.

Paint is sometimes applied with a spray gun, instead of with brushes. However, many ship buyers insist that brushes alone be used. They say bristles reach into rough spots better than does the spray gun.

Only a thin paint film stands between a ship's wood or steel and the destructive forces of salt water, wind, sun, and rain; so paint is more than decoration.

Du Pont says that it takes about as much paint for a ship of 27,000 tons, such as the *America*, as it would for all the houses in a town of 4,500.

To reflect as much light as possible, cargo holds are usually painted white, as also are most cabin walls and the interior.

While they're painting a ship's sides, you see workmen swinging dizzily in bosun's chairs, reaching far out to right or left. Others climb high aloft, paint bucket in hand. One false

move may mean a fatal fall.

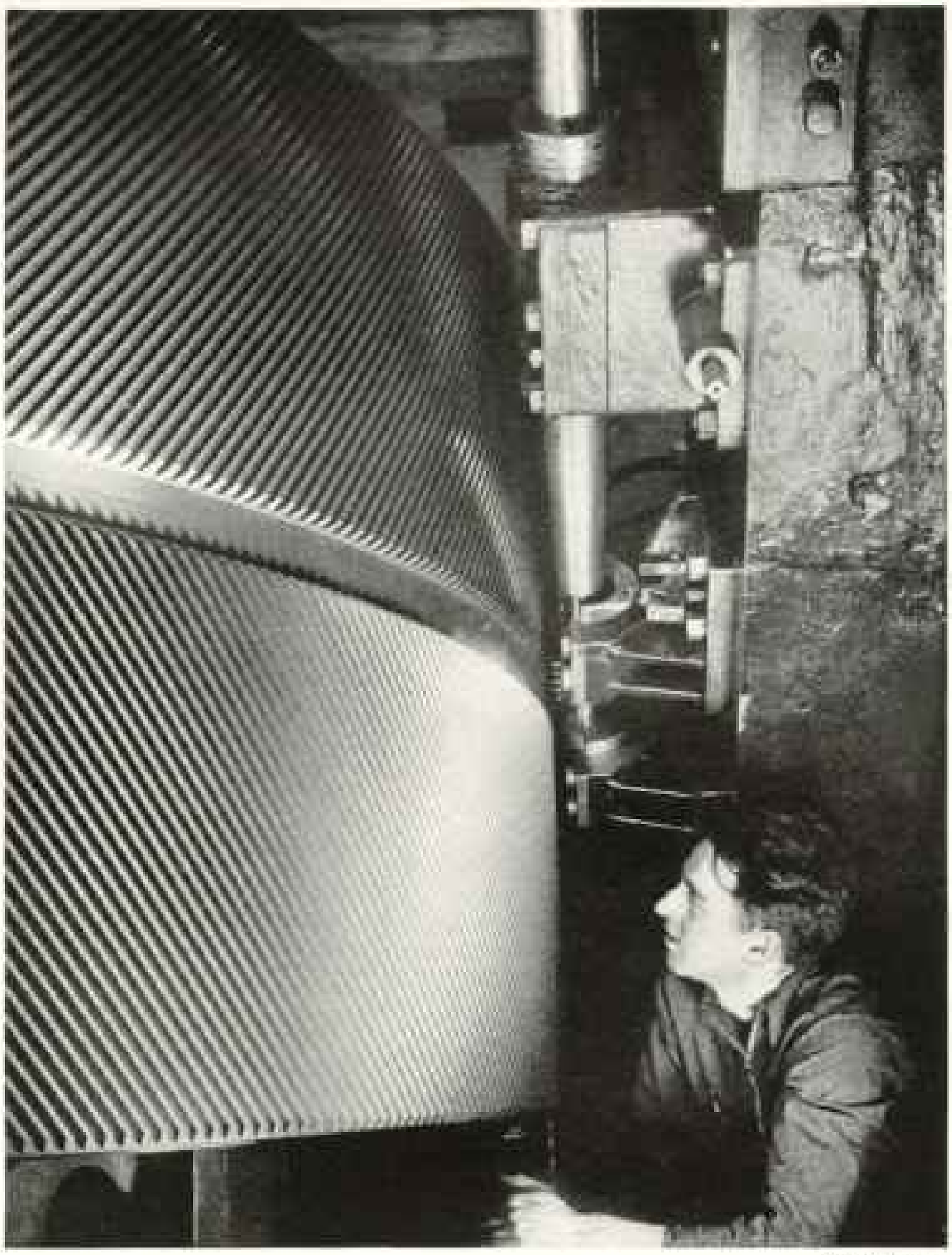
"Warning! Danger! Play Safe! Eternity is a Long Time!" All about, in shipyards, you see such signs (page 586).

Men wear crash helmets. "Something's always dropping on your bean," said a workman. "Skulls crack easy under a nut or bolt that's dropped 50 feet, and a monkey wrench or a paint bucket from up high hits like a bomb."

"Plenty of ways to get hurt here," said another. "Some guy finds a new way every day; yesterday one opened his lunch box and got choked on a chicken bone! In war you only get shot. A shipyard can hurt you a hundred ways. If nothing falls on you, you can fall down a hatch, or off a crane, or through a scaffold; you can get burnt, drowned in the wet dock, or even electrocuted."

"Who, mostly?" I asked. "The newcomers?"

"No, it's not always the 'peanuts,'" he replied, which is their slang name for green recruits. "Often it's the wise guy who's been here a few months and gets too smart.



Westinghouse

Biggest and Best-matching Teeth in the World Are Those of Reduction Gears

Just as an automobile needs a transmission because its engine does not turn over at the same speed as its wheels, so a ship must have reduction gears between its fast-spinning steam turbines and slower propellers. The huge gear boxes may reduce turbine spin in a ratio of 80 to 1 for the propellers. Gears must be machined with the same accuracy as a fine watch or microscope.

"Look out for that hook!" he warned, as I ducked a big steel plate that came swinging silently at me. "When you hear a bell ringing on that crane, it means something's coming."

Uncle Sam Needs More Sailors

One new ship we saw was just starting on its first voyage. From New York its new crew rode down to Baltimore in a bus. In the group were a few sunburned, tattooed veterans, reminiful of the story-book tar of old who, with parrot on shoulder, regaled the loafers in the pub with strange tales of cannibals, shipwreck, and piracy.

Most of the men who climbed from the bus, however, were youngsters. One college boy still carried a suitcase plastered with world-cruise labels (page 584).

"I was going to sail tonight," said the skipper. "But after looking at that green crew, I think I'll wait a day till they can find their way about the ship, then start in daylight."

Manning all these new ships calls for yet more thousands of officers and men.

"What are you doing about this?" I asked of Mr. Telfair Knight, Director of the Maritime Commission's Division of Training, prior

to the transfer of training activities to the Coast Guard.

"We have 18 training ships busy, besides six shore training stations," he said (pages 573, and 583-585). "And we must enroll thousands within the next year, and then still more thousands."

"How do you find them?"

"By advertising in the papers, and by direct recruiting from coast to coast. We use the radio, too, and other means, such as the U. S. Employment Service, with 4,500 nationwide offices, and Coast Guard recruiting stations.

"The Maritime Commission was charged by the Merchant Marine Act of 1936 with the job of manning our merchant marine with trained and efficient citizen personnel. In March, 1938, we started our cadet training system and have since brought into coordination with it the State nautical schools which were in existence prior to that time. In March, 1942, these activities were transferred, by executive order of the President, to the Coast Guard.

"There are three cadet schools—at New York, New Orleans, and San Francisco. Here we launch young citizens to become future merchant officers. Then we have the Maritime Service, established in July, 1938, which gives training to experienced seamen and officers to improve their skill and ratings, and to young men without previous experience who want a career at sea."

"First tell me about the cadets, as you call them, those who are officer material. How old, what previous schooling, how much pay while learning, etc."

"Age, 18 to 23," said Mr. Knight. "Education, 12 to 16 units from accredited schools, with mathematics and science predominant. From them we qualify men to be examined for licenses as third mates and third assistant engineers in twenty-two months of training, under emergency regulations.

"About ten months are actually spent at sea in merchant ships such as those on which they will later serve as officers. They get $65 a month, the same as naval midshipmen; they study about a year at cadet schools ashore, and then get their papers as officers. While cadets they must qualify for the Merchant Marine Naval Reserve and after graduation they become ensigns in the Naval Reserve."

"Tell me now about the host of sailors you're training to be deck hands, stewards, engine room workers, radiomen, etc."

"They must be Americans between 18 and 30. We train them at shore schools and on training ships at Boston, New York City, St. Petersburg, Florida; and Hueneme, California.

"Their work involves two months of training ashore and four months of actual experience on training ships at sea. Then they get their certificates as able seamen, radio operators, firemen, cooks, etc. They get paid while in training and are furnished with clothing and quarters and subsistence.

"There also are training schools for prospective officers at Fort Trumbull, New London, Connecticut, and at Government Island, Alameda, California, where experienced seamen with twenty-two months' sea service take a four months' course to qualify for examination for officers' licenses."

"About how many sailors in the United States are now working on merchant ships?"

"Our figures indicate that about 50,000 officers and men now man our existing fleet of vessels above 1,000 tons each. The new ships will double the number needed. There are, of course, many additional seamen now working ashore in the shipyards, etc. Some of these will undoubtedly return to the sea."

"Does the Maritime Commission feel that men can be found and trained fast enough to take charge of these new ships when they begin coming into service at the rate of two new ships a day, late in 1942 or early in 1943?"

"Yes, we do. The plan is to supplement experienced seamen with trained men who have acquired skilled ratings after completing their training. There are some positions aboard ship which require less training than others. We are confident that crews will be found to man all of the new ships as they are delivered. The seamen themselves realize the necessity for additional sailors and their unions are cooperating in the training program."

Ship Refrigeration Changes World Eating Habits

In its survey of trade routes and the ships which shall serve them, the Maritime Commission has decided that on some cargo boats 22 percent of all cargo space shall provide refrigeration. It pays to protect perishable cargo. In fact, today some general cargo boats could not earn money without refrigeration.

In building these new boats, this cooling or freezing facility is obtained by insulating a part of the hold and by the use of a refrigerating machine. Silicates and corkboard are used for insulation. The machine itself is usually set between decks or in a deckhouse near the insulated hold.

You realize how refrigeration influences a nation's eating habits when you look at the boatloads of butter and fresh meat that ordinarily go from Argentina to England. Then

Staff Photographer B. Anthony Stewart

Today a Student Sailor Must Learn to Defend His Ship as Well as Run It

These apprentices are attending a lecture on antiaircraft guns in a seamen's school on Hoffman Island, near New York City. Other such shore schools exist, and also several training ships (pages 573 and 581).

there are the great frozen and chilled meat trades of Australia and New Zealand. Normally New Zealand alone sends Great Britain more than 8,000,000 frozen lamb carcasses a year. On this run a typical ship carries 60,000 to 80,000 carcasses at a time.

New ships built for the Maritime Commission not only have big refrigeration capacity, but can take care of many different kinds of foods, from beef to bananas, in tropic or temperate climates. Some foods, such as apples, must be carried in an air-conditioned hold, but not frozen. Beef is only chilled; mutton is frozen, but you have to keep milk, butter, and vegetables without freezing them.

The new *Panama* on her maiden voyage took potatoes and frozen foods south and brought back bananas, each class of food calling for different low-temperature air conditions.

On the new *President Polk* there's sufficient refrigeration space to preserve enough meats, fish, and other foods for a 90-day run around the world. On her, too, the crews' quarters are ventilated and heated and all inner cabins air-conditioned, as is general now on new ships of other lines.

Besides the automatic control of refrigeration and air-cooling systems, many of Uncle Sam's new boats provide humidity control in the cargo holds to avoid damage to freight.

New Uses for Air in Motion

Big mechanical draft blowers force air through boiler furnaces, rousing the fires to hotter fury.

Lungs of steel breathe air all through the ship, to ventilate and cool both passengers and crew and to help keep food and perishable cargo fresh.

Into blue water they plow, these new ships, off to world's end with freight needed by warring Allies, then to bring back things we need.

Sea trade now is disorganized. Enemy ports with which we once enjoyed normal trade are closed. Sailing schedules of old established

Staff Photographer B. Anthony Stewart

From a New York Sailors' Hiring Hall, a Bus Brings a Crew to Baltimore to Be Signed on a New Tanker

In the background lies the newly completed tanker, the *Cuddo*, built by the Bethlehem Steel Company (page 576). Here you see among the crew a few youngsters fresh from the training schools; walking with them, carrying their ditty bags, are some tattooed old-timers. One lad was carrying a suitcase still plastered with vivid hotel and steamship labels from a round-the-world cruise (page 583).

Staff Photographer B. Anthony Stewart

To Man His 2,000 New Merchant Ships Uncle Sam Must Train Some 75,000 Officers and Sailors

At shore stations and on training ships the Coast Guard, working with the Maritime Commission, carries on the schoolwork. Seamen, as here at Fort Schuyler, near New York, are instructed in rowing and sailing, fire, gunfire, boat and breeches-buoy drill, hygiene, hitches and splices, seaman's laws, etc. Note the giant slide rule. Flags are used for visual signals on shipboard; working with a code book, one ship near another can talk with flags without danger of radio detection.

Staff Photographer B. Anthony Stewart

"On the Battlefield You Simply Get Shot! In Shipyards, There Are a Hundred Ways to Get Hurt"

"So there went my little finger," sadly points out a victim who didn't think, see, or know danger. "Even a small bolt, falling far enough, can crack a skull." Every big shipyard is now well equipped to give instant aid to injured workers.

steamship lines have been upset by enemy action and by Army and Navy demand for some of our merchant ships. Many vessels have been given to the British; some have been sunk.

How, then, get imports we need, help our Allies, move our own troops, and yet preserve normal trade with neutral lands against the peacetime day of reckoning?

To keep ships moving in the most efficient way is a difficult job now handled by the War Shipping Administration. You find it allocating some to carry coal, from Hampton Roads to Rio de Janeiro, Montevideo, and Buenos Aires; others may go to South America's west coast, to bring back Chilean nitrates urgently needed by our powder mills.

Power thus to control shipping flows to the Commission through the Ship Warrants Act. Under it a ship which cooperates with Uncle Sam in his defense efforts enjoys priority in the use of shore facilities such as stevedoring, towboats, fuel, shipyard repairs, etc.

One main object of the Warrants Act is to compel ships to bring us the particular kind of freight we most need. Even if a returning steamer could get $50 a ton for bringing home, say, rum or live giraffes, and we preferred instead to have her bring aluminum ore or tung oil from China, on which she might earn only $10 a ton, Uncle Sam says let the big profits go.

By this Warrants Act, if a ship agrees to go to British Guiana and bring back bauxite, she gets a "warrant"; if she declines, she gets none.

Actually, no ship is compelled to hold a warrant, but she may find herself hopelessly tied up if she has none.

"So far," says the Maritime Commission, "all the steamship lines have worked harmoniously with the Government. We haven't had to turn the heat on any of them."

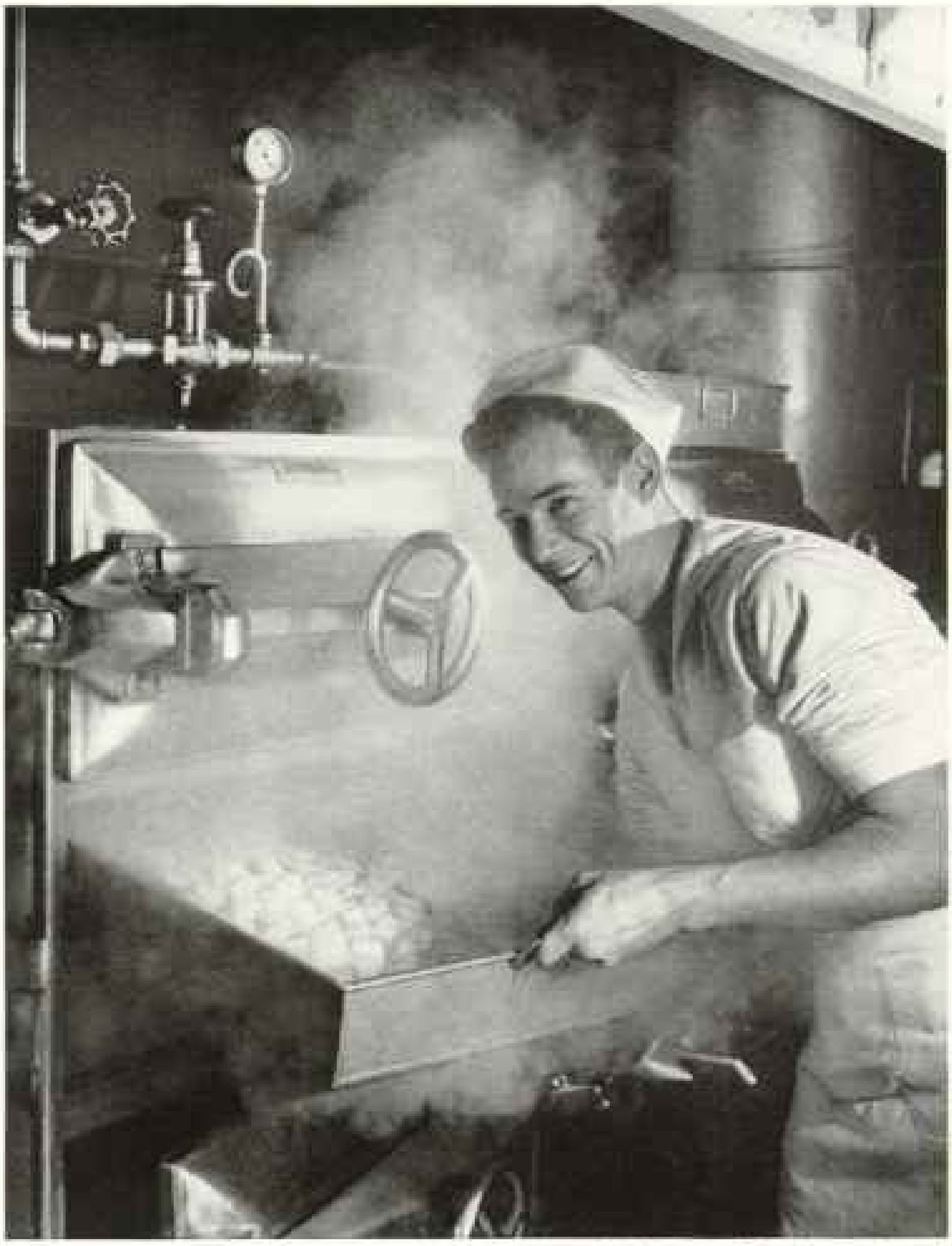
To help it run our growing fleet of merchant ships, the Commission borrows key men from big privately owned lines. Some of these are posted at distant seaports to expedite the handling of cargo and the movement of ships.

Such trouble shooters are busy now at Basra, Honolulu, Massaua, Durban, and other distant spots—all along the busy sea lanes. They can divert ships from one port to another to save time and pick up waiting cargo.

Take Red Sea and Persian Gulf ports. Ships going there now take big loads of trucks, planes, guns, and railway equipment and building materials. Some of these cargoes, via Iran, are for Russia; some are for use in Africa. Coming home, some boats may stop at Indian ports and elsewhere to pick up jute, manganese, shellac, mica, tungsten ore, teakwood, rubber, tin, quinine, coconut oil, wood oil from China, etc. Others return via Africa, for manganese, chrome, and wool.

All ships of old-established privately owned lines on some 21 trade routes join heavily in this freight work. Their loads are doubled now, because so many merchant ships once used by England, Germany, France, and Italy to handle their colonial and other trade are not now in service.

We have no colonial or dominion sea trade in the sense that England has; but from this world-wide shipping experience we, too, gain now a new geopolitical sense. Especially significant are the closer relationships growing between us and all Latin American lands. Many of their old trade ties with Europe and England are broken, and few of them have many merchant ships. We must help them handle their ocean commerce.



Staff Photographer B. Anthony Stewart

"Come Jumping, Sailor, and Get a Smell of This!"

Delicious food, and "more in the galley," at the Coast Guard Training Station, Gallups Island, Boston. Here men are trained as seagoing cooks and bakers for the new merchant fleet (page 581).

Every State Contributes

Every State in the Union sells machines or materials that go into new ships, and, indirectly, sea trade is as vital to Des Moines, Denver, and Little Rock as it is to Boston, New Orleans, or Seattle.

Raw materials from every State are used in ship construction and are shipped to hundreds of processing plants scattered throughout the Nation to be made into ship machinery and equipment.

This machinery and equipment are being furnished by 503 industrial concerns located in 31 different States. From these concerns the products may be sent to any one of 43 shipyards strategically located in 21 widely separated States.

Rapidly, now, we're building up the largest, finest, and most efficient merchant navy in our history. With all the vast cash grants the Maritime Commission is making to help build and operate this huge fleet, Uncle Sam himself is getting deeper and deeper into a government-owned merchant fleet.

To make most efficient use of this ever-growing merchant fleet, the President created

European

Hoisting a 4-inch Gun into Place on the Fantail of a New Freighter

All our transports, freighters, and tankers are now being armed. Usually there's a big rifle like this set both fore and aft, and many merchant ships also carry machine and antiaircraft guns amidships. Gun crews, who may number 30 or more, occupy specially built quarters near their weapons.

the War Shipping Administration, headed by Rear Admiral Emory S. Land, retired, who is also Chairman of the Maritime Commission.

Sweeping powers to operate, buy, charter, or requisition any merchant ship under the American flag or under American control are given Admiral Land. From the War Production Board the Admiral will receive schedules and priority ratings covering all the guns, planes, tanks, and other war supplies being shipped to overseas American and United Nations bases, as well as for handling our civilian foreign trade. Close cooperation with the British Ministry of War Transport, and with similar agencies among nations allied with the United States, is also provided for.

Convoyed by the Navy, crowded troop transports as well as steady fleets of merchant ships loaded with munitions and supplies are already bridging the seas, tying our busy home ports with distant bases—some in nooks and crannies of the world whose very names are unfamiliar to most Americans.

Thus Uncle Sam enters this greatest of all wars with more than 11,000,000 dead-weight tons of ships now in use, not including non-combat ships of the armed forces or American-owned vessels under foreign registry. A full score of millions of additional tonnage is planned for delivery by the end of 1943.

Family Afoot in Yukon Wilds

Two Young Children and Their Parents Live Off the Country in the Northwest Canada Wilderness Now To Be Traversed by the Alaska Highway

By William Hamilton Albee, with Ruth Albee

With Illustrations from Photographs by the Author

WITH our two small children, Billy, 8, and Jo-Evelyn, 5, we hiked more than 300 miles through the wilderness of southeastern Yukon Territory, living mostly off the country.

The opportunity to explore this little-known area of northwestern Canada, one of the least populated regions in North America, was offered by the National Geographic Society when I visited Washington, D. C., in connection with our interest in the proposed highway through Canada to Alaska.

I had just completed writing for the Alaska International Highway Commission their report which was submitted to the President and Congress in May, 1940.

Dream Alaska Road Now Coming True

Then the road to Alaska was just a dream, with many alternate routes under consideration. Now the highway, known as "Route C," is actually under construction by U. S. Army engineers.

It will follow much of the route that we flew over and walked on our summer's exploratory trip.*

Beginning at Fort St. John, it goes along an old tractor road to the bomber landing field at Fort Nelson. From there it will strike up the virgin Liard Valley to Lower Post (Liard Post) and the landing field at Watson Lake.

Beyond Watson Lake, according to tentative plans, it will follow a section of the Liard River past Wolf Lake to Teslin and Whitehorse. From Whitehorse it will continue past Boundary to Big Delta and Fairbanks, Alaska.

I telephoned the good news of our going to Ruth in Illinois.

"Oh, Bill, that's wonderful!" her voice came excitedly over the miles of wire. "I haven't had my feet in moccasins for five years."

"But what will we do with the children? Leave them with your mother or with mine?"

"Neither, Bill. Let's take them with us." Her voice was decided.

Why shouldn't we take our children on such a trip? Our ancestors had migrated into the West with their children, even when there was real danger of Indian massacres. On our honeymoon we ourselves had tramped through British Columbia and the Yukon to Alaska.

Both Billy and Jo had been born in the North, Billy at Fairbanks, and Jo among our Eskimo friends at Bering Strait. The experience of exploring a wilderness on foot was a heritage we felt we ought to pass on to them.

Our friends' objections made us so cautious that we took six weeks to prepare for the trip.

On the morning of July 3, Ruth, Billy, Jo, and I boarded at Vancouver, British Columbia, a bimotor plane of the Yukon Southern Airways (officially, Yukon Southern Air Transport, Ltd.), which flew twice weekly from Vancouver and Edmonton over an almost uncharted country to Whitehorse in Yukon Territory. We were off for a land which even the few trappers and prospectors who lived there called "a real he-man's country."

We were whisked back through years and centuries: past prosperous Prince George, a town at the beginning of the railroad age; past Fort St. John with its new wheatfields of the agricultural frontier; past Fort Nelson of the fur-trading era; and down to Watson Lake, a body of water not then named on any map.

There a lone white family lived in the midst of vast primeval wilderness. Frances Lake, our objective, lay behind dim mountains far to the north.

The pilot eased our plane to a bumpy landing on Watson Lake's whitecaps, taxied cautiously to a small log pier, unloaded our heavy packs, and then waved good luck as he took off toward the sunset.

Met by Weatherman and Mosquitoes

As squadrons of hungry mosquitoes descended upon us, Jack Baker, weather observer for the Yukon Southern Airways, helped rush our stuff into his new log cabin.

We burst into a front room filled with the pungent smoke of an insecticide burned to drive the mosquitoes back through the loosely chinked walls. From a radio in the corner came the voice of our pilot already reporting in: "Trip five calling Watson Lake."

Jack hurried to the microphone and re-

* For the projected route of the Alaska Highway and other places mentioned, see the Map of North America supplement with this issue.

Jo Gained 5 Pounds and Billy 14 on the Long Summer Tramp

Of the food the family carried, oatmeal was the children's favorite. They learned to relish it without sugar or milk. Store supplies were used only at the beginning of the trip. The family soon learned to live on the wild berries, vegetables, fish, and game of the wilderness.

peated the message back to the plane, the motors of which we heard droning from the loudspeakers (opposite page). His wife was busy loading the table with food.

Over by the washbasin, Billy and Jo were trying to break through the sudden shyness of four-year-old Eileen Baker by blowing up balloons.

We newcomers found a supper of roast caribou meat and wild mushrooms as much a treat as our hosts considered the fresh fruit we had bought in Vancouver that morning. As we ate, the voice of the pilot came over the radio every 15 minutes. We heard him call "Over Wolf Lake," and later "Over Teslin Lake." He finally signed off just before landing at Whitehorse.

The operator at Whitehorse came in, reporting his time as 10 p. m. We looked at Baker's clock. It said 11.

Baker laughed and explained, "The closest station to the west is on Yukon time; we use Pacific time, though we're in the Yukon belt. Fort Nelson, the nearest radio to the east, is in the Pacific zone, but it has midnight now, for it is on mountain time."

The Bakers slept under net canopies stretched over their beds to protect them from the mosquitoes. They offered us comfortable quarters in the loft, but we preferred to set up our own mosquito-proof tent among the poplars, birch, and spruce by the lake.

By midnight Billy and Jo were asleep in their bags inside the tent. Ruth and I found there was light enough to make notes in our diaries.

Moccasins for a Shakedown Hike

Next morning Ruth obtained from Mrs. Baker some chamoislike tanned moosehide and made moccasins for Billy and Jo (page 613). Jo, who had watched the whole process intently, put hers on as soon as they were finished.

"Gee, mommy," she cried, dancing for sheer joy, "it's just like going barefooted!"

To break ourselves in for the Frances Lake trip, we decided to make a shakedown hike to Lower Post, British Columbia. This tiny settlement of less than a dozen regular residents was the only supply center for the wilderness about us. It was at the junction of the Liard and Dease Rivers, 25 miles to the south by good Indian trail. Ruth and I had visited it ten years before, and we hoped some of our old friends might still be there.

Billy Learns to Make a Raft without Nails or Rope

Using a thin Swedish saw blade held taut by a willow "bow," father and son cut dovetailed notches in both ends of dry spruce logs. Through these they will drive crosspieces hewn to fit the dovetails (Plate VIII).

From His Isolated Log Cabin, Jack Baker Guides Pilots Flying over the Wilderness

His friendly voice coming over the radio gives weather reports and flying information on the long route between Fort Nelson and Whitehorse. Power for the batteries is generated by a wind charger in summer when there is sufficient breeze and by a motor-driven generator during calm spells in the winter.

Two Lone Log Cabins Put Frances Lake Post on THE GEOGRAPHIC's New Map of North America

Here lived Roy Cunningham, the manager of the Hudson's Bay Company outpost (page 609). A windmill on the tower supplies energy for his radio. The garden within the fence was planted early in June and flourished despite the weeds.

Though Heavily Laden, the Albees Find the Going Easy as They Follow the Frances River

Sometimes tangled thickets crowding down to the water necessitated slow detours. In pioneer days the Hudson's Bay Company maintained a line of posts from Fort Simpson on the Mackenzie to Fort Selkirk at the junction of the Lewes and the Pelly. Most of the settlements have long since been abandoned.

Ruth and Jo Gather Their "Spinach," Lamb's-quarters, from a Yukon Roof

Seeds of this European garden weed probably were spread over North America by birds. Cooked, it makes excellent greens. Many northern log cabins have roofs of poles covered with moss for insulation, shingled with bark, and weighted down with a layer of dirt.

Besides a bundle of mail which had come in on the plane with us, we took along all of our equipment to test it out, but carried only enough food and film for the short trip.

We were a gay sight, what with yellow moccasins, blue jeans, colored shirts, and bright head scarfs of silk chiffon to keep off mosquitoes and black flies. These brilliant costumes helped our morale all summer.

Eager to gather the blue lupines, pink roses, and magenta fireweed along the trail, Jo was not careful where she walked. She slipped on a wet log while crossing some muskeg and wrenched her ankle; but though she winced a little at first, she made no complaints.

Despite our late start, we were nine miles out from Bakers' when we camped about 11 p. m. Billy carried a pedometer and a watch to keep track of our progress.

A thick smudge drove the mosquitoes away sufficiently for us to erect the tent. By the end of summer we should smell, we knew, like smoked hams.

Jo Sings for What Ails Her

Jo awoke with her injured foot too sore to bear her weight, but after Ruth had taped the ankle and encouraged her to walk a little at a time, the child was able to limp along. Though the going was tough for her all day, she sometimes sang little songs.

"It doesn't feel so bad when I sing," she said.

Many times we were tempted to carry her, but were afraid if we once started that she would get the idea that she should be carried any time she became a bit weary. The next morning Jo actually skipped into Lower Post.

We passed several yelping dogs tethered to swivel poles and walked up to a group of bronzed men who gaped at us in amazement. Introducing ourselves, we handed over the package of mail from Watson Lake. Then Ruth inquired casually if our old friend Malcolm MacDonald was still at the post. Someone went to a cabin to tell him of our arrival, but he just laughed and refused to come out.

When we walked in and found him on a couch reading, he was flabbergasted. The men had been joking him about a picture of him they had found in a magazine review of our book *Alaska Challenge*, and he had taken the announcement of our coming as a hoax.

While we were at the post, we met 15 or 20 white men who had come in to trade last winter's furs—marten, beaver, lynx, fox—for

A Log Fence Protects Supplies or Unguarded Babies from Hungry Dogs

If meat is scarce, Indian dogs are seldom given food in summer. Therefore they become increasingly predatory. When snow is on the ground and the animals are needed for pulling sleds, they are better fed and more tractable. In the North, the Albees saw several children who bore scars from attacks by desperate dogs.

Young Daniel Boone Draws a Bead with a Muzzle-loading Musket

While exploring a clearing, Billy stumbled upon an old firearm. It bore the Hudson's Bay trademark. In early days the price of such a gun was a stack of beaver skins as high as the length of the gun.

Billy and Jo Examine an Old Cache They Discover Near the Liard River

It had belonged to a former member of the National Geographic Society, Frank Watson, who had used it to store supplies for use on his trap lines during the winter (page 598). Tin cans wrapped around the posts keep the rodents from climbing up, and the platform overhangs far enough to prevent wolves and bears from reaching the top. The ladder is taken down when not in use.

next winter's outfits and to listen to the war news on the radio in the front room of the Hudson's Bay Company manager.

With the trees and brush cleared back for a quarter of a mile, swarms of barn swallows swooped around the post during the evening, ridding it of mosquitoes. These swallows nested under the eaves of the company log store, warehouses, and public bunkhouses, where they were protected from their natural enemies.

We gave Billy and Jo free rein in the village, except that we cautioned them to keep out of the bunkhouses, which were full of "cold sick." Around 1932 many Indians had succumbed here to tuberculosis.

When we asked the trappers about trails up the Frances River to Frances Lake, they tried to dissuade us from going. None of them had been up the Frances River, and they had heard of no trails there.

During the Klondike stampede in '98, some recalled, several parties of white men had gone that way to Dawson, but the route had been abandoned long since. Indians from Frances Lake rarely came down to Lower Post, and when they did they usually traveled by dog team over the river ice.

The men spoke highly of old Stuart, a half-Indian, half-Negro trapper, who had a cabin about 50 miles up the Liard near the mouth of the Frances. Suffering from varicose veins, he had come to Lower Post to await the annual visit of the government doctor from Telegraph Creek.

Stuart could give us little information. He said he had a good trail from Watson Lake to his cabin, where he expected to be by the time we reached there, and he would guide us a few miles up the Frances Valley.

"Upper end of Frances will make more trouble," he said. "Much windfall and swamp."

The Exploring Albees Operate an Arm-power Sawmill

To while away the time at Frances Lake, they whipsawed enough lumber to floor a cabin. This gave Bill much "face" with the Indians. They said that any white man who could get so much work out of his squaw was "some man."

Bears had raided Stuart's cabin that spring, cleaning him out completely, and Bill Strong, who ran the Taku Trading Company, was loading a long river boat with a new outfit for the old man. The trader offered to take along for us as far as Stuart's a 40-pound box of staples. Timmy Stuart, the old trapper's son, would see that the box was put in a safe place.

When, reluctantly, we left Lower Post, Malcolm MacDonald insisted on taking us in his "kicker"-propelled poling boat six miles up the Liard to the Lower Canyon. We know the trail so well from that place, and the children were in such good spirits that we were only one day on the trail to the end of Watson Lake. There we stopped to watch ospreys plummet into the water for fish.

Jack Baker saw our mosquito smudge and came to meet us. He had found out by radio that a plane was due to go from Whitehorse to Frances Lake early in September to take in a new manager for the Hudson's Bay outpost there. If we wished to reach Frances Lake in time to leave with that plane, we should have to shake a leg.

Three Loads in Two Packs

That night we faced our biggest problem. A young man whom we had expected to travel with us had suddenly turned back at Vancouver. Consequently, what we had arranged to divide into three loads—60 pounds each for the other chap and me and 40 pounds for Ruth—must be carried in two packs.

Our outfit included the 7 x 7 tent; two down sleeping bags for Billy and Jo; a double bag for Ruth and me; a 16-mm. movie camera and tripod with 3,000 feet of color film; two still cameras with film; one pair of binoculars; one Hudson's Bay tomahawk ax; one 30-30 carbine; one single-shot .22 rifle; 14 boxes of ammunition; hunting knives; medical, sewing, and toilet kits; a notebook; extra clothing;

and an extra piece of moosehide for making moccasins.

In addition to this equipment, we had 10 lbs. of ready-mixed flour, 6 lbs. oatmeal, 5 lbs. sugar, 4 lbs. vegetable powder, 4 lbs. dehydrated vegetables, 3 lbs. rice, 3 lbs. ground chocolate, 3 lbs. powdered milk, 2 lbs. raisins, 1 lb. tea, and 1 lb. salt.

A can of cinnamon, another of curry powder, a bottle of saccharine tablets, and two dozen candy bars were extra luxuries.

When we finally put the two packs on Baker's scales, Ruth's weighed 68 pounds and mine 93.

Baker hefted the larger and remarked, "That may be all right for a short time on a good trail. But it is out of the question for a long trip cross-country."

"The only thing we can do is try," Ruth answered for both of us. "If we can't make it, we're not too proud to turn back."

The children had two little packs of their own, containing their own spare clothes and our cooking equipment—2 lard pails with lids, 3 cups, 3 spoons, 1 fork (Ruth carried the frying pan).

Strapped around the outside of each of their packs was a kapok life preserver to be worn when crossing streams. Although their packs looked big and important, Billy's weighed only eight pounds and Jo's four (Plate I and page 593).

Ruth struggled into her 68-pound pack and adjusted her shoulder pads with care. She couldn't afford to get any blisters now.

"Gee, mommie," asked Jo, "when are we going to get done starting?"

Billy said nothing, but his big blue eyes were shining.

As for me, thoughts of what might lie before us suddenly became menacing. I almost weakened—almost.

Thus we started out. I walked in front, Billy came immediately behind, Jo was next, and Ruth brought up the rear. Frances Lake was more than 80 miles ahead as the crow flies, but far more than that by the way we should have to walk.

We had good trails all that first day.

Bombers Now Land in Clearing

A short distance from Baker's we crossed the end of a clearing for the first ground landing field in the area. It bristled with a maze of 4-foot jack-pine stumps which were to be pulled out later by tractor. Now bombers land there on their way to Alaska.

In the middle of the field a mother nighthawk, scared up by Billy, fluttered about the ground as if it had broken its wings. Billy located on the bare ground among masses of pale-pink corydalis a nest containing one egg and two pieces of newly hatched fluff.

Jo wanted to take the baby birds with us. We compromised by taking pictures of them.

About a mile from Baker's we found an Indian family, Liard Tom, his wife, his daughter Fanny, 17, and his son Frank, 16, just getting up. They were on their way from Lower Post to their home camp on Liard River (Plate VII and pages 614, 616).

Tied to the trees about their trail camp were the four emaciated dogs used to carry all the equipment. Jo went right up to them and petted them. Though usually savage with strangers, they accepted the caresses with friendly tail-wagging. Jo has a way with animals. She loves them all, and they never harm her.

To explain the family's late rising, Liard Tom said, "Night best time travel—not so many mosquitoes."

Wilderness Ahead; No Trails

We asked him about trails up to Frances Lake.

"No trails," he replied. "Nobody come that way for long time."

While talking to us, Liard Tom had been looking at Ruth's pack as if he could not believe his eyes. He picked it up and grunted, "Much too heavy, too heavy for man."

Ruth, however, took up the load again and we were off, with Liard Tom and his wife saying, "My, oh my!"

Another half mile and we came to a branch trail leading through jack pine and magenta fireweed to a cabin belonging to the Indian widow of Frank Watson. Watson, the only white man who had trapped in this part of the valley, had died the year before. For him Watson Lake had been named.

We left our packs leaning against a tree and walked over to the cabin. Near the door a young girl was squeezing thick soapsuds out of her hair. Watson's widow popped up out of a small mosquito tent with a startled cry, and then laughed abashedly.

The dogs woke up and barked furiously. From the cabin an older girl, husky and attractive, came out to talk, and invited us inside. She drank in the children with her eyes.

"Thank you for coming," she said. "No see many people—children very good to look at."

We were amazed at the things that cluttered the one room. There were eight rifles, three portable phonographs, piles of records, three beds, a radio without any batteries, a cast-iron stove, a large table with many cooking implements, and a stack of NATIONAL GEOGRAPHIC

Off Through the Yukon Wilds, the Albee Family Begins a 260-mile Trek to Frances Lake
Bill's pack weighed 93 pounds, Ruth's 68, Billy's 8, and Jo-Evelyn's 4—heavy even on the best trails.

Kodachromes by Ruth and William Albee

Ready to Start from Watson Lake, the Albees Laugh at Their Heavy Packs

Pads under the shoulder straps are spare duffel socks.

Kodachrome by Ruth and William Albee

Unworried, Ruth Permits Billy and Jo to Leave Their Frances Lake Camp Alone in Search of Berries

Each member of the family carried on a leather thong about the neck a police whistle for signaling. One blast called for a reply to indicate direction, two asked "Come here," and three meant "Help." By this code the children kept in touch with their parents and rambled freely through the thickets without fear of being lost.

Cleaning Up Was Often Just a Lick and a Promise

No wonder two bars of toilet soap lasted all summer! And drying on the same towel was simply a mark of comradeship.

Kodachromes by Ruth and William Allen

Stream Banks Provide Laundry Facilities

Even though the water is chilly, it cleanses woolens easily and without shrinking them. Jo insisted upon helping her mother with all housewifely duties.

Spruce Hens and Dolly Varden Trout Were the Mainstays of the Larder

Who wouldn't look pleased at the prospect of a feast from the frying pan and no dishes to wash!

Kodachromes by Ruth and William Albee

Mealtime Is Always the Best Part of the Day

Jo and Billy are enjoying "fried" spruce hen—sizzled in water without salt. Knives and forks are dispensed with.

The "Porch" of the 8-pound Home Made a Pleasant Dining Nook

During heavy rains the flap could be tied down to prevent water leaking through the screened "window."

Kodachromes by Ruth and William Albee

"Citronella" Earned Her Name Because She Was a Fine Mosquito Repellent

This immature red-winged blackbird joined the Albee party uninvited, coming to pick insects off the tent "window."

When September Has Painted the Hills and Frosts Have Killed the Mosquitoes, the Yukon Is a Veritable Paradise

With the early fall days still delightfully warm, this wide, sandy beach on the eastern arm of Frances Lake was a joyful camping place for Billy and Jo. Here were water to swim in—oh, not too cold, about 50°!—driftwood for fuel, blueberries and cranberries galore in the woods, huge trout for the catching, ducks and grouse for the shooting, and a vista of the Logan Range to enjoy. Although marked prominently on most maps of northwestern Canada, the shores of this body of water have been trod by few white men.

Liard Tom and His Taku Indian Wife Like Color

Gay with cotton embroidery are their moose-hide coats and rifle cases, and their mittens are decorated with beadwork.

Kodachromes by Ruth and William Allen

Billy Gathers Mushrooms in a Poplar Grove

The family ate almost every kind they could find, but preferred this variety, nicknamed "beefsteak," because "steaks" could be cut off some of the larger ones.

Billy and Jo Help Their Father Make a Raft

When the wedged crosspiece had been driven through the notches, the construction was as solid as one piece.

 Kodachromes by Huth and William Allen

Fireweed Derives Its Name from Its Habits Rather Than Its Color

In the North it springs up quickly on burnt-over ground and scatters cottony seeds for miles.

MAGAZINES (Watson had been a member of The Society).

Back on the main trail, we struggled under our packs and resumed the steady plodding ahead. We had to be careful how we walked with those heavy loads lest we overstrain muscles not yet hardened.

The trail wound along a creek for a few miles. Where timber had been flooded at times of high water, several varieties of mushrooms grew profusely. Many of the larger ones had been knocked over that very morning by a playful bear—a rather large one, prints of his feet indicated!

The big fellow's tracks led out through a fragrant meadow filled with lavender geraniums, waist-high purple larkspur, and patches of lacy willow bushes. Billy kept close to me, and Jo clung to Ruth's hand.

I admit pumping a cartridge into the 30-30 chamber "just in case."

Then I suddenly realized that with Jo continually asking questions in her far-carrying voice, no self-respecting bear would stay in that part of the country.

Mosquitoes More Annoying Than Bears

Mosquitoes soon became an annoyance that banished the bear from our thoughts. Fogging up particularly thick in the meadows, they had us switching them off our faces with branches as we walked, and lighting smudges to keep them away when we stopped to rest. Our five small bottles of mosquito repellent had to be reserved for rubbing on our hands and faces when we were taking pictures.

In the early afternoon we reached the outlet of Watson Lake, seven miles from Baker's. Scattered moose horns and traces of old campfires marked the place as a favorite camping ground for Indian hunters.

As Jo slipped off her pack, she said, "Boy, it feels as if the wind will blow me away!"

After lunch we went on toward Eight Mile Creek. Liard Tom and his family caught up with us and followed us all afternoon.

Their overloaded dogs were so weak and emaciated that they had to rest every few hundred yards. Again Jo petted the poor animals and wiped the rings of blood-filled black flies and mosquitoes from around their eyes. Ruth gave Tom and his son bandanna handkerchiefs to tie around their heads to keep off insects.

The old Indian recalled that in early days traders, the only lawmakers in the North, had punished desperate criminals by turning them loose naked in the bush.

By the time we reached Eight Mile Creek, Ruth and I were exhausted from our heavy packs. Billy's pedometer recorded 11 miles walked that first day. Boasting of the great distance he could cover without rest, Liard Tom went on while we pitched camp.

I cut springy boughs from lower branches of white spruce trees, and Billy and Jo carried them to the camp spot, where Ruth made a bed of them. Beginning at the head end, she laid the curved boughs with the butts down and the arches up so that the needles matted smoothly across the top.

We stretched the sewed-in floor tightly over the resilient boughs, staked it down to form a mattress top, and then raised the tent itself with a couple of 10-foot poplar poles tied together at the top.

That tent was our most necessary piece of equipment. Absolutely mosquito-proof, it was covered at one end with strong bobbinet protected by an extending flap to keep the rain from beating in. At the opposite end was a zipper door (Plate V).

The few mosquitoes we carried with us as we crawled in collected at once on the bobbinet, and we literally wiped them out with our hands. What relief to escape them for a few hours!

Ruth had cooked a mulligan of dehydrated "soup-mix" vegetables and dried moose meat from Watson's in a lard pail hung on a pole over the fire. Though the meat was as tough as shoe leather, we ate it with relish. The children drank some hot chocolate, wriggled into their beds, and fell asleep immediately.

We were so exhausted we almost slept the clock around—didn't get up till 9 a. m.

"Much Miles" Dwindle to One

After walking less than half an hour, we came upon the ashes of Liard Tom's campfire. The "much miles" he had expected to travel after leaving us had dwindled to about one. Where the trail to his home branched off to the left, he had placed a sapling to show us the right way to Stuart's.

About five o'clock we were stopped by a stream that was running wild among some cottonwood timber. Old beaver dams and driftwood piles had spread it out till it was 200 yards wide, and its bed was filled with mud.

While Ruth started dinner, Billy and I scouted upstream to look for a crossing. We had not gone far when we found a series of driftwood piles stretching almost across the runaway stream. There was just one 25-foot gap next to our bank where the water gushed through. Luckily, a couple of tall spruce trees grew just right for me to fell them and bridge the gap to the first driftwood pile.

Ruth had dinner ready when we returned—a grouse fried in moose grease with mushrooms

In the Yukon, a Radio Operator Must Be Jack-of-all-trades

Here Jack Baker, weather observer and wireless man at Watson Lake for the Yukon Southern Airways, hews a 2-inch doorjamb from a solid log with a broadax. He can read a barometer, repair a radio, dress a moose, or build a cabin single-handed. Bombers now land where this timber grew.

gathered earlier by the roving children. Although our packs contained two weeks' rations, Ruth wasted no opportunity to teach Billy and Jo to live off the country.

We set up our tent at the crossing on a patch of moss as soft as a mattress. Then we crossed our improvised bridge to a sandbar, lit a mosquito smudge, and bathed invigoratingly in the clear, cold stream.

Next morning Ruth and I got under our packs and with the aid of steadying poles made a safe crossing, the children clinging to our belts. We climbed to the top of a 200-foot cut bank for a view of the Liard Valley, spread out southeast and northwest as far as we could see, and rimmed on the west by the blue mountains of the Wolf Range, near Wolf Lake. It contains millions of acres of farm land covered with pulpwood.

Stuart had marked his trail well except in a few places where he had taken it for granted the direction was perfectly obvious; but for strangers going over it for the first time it was not so easy to follow. Sometimes it was only a dim path without any blazes, and often only a few blazes without any path.

It went along a ridge for several miles among twisted and fallen timber, then came out into open, parklike country carpeted with pink twinflowers and lightly forested with jack pine. Skirting a small grass-bordered lake dotted with ducks, it entered a flat of young jack-pine saplings which Billy said looked like a Christmas-tree farm.

The weather, however, held no hint of Christmas. We were all wringing wet with perspiration by the time we reached green-bordered "Airplane Lake," which Liard Tom had marked for us on a map he had drawn in the sand two days before.

For Dinner—Grouse and Bannock

During a sudden downpour, brought on no doubt by the hot spell, we had a dinner of fried grouse, chocolate, and frying-pan biscuit, called "bannock" in the North.

Ruth made bannock by pouring a little water directly into the sack of ready-mixed flour, baking powder, and salt. When just the right amount of the mixture was moistened to the proper consistency, she put the dough into moose grease in the frying pan and heated it over the fire. The rest of the flour in the sack remained dry, not a bit of it wasted; and there was no mixing dish to wash.

Stuart's cabin was in a quarter-mile clearing on the Liard River only an hour's walk from the lake. When we reached it, we were soaking wet from wading through swamps and dripping bush.

Fresh tracks showed that someone with dogs had been there only a few hours earlier. I scouted up and down the bank knee-deep in wet grass, but found nobody.

All about the cabin were bear tracks, and near by stood a bear-proof cache with a small white tent on its overhanging platform. Tied to one of the posts supporting the cache was this note:

Bill Albee
that is you Boxs on Coche if you come up here you look for you Boxs on the Coche we put in Sure place So Would See that that all
Coche
letter for your from
Timmy Stuart

We dragged a ladder out of a patch of blooming fireweed and climbed to the tent. Inside, with Stuart's ton of staples, was our box of supplies from Lower Post. We pitched our tent on bare ground that night, for we were too wet and tired to gather spruce boughs.

No Maid Problem Here!

With a towel to serve as apron, Roy Cunningham, manager of Hudson's Bay Company outpost at Frances Lake, "hatches" in the kitchen end of his one-room cabin. He was the only white resident there during the winter of 1940-41. The Albees helped him whipsaw, plane, and lay the floor boards. Ruth sewed curtains for the windows. Stove, pots, and pans were flown in by airplane.

The "Citronella" Bird Attaches Itself to the Party

In the morning a tapping sound awakened us. A small brown bird, which looked like a cross between a sparrow and a thrush, was methodically pecking mosquitoes off the bobbinet of our tent.

At first we moved about cautiously lest we frighten our new friend away, but it showed no fear and soon was hopping all over us as we went about preparing breakfast. The children were gleeful.

Jo tried to feed the bird crumbs, but it refused them and gorged itself almost to bursting on insects. In a few minutes it had thinned out the mosquitoes till we were no longer annoyed by them. We named it "Citronella" in recognition of its prowess as a mosquito repellent (Plate V).

While waiting for Timmy Stuart or his father to show up, we enjoyed five days of relaxation.

The windows of Stuart's well-built cabin had been knocked out and were now boarded up. Within the room, a veritable jumble testified to spring bear raids. Muslin, once stretched across the ceiling to catch the dirt

Frances Lake Indians Come from Many Tribes

These two men live peacefully in summer on the site of old Fort Frances and trap throughout the winter. "Old Sam" (left) remembered when many white men and former slaves (the latter had come to Canada by the "underground railroad") searched for gold along the Dease River of British Columbia in the 1870's.

which sifted through the log roof, hung in tatters. The crude tables and chairs had been smashed.

New equipment was piled in the center of the floor—windows, a cast-iron stove, a sanitary iron cot, and a Peterborough canoe.

Near the cabin a marble tombstone enclosed by a woven-wire fence with padlocked iron gate marked the grave of Stuart's son. The bereaved father had had the monument and fence shipped to Lower Post at a reported cost of $350.

A gaunt dog with fine ears came quietly out of the brush one morning and begged wistfully for food, but slunk away before we could catch fish for it. We dared not feed it from our "store grub."

The river teemed with Dolly Varden trout and sleek grayling eager for flies. For the picking we could have all we could use of wild strawberries, lamb's-quarters, miners lettuce, peppery fireweed shoots, and even rhubarb. This last had been brought into the North by old-time prospectors who thought it would prevent scurvy.

One day while I was scouting for possible trails north and Ruth was washing and mending clothes, a young Indian, Liard Tom's son-in-law, Peter, appeared at the camp. He was talking to Ruth when I came in about dusk, telling her that he had lost two of his dogs. That accounted for the hungry creature we had seen earlier and another which Jo had just fed "store grub" while her mother was not looking. Peter had made the footprints which had puzzled us on our arrival.

To everybody's amazement, Citronella began to peck the rings of insects from the dog's eyes. The dog resented the attention and tried to make a mouthful of the bird.

Peter's eyes fairly popped.

"First time I see that kind bird!" he said. "Just like spirit. If I tell Liard Tom I see that kind bird, he say I big liar!"

Peter knew no more than his father-in-law about the Frances River.

He shared our dinner and, because rain was falling, slept that night in the cache tent. The next morning he had the fire going before we were up.

The Hikers Often Played a Game of Gigantic Jackstraws

A tangle of windfall had been caused by fire which burned off only the branches, leaving the trunks to rot and blow down in confusion. Little Jo just tumbled through; if she couldn't go over an obstacle, she went under, and often came up with a handful of flowers. Indians of this section often set fire to timber to make "moose country." On such burned-over areas long-legged moose browse on the new growth protected from wolves, which are slowed down by the fallen logs.

We entrusted him with two bundles of the things we wished taken back to Baker's, and after breakfast he headed out, more than satisfied to receive two boxes of 30-30 shells for his trouble. He was the last person we saw for several weeks. We decided not to wait longer for the Stuarts.

With packs seeming only slightly heavier than those we had carried before, we struck out on a well-cleared winter trail, which went in a beeline across to the Frances River.

Citronella accompanied us for a while, sometimes running along between our feet, sometimes sailing ahead and waiting for us to pass, and sometimes even riding on one of the children's packs. The first time we sat down to rest, however, the bird was nowhere in sight. Jo was tearful when we had to go on without her friend.

Not till months later did we find out what kind of bird Citronella was. Dr. Alexander Wetmore of the Smithsonian Institution identified her from some natural-color photographs as an immature redwinged blackbird.

Citronella demonstrated how effective an insect-eating bird can be in ridding an area of mosquitoes. Perhaps the cultivation of swallows and martins will one day solve the mosquito problem, the most serious obstacle to development of the North.

While Jo was still bemoaning the loss of her pet, Billy cried out, "Daddy, I see something through the trees!"

"What is it, old Eagle Eye?"

"It looks like a cache," he said, pointing.

Two freshly peeled spruce trunks in a little clearing supported a canvas-roofed platform on which rested a coffin-shaped box covered with black cloth. At one end was a wooden cross. The cuttings showed that the tree burial had been made late in the winter.

Up the Little-known Frances River

We had to explain to both children that someone must have died in the spring when the ground was frozen solid as concrete, too hard to dig, and that the body had been cached up in the trees to keep it safe from animals.

We had lunch on top of a high cliff at the junction of the Frances and Liard Valleys. Now, heading up the Frances, we were on our own, our only tie to the rest of the world a sketch map made by G. M. Dawson in 1887.

The next morning we headed straight north by compass. Soon we came to a wide swampy area, where, though moose trails showed the firmest places to cross, we had to wade through a lot of muck. When it was too soft and too deep, we cut saplings for footing.

Jo did not like the feeling of wallowing in soupy mud above her knees, but we had to keep on going and wring out our moccasins and duffel socks afterward. Before noon we shot two spruce hens, and when we reached a point of land high enough for a lookout, we rested while Ruth fried the birds for our lunch.

Balancing our heavy loads through muskegs and swamps had been so tiring that we kept to high ground all afternoon. There we got into an abominable windfall, caused by fire which had swept through the timber and burned off only the branches, leaving the bare trunks to rot at the roots and blow down in jackstraw confusion (page 611).

Whenever we stopped to rest, Billy would pull out his watch and pedometer, study them gravely, and warn us, "It's about time to move along if we want to make 12 miles to-day."

We had to keep going much later than usual to reach water. It was about 9:30 p. m., almost dark, when we discovered a pond in a moraine depression.

Thus we went on day after day. Whenever it was possible, we climbed lookout points to search ahead with our binoculars for the best route. We learned to estimate by the color of the treetops the type of going underneath.

Treetops Reveal Ground Conditions

Sparse, dark-green tops of black spruce and larch warned of swampy areas to be avoided; thick, dark spruce meant firmer muskeg and perhaps the edge of some body of water. Ordinarily, tops of medium green indicated mature jack pine on dry, open stretches, though sometimes they concealed undergrowth of dense alder brush. Fresh yellow-green of young jack pine, poplar, and birch might cover bad windfall.

Always we tried to go as straight north as we could by the compass. Sometimes we could cross a swamp on an old beaver dam, but more often in such places we had to lay a trail of treetops over floating grass.

I usually carried the others across shallow streams to keep their moccasins dry. When small streams were too deep to wade, I would chop down a tree or two to bridge them.

The first stream too wide either to wade or to bridge rather frightened Jo, but only made Billy eagerly expectant. It was swift and full of log jams.

"Oh, daddy," Billy asked excitedly, "can we really build a raft now?" He had been looking forward all summer to this moment.

Jo was not so sure about it. "Why can't we go around?" she asked.

Because drowning takes such high toll in the North, the utmost caution was necessary. We found a patch of fire-stripped spruce trees atop a 10-foot cut bank near the upper end of a comparatively slack stretch of water. From these trees I cut seven 14-foot logs which I joined together near the ends with two sturdy crosspieces driven through dovetailed notches (Plate VIII and page 591).

A Bowstring Saw Works Wonders

On previous trips I had built rafts with nothing but an ax. This time I had a handy tool for cutting uniform notches wider at the bottom than at the top—a Swedish steel saw blade 48 inches long and only one inch wide. We carried it coiled up in our frying pan.

To use it, I made a frame like a bow from a straight green-willow pole. I heated the pole over the fire, bent it with my foot to the approximate shape, and held it till it "set." Then I "strung" the bow with the blade.

The raft, the first of four we built on the trip, was as solid as if made of a single log. As we skidded it down the bank into the water, Billy burned his hands by holding too tightly the tent rope we had tied to it to keep it from swinging away into the current.

This was his only accident of the summer, aside from a few minor scratches. While Ruth taped the burns with Band-aids, Billy grinned a bit wryly. He said he wouldn't let us down.

With our medical kit, we were prepared for almost any emergency. There were disinfectants, cauterizers, and even sutures and surgical needles, which luckily we did not need.

We all had police whistles strung on moosehide thongs around our necks, and therefore it was perfectly safe for the children to do a little exploring by themselves while Ruth and I were busy in camp. Whenever in doubt as to where they were, they sat right down and kept blowing their whistles until we answered. One blast asked for a reply, mainly for direction. Two meant "Come"; three, "Help."

Quickly the children learned there was little to fear in the wilderness. There were no poisonous snakes, and any plants or berries we might run across were pretty apt to be harmless. Jo ate every kind of berry she could find. As for wolves and bears, although we con-

Ruth Turns Moccasin Cobbler

Indian-style, she made the footwear from chamoislike moose hide. All her sewing and mending equipment was carried in a compact kit, each item in a separate pocket. Fourteen-inch squares of Hudson's Bay blanket were used as socks.

stantly came upon their fresh tracks and often heard them in the bush near us, the children's chatter kept them too far away for us to see.

Billy developed a remarkable sense of direction. I often tried him out by having him lead us back to camp, or allowing him to choose the way for the day's march ahead.

As we ate up the food that we carried in our packs, we became more and more dependent on game along the way. Spruce hens fortunately were so plentiful that we did not need to hunt larger prey. When we ran out of moose grease for frying, Ruth found that the easiest way to cook them was to sizzle them in a small amount of water in the frying pan.

Sometimes we plastered fish with mud, buried them in a hole filled with live coals, and left them to bake for a couple of hours. Removal of the baked clay exposed a fish done to a turn, juicy and tasty.

The first time we tried this method of cookery, Jo proceeded to outline the buried fish with rocks and then planted the center with lupines, buttercups, and monkshoods.

"I'm making a grave," she said, "like the one back there at Stuart's cabin."

Many kinds of wild fruit gave variety to our diet of fish and birds—red currants and gooseberries, red raspberries and black mossberries, high- and low-bush cranberries, and, best of all, the northern blueberries, which grow profusely all over this part of the Yukon. Sweetened with saccharine tablets and flavored with sugar, blueberries on bannock made a delicious shortcake.

Exploring a Cabin Ruins

There was a caved-in cabin near the Middle Canyon. Exploring it as if it had been a ruined castle, the children found a rust-eaten fragment of a frying pan and an empty rum bottle. We were told later that the prospector builders of the cabin, isolated there one winter with nothing but meat to eat, had all died of scurvy. Had they eaten all parts of the game they killed, as Ruth and I had learned to do, they would have escaped the disease.

In the middle of the night, I was awakened by a heavy splashing coming along the shore toward us. I cocked the 30-30 and held it ready to repel invaders, but the sounds died away. Next morning we found 10-inch bear tracks within 20 feet of our camp. I took motion pictures that afternoon of two moose cows swimming across the river.

Every Indian Girl Must Learn to Make Her Own Footwear

In summer Fanny, Liard Tom's 17-year-old daughter, prefers to sew moccasins inside a mosquito-proof trail tent which has a canvas roof and netting sides. She is especially proud of her homemade zipper blouse (page 598).

A few days later we came to a sandy bar caused by a strong back eddy at the bottom of some rocky riffles. Several logs, evidently remnants of broken rafts, littered the bar, and among them Jo found the collar and one cuff of a pin-striped shirt of good quality.

No Indian's shirt this; we knew it had been worn by a white man—probably some prospector drowned while trying to run the rapids. The ravenous Dolly Varden trout would make short work of a body.

A Race against Time

In one part of the valley, between two ranges of mountains, we tramped for days through rain and dripping brush. The children took the constant soaking without complaint, Jo even singing as she went:

> A frog came out of a pond one day,
> And found himself in the rain.
> Said he, "I may get cold and wet,"
> So he jumped in the pond again.

Although often wet to the skin, none of us ever caught cold. Our fine woolen underwear felt warm as long as we kept moving, and we each had an extra suit dried and ready to put on as soon as we camped.

During the last few days before reaching Frances Lake we raced against time. According to Dawson's map, we should, at our average rate of 8 to 12 miles a day, just about reach the lake on the day when the plane was due there with the Hudson's Bay manager.

We had long since used up all of our provisions and for several days now had been living entirely off the country. Gathering berries, fishing, and even hunting took time. The children readily agreed to go on reduced rations in order to avoid delay.

We were passing fresher and fresher signs of Indian camping, showing that the natives from the lake had been along this part of the Frances Valley during the spring. But still there were no through trails—only local hunting trails.

At one well-used camp spot, we had to cross a stream about a hundred yards wide. An old raft of four logs tied together with a rope lay among the tall grass and willows on the other side, and to save time I decided to use it. Stripping bare, I swam to it. I had hardly got out of the water when swarms of mosquitoes and black flies settled all over me and gave me a taste of the punishment Liard Tom had described (page 607).

After 10 minutes of torture my body looked as if covered with smallpox.

In This Plane the Albees Flew Back to Civilization

Supplies for Frances Lake Post must be brought in by air from Carcross, 200 miles away. Freight rate is 20 cents a pound in summer, when floats are needed on flying craft, and 15 cents in the winter, when skis can be used for landing. The plane is about to take two white trappers and their grubstake to virgin trapping ground near the summit of the Rockies, 150 miles east.

We were still several miles from Frances Lake the day the plane was due. To our despair we saw an airplane come droning low over a ridge, heading for the lake. We waved frantically to attract the pilot's attention, but though he was so low that we could actually see him, and we were out in the open on a sand bar, he passed us by unnoticed. We struck out in a determined effort to reach the lake that day.

Unfortunately, from then on we were in the worst windfall of the trip. It reached from the edge of the water back into the hills as far as we could see, and there was not a foot of sand bar or beach along the steep cut banks of the river. With the packs still heavy, we made only four miles all morning.

I left Ruth and the children to make camp by the river, and, carrying only a light pack, pushed on alone. By sunset I reached the shore of Frances Lake, along which there was a beach I could follow even in the dark.

It was pitch dark when I walked into Frances Lake Post. With true sourdough hospitality Jack and Norman Harlan, trappers in their early thirties, prepared me a meal. Between mouthfuls, I told them about the plane which had passed us by. They explained that it had carried a couple of Mounted Police and a doctor from Whitehorse on their yearly round of the territory to check up on the Indians. The plane with the Hudson's Bay manager would not arrive for several days.

The police had asked the Harlans to keep a sharp lookout for a white man who had headed for the Frances River area early in the spring and was several months overdue. I remembered the cuff and collar we had found in the sand!

Though it was now midnight, the Harlans insisted on setting out in their newly finished poling boat to fetch Ruth and the children.

"A woman and two kids are going to look mighty good to us," they said. "The only white people we have seen in months were those on the plane you saw yesterday."

In inky darkness we crossed the lake, slid down the river, and located the camp by the unmistakable smoked-ham smell. The sound of our splashing oars awakened Ruth and the children.

Jack and Norman had brought a box of grub. Never before had I seen Billy and Jo stow away so much oatmeal, bacon, and bannock at one time.

At the crack of dawn came four hours of

Liard Tom's Wife Has Many Grandchildren, But Her Looks Belie Her Age

Told jokingly that a highway might someday pass through his trapping ground, Tom replied, "Then I run trap line with jitney!" This jolly patriarch of the Taku tribe lives with his family on the upper Liard River (page 598 and Plate VII).

lining the boat upstream, with Ruth and the children snuggled under a canvas.

The Harlans told about some Indian families camped near the post. As we crossed the lake, Billy and Jo blew up several balloons to present to the little Indians.

Road Surveyors Now Invade Frances Lake

Jack and Norman are two of the finest men we have met. They had both gone out to Vancouver at their own expense to join the Army, but had found that no more volunteers were needed. Disgusted, they had come back for a winter of trapping all by themselves. The only white men at Frances Lake, they were camped on the beach waiting for a plane to come and take them and their supplies farther into the virgin wilderness.

We talked about the future of the country, but little did we realize that before this story came to print surveyors would be laying out a famous road along these very rivers.

What appetites the children had developed! Despite walking 310 miles, according to Billy's pedometer, Jo had gained five pounds, Billy 14. Billy, who, before the trip, had always been finicky about his food, now relished anything that was set before him.

The final days at Frances Lake were joyous. Here in September the country was in its glory (Plate VI). The first frost had painted the birches and poplars brilliant yellow against blue sky alive with long strings of geese and sandhill cranes in V formations.

On September 26 a yellow plane came to speed us on south, too, like the birds (p. 615).

It was Billy who said, "Gee, mommy, it's been like one big picnic all summer long!"

Tidewater Virginia, Where History Lives

By Albert W. Atwood

IN TIME of war it is inspiring to go back to the beginnings of the American nation, not only in memory but through visits to venerable landmarks which still remain. Down in Tidewater Virginia, not far from crowded Washington, history seems to fairly live on.

This is especially true on the Peninsula, a small, narrow strip of land between the James and York Rivers. For here, within a few miles, are Jamestown, where English civilization secured its first permanent foothold in North America, and Yorktown, where the surrender of Cornwallis ended the Revolution and ushered in American independence.

Near by lies Williamsburg, capital and metropolis of the first of the Colonies and for nearly a hundred years proud center of its cultural and social life.

Tidewater Virginia saw the New World's first legislative assembly, it produced daring patriots and political philosophers, and it laid the constitutional foundations of the Republic.

Five of the early Presidents of the United States, including George Washington, were born here; and the third President, Thomas Jefferson, attended its college, the second in all the Colonies.

A Land of Many Waters

Nature intended that Tidewater Virginia should fill a romantic and stirring part in the great drama of national life. It is a land of many waters, of broad estuaries, long, deep, tidal rivers, and spacious, naturally protected harbors.*

Four major rivers—the Potomac, lying between Maryland and Virginia, and the Rappahannock, York, and James, all in Virginia—tumble over the "fall line" and are merged into the tidal waters of the estuaries of Chesapeake Bay. They cut, or separate, the low-lying plain into three long, narrow strips or peninsulas, known locally as "necks," which, taken together with the peninsula of the Eastern Shore and part of the "Southside," constitute Tidewater (map, page 621).

The Northern Neck lies between the Potomac and the Rappahannock; the Middle Neck between the Rappahannock and the York; the "Virginia Peninsula" between the York and the James; and the Southside below the James.

Until comparatively recent years there were few bridges across the wide rivers, and to span the James required a structure 4½ miles long. Formerly one had to travel a hundred miles up the three longer rivers before finding a bridge.

Today, all the rivers except the York are crossed by bridges, and from Baltimore and Washington one can go directly south by modern highway straight across Tidewater (618).

But physically the region has changed little in more than 300 years. The broad stretches of silent waters are the same. Cities, great and small—Washington, Fredericksburg, Richmond, Newport News, and Norfolk—are on the rim of Tidewater.

Peninsulas Still Rustic

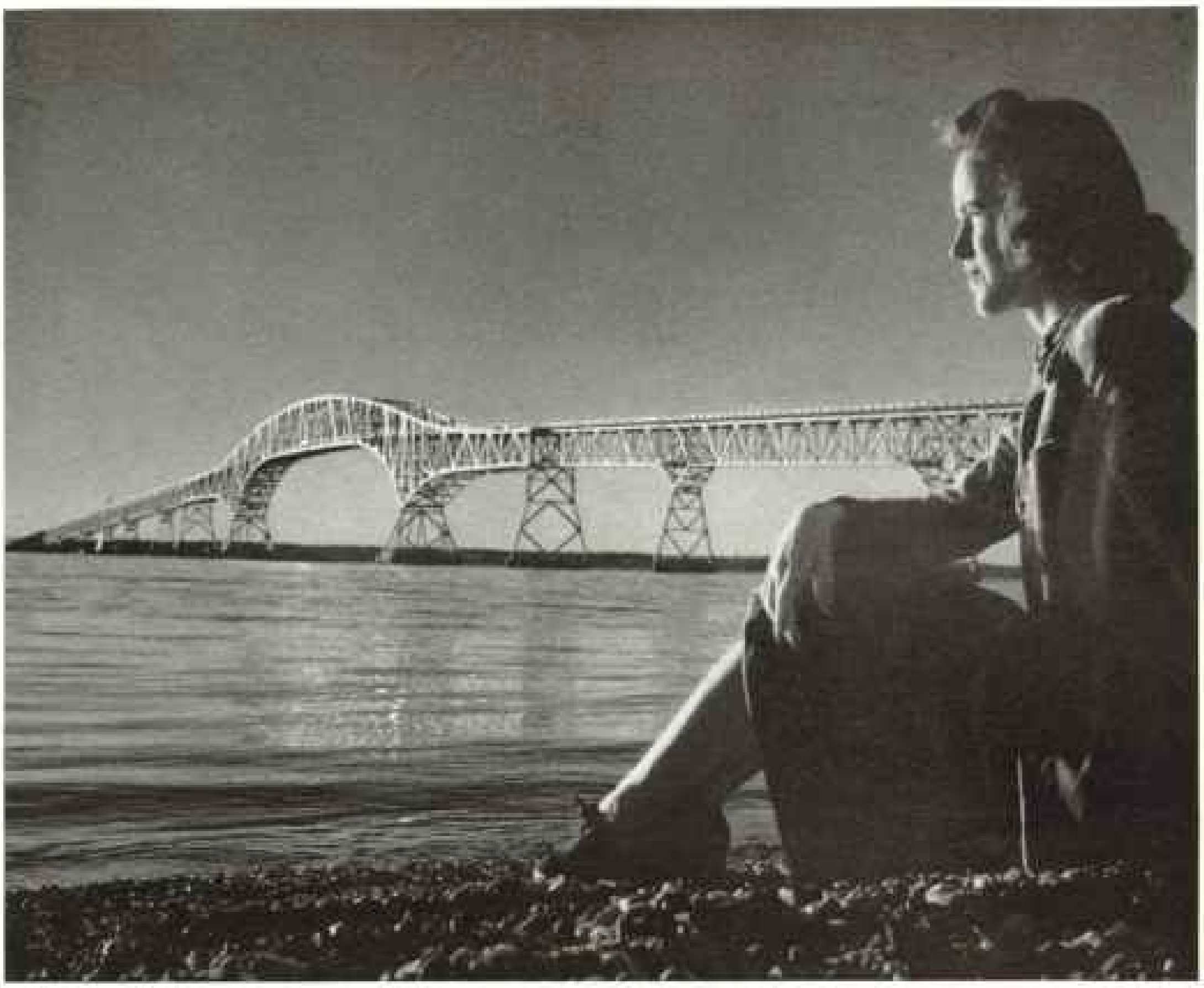
At heart the peninsulas are still townless and rustic in their simplicity. One travels the whole 80-mile length of the Northern Neck without encountering a railroad, and there are ten counties in the Northern and Middle Necks which have not been entered by the iron horse.

Indeed, some magic touch seems to have turned time back to colonial days. This is partly due to the historic landmarks of Jamestown, Williamsburg, and Yorktown; to the quaint, tiny county seats, with their picturesque old courthouses and clerk's offices; to the storied churches, in their remote but beautiful sites, and to the many scattered plantation mansions. Each spacious river estate and home has its own proud family story, and not a few of them are shrines.

To Jamestown Island, first of all, the visitor must go if he is to sense all this. For here, if anywhere in America, is hallowed ground. About this quiet little island there is a strong emotional quality and a spiritual appeal. If the crowd is not large, there is a feeling of sacred calm, especially near the old, ivy-covered church tower, a ruin whose thick walls of handmade brick, original and unrestored, have stood for more than three centuries.

This tower was part of Jamestown's fourth church whose construction began about 1639. Around its walls and in the floor where the church building stood are many gravestones and even more graves of the very early settlers. For reasons not easily put into words

* See, in the National Geographic Magazine, "Approaching Washington by Tidewater Potomac," March, 1930, and "Jefferson's Little Mountain" (Monticello), April, 1929, both by Paul Wilstach; "Roads from Washington," by John Patric, July, 1938; "Home of the First Farmer of America" (Mount Vernon), by Worth E. Shoults, May, 1928; "Restoration of Colonial Williamsburg," by W. A. R. Goodwin, April, 1937; and "Virginia—A Commonwealth That Has Come Back," by William Joseph Showalter, April, 1929.



Joseph S. McCoy, Jr.

Only Potomac Bridge Below Washington, This Span Saves Rubber Tires

Before its completion, in December, 1940, the road distance between Morgantown, Maryland, on one side, and Dahlgren, Virginia, on the other, totaled 140 miles when ferries were tied up. The 2.9-mile span, together with other recently built bridges across the James and Rappahannock, has opened up historic and formerly remote Tidewater Virginia to through north-south traffic (page 617).

the old church tower dominates Jamestown Island, not only physically but in the beholder's thoughts as well.

Three years after the death of Queen Elizabeth the London Company was formed in England, in the reign of King James, for colonization and trade in North America.

In the following year three of its small ships, carrying about a hundred men, sighted "the land of Virginia" May 6, 1607 (New Style). Entering Chesapeake Bay between two capes which they named Henry and Charles, after the sons of King James, they landed on the southern one, Cape Henry.

A few days later they sailed 37 miles up the broad river, which they named the James in honor of the King, and after two weeks of exploration disembarked at a site which they called Jamestown. It was then a peninsula on the north side of the river, perhaps slightly larger than the present island of 1,559½ acres.

Although the capital of Virginia for nearly a hundred years, Jamestown was later abandoned and neglected for two centuries. Even the site might have been washed away by the encroaching river if government aid had not been enlisted to build a sea wall in 1901.

Except for the old church tower, there is scarcely any evidence above ground of the town that grew up there. Underground, however, there is a wealth of material.

Already there have been excavated the foundations of houses and public buildings, remains of streets, walks, ditches, fence lines, drains, wells, an entire brick kiln still containing several hundred unfired bricks (page 633), as well as hundreds of thousands of small objects and broken pieces thereof, such as pottery, glassware, farming tools, weapons, pins, thimbles, shoes, dice, dominoes, jew's-harps, perfume bottles, bronze candlesticks, delftware, and clay pipes.

Staff Photographer B. Anthony Stewart

Once More, Officers and Their Ladies Try the Cheeses in Chowning's Tavern

United States Navy ensigns find colonial atmosphere recaptured in one of Williamsburg's famous eating places. In Revolutionary War days, officers of Washington's army gathered here. Chowning's and several other ordinaries are among the most recent restorations in the old Virginia capital (page 622).

Many of the objects are the first found or known to have existed in North America, or, perhaps, are the only ones of their kind.

More important to the visitor, he not only can see the items themselves but can watch the laboratory work by which they are studied and pieced together, if broken.

Visitors Watch Diggers of History

From May to November visitors may also watch the actual recovery of innumerable objects from the ground. In other words, you may stand beside the ditches and see how the workmen and archeologists dexterously extract or sift the buried artifacts from the earth.

This is of peculiar interest because every few cubic feet of earth below the plow zone are literally filled with buried evidence of the early settlers (page 634).

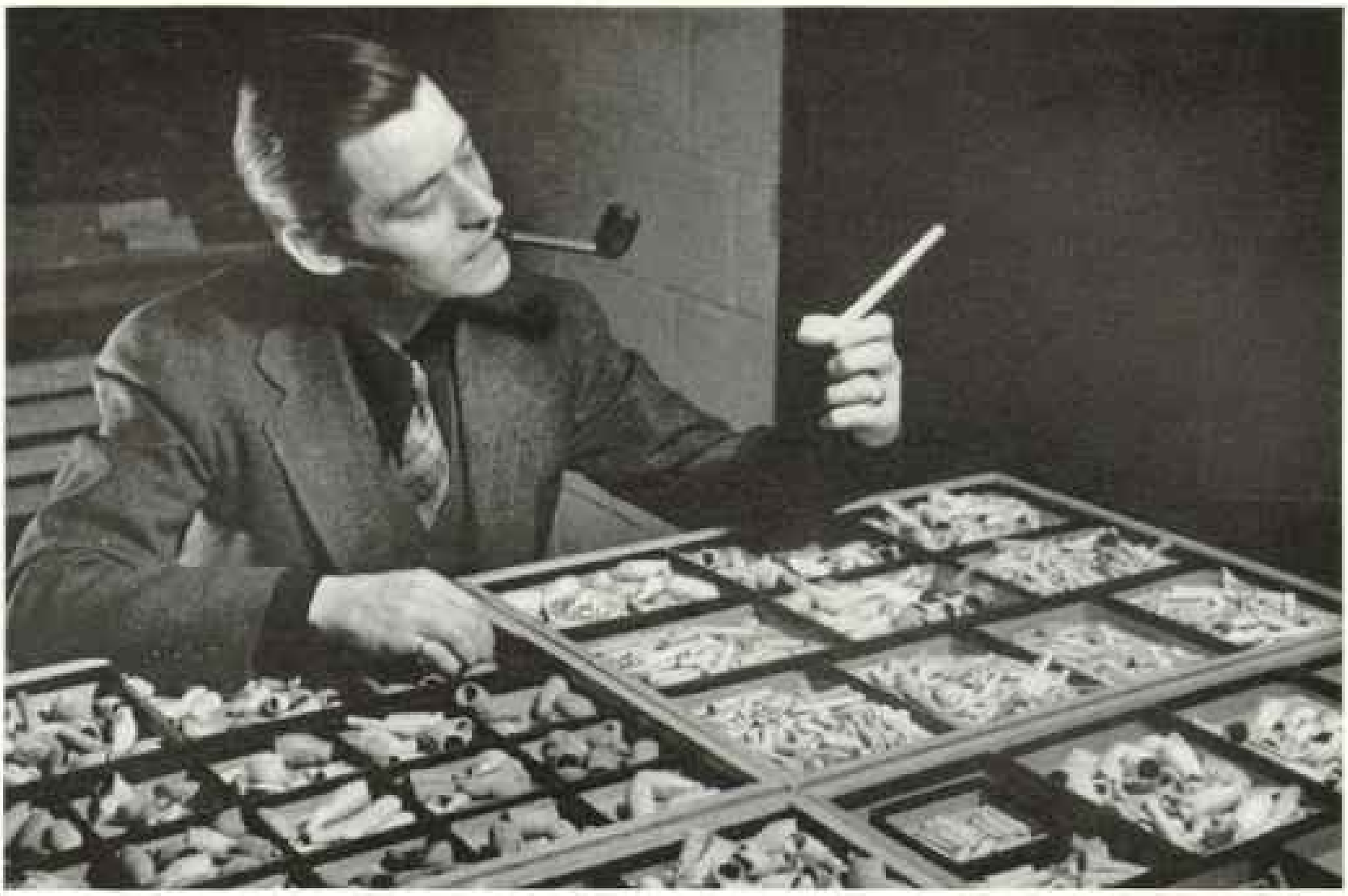
The work is being done by the National Park Service in conjunction with the Association for the Preservation of Virginia Antiquities, which owns part of the island.

Probably much less than ten percent of the town site has been explored below ground, and because of the almost limitless opportunities for new finds the work must go on for many years to come.

Take, for example, clay pipes for smoking tobacco. Already the number of fragments recovered is estimated at 50,000. The first full development of tobacco by English-speaking people came in Jamestown, and it looks as if the inhabitants took full advantage of the discovery; indeed, it is known that tobacco was grown in the streets of Jamestown.

In the 50,000 fragments an extraordinary variety of designs is present. While some show a distinct Indian influence, it is apparent that fashions changed often (page 620).

Land records and other documents have very little to say about early Jamestown, and it is only from the slow piecing together of the innumerable artifacts that its true story



Staff Photographer B. Anthony Stewart

Clay Pipes by the Bushel Turn Up in the Ruins of Jamestown

Most of them came from England and some bear the trademarks of the makers, whose records have been preserved. Thus it is possible to learn when the pipes were made. This gives a clue to the age of other articles. Clay pipes were often used for trading with the Indians (page 619).

will eventually be told. No one knows yet, because of lack of documentary evidence, where even the first palisaded enclosure stood, although it was probably a short distance west of the church.

Eventually the old streets, paths, and building sites should all be known and will be laid out, although there is no present intention of reconstructing or "restoring" the town, as in Williamsburg.

It is no wonder that documentary evidence of early Jamestown is missing. In the winter of 1609-10, nine-tenths of the settlers died during the "starving time." They also suffered from Indian massacres and from illnesses due to brackish drinking water, fever-infested marshes, and a warm, humid climate.

Tobacco a Money Crop and Money, Too

The settlers had been sent from England to find pitch, tar, soap ashes, resin, flax, cordage, iron, copper, glass, and timber, and also hoped to stumble upon gold, silver, and jewels.

But they had to spend their time in finding food and in building forts and houses, for all of which they were utterly unfitted.

Eventually the arrival of new settlers and the productive growth and export of tobacco saved the day.

John Rolfe, who married Pocahontas, first grew it in 1612, and some 20,000 pounds were shipped to England in 1619.

Throughout most of the colonial period tobacco was used as currency, and by 1750 there were 330 ships, with 3,000 sailors, plying the tobacco trade between Virginia and England.

Tobacco was grown on all the plantations and laid the foundations of Virginia's future wealth and greatness. Even today it is grown on more than a quarter of the State's farms, though the State has lost its lead as a producer.

Jamestown's decline began in 1676 when many of the colonists, under the leadership of Nathaniel Bacon, Jr., rebelled and burned Jamestown as the stronghold of British oppression, so that it might no longer "harbor the rogues."

From this disaster the town never recovered, and when the Statehouse burned again in 1698 the capital was moved six miles inland to Middle Plantation the next year.

After the Indian massacre of 1622 a palisaded defense line was built from the James to the York River, and a settlement grew up

Tidewater Virginia—Sweet Land of Liberty

Into the mouth of Chesapeake Bay bands of English colonists sailed early in the 17th century. Some went on up the bay, others found havens on the banks of the James, York, Rappahannock, and Potomac Rivers. In this fertile land of many waters they laid the foundation for the vast colony of Virginia. English colonial history in this country began with Jamestown in May, 1607. The American Revolution reached its peak 174 years later at Yorktown, where Cornwallis surrendered.

Rockville
Laurel
Washington
Falls Church
Alexandria
Mt. Vernon
Gunston Hall
Rippon Lodge
Indian Head
Waldorf
La Plata
Charlotte Hall
Prince Frederick
Annapolis
Gibson Island
Love Point
Centerville
Chesapeake Beach
Romancoke
Claiborne
Wye Mills
Bristol
St. Michaels
Easton
Oxford
Cambridge
Taylors Island
Fredericksburg
Dahlgren
Morgantown
Potomac Beach
Colonial Beach
Wakefield
Stratford
Leonardtown
Solomons
Wingate
Hoopersville
St. Marys City
Bloodsworth Island
Deal Island
Salisbury
Princess Anne
Snow Hill
Westover
Pocomoke City
Bowling Green
Kinsale
Point Lookout
Mt. Airy
Tappahannock
Sabine Hall
Smith Point
Crisfield
Chincoteague Bay
Chincoteague Island
Pocomoke Sound
Central Garage
Irvington
Windmill Point
Glenns
Locklies
West Point
Gwynn Island
Accomac
Onancock
Keller
Wachapreague
Bells Haven
Exmore
Parramore Island
Hog Island
Richmond
Roxbury
Gloucester
Toano
Rosewell
Eastville
Cobb Island
Shirley
Berkeley
Westover
Sherwood Forest
Williamsburg
Hopewell
Brandon
Jamestown
Gloucester Point
Yorktown
Mosgrun
Wreck Island
Cape Charles
Petersburg
Carter's Grove
Fort Eustis
Smith's Fort Warren House
Bacon's Castle
Kiptopeke
Cape Charles
Waverly
Langley Field
Military Reservation
Phoebus
Fort Monroe
Old Point Comfort
Hampton
Hampton Roads
Smithfield
Homeville
St. Luke's Church
Newport News
Cape Henry
Norfolk
Virginia Beach
Portsmouth
Stony Creek
Courtland
Suffolk
DISMAL SWAMP
Lake Drummond
Franklin
Back Bay
Hickory
STATUTE MILES
VIRGINIA–NORTH CAROLINA STATE LINE

on a slight ridge halfway across the Peninsula, being near both rivers but not near enough to be bombarded even by the later Revolutionary frigates.

Throughout the whole South, beginning in Virginia, farms, especially large ones, have long been known as "plantations." But in Tudor and Stuart England a plantation meant a colony, great or small; for example, the Virginia Plantation of the London Company.

When settlement slowly spread, the original communal system of land ownership gave way to grants to individual settlers, and the word "plantation" came to apply to their private holdings. Middle Plantation, however, developed into a town and changed its name to Williamsburg.

In the NATIONAL GEOGRAPHIC MAGAZINE of April, 1937, the late Reverend W. A. R. Goodwin told in detail the story of the restoration of colonial Williamsburg, made possible through the generosity of John D. Rockefeller, Jr. But this project, which has been under way for nearly 14 years, was not finished in 1937, and is far from completed even today. Thus one can visit Williamsburg frequently and nearly always find something new to see.

Considering its size, the little town has an extraordinary number of places of interest. Many historic homes and public buildings were rapidly disappearing or were in ruinous condition when restoration began; yet a remarkable proportion of them had been preserved.

Moreover, Williamsburg was neglected and almost wholly forgotten by the world from the end of the American Revolution until about 1927, and thus many of the old buildings were not disturbed or torn down.

In a few cases nothing was left of the more notable buildings except the foundations, upon which, with the help of contemporary documents, could be erected reconstructions. Such were the Governor's Palace, one of the most pretentious and luxurious structures of colonial times; the historic Capitol, first building in America to bear that name; and Raleigh Tavern, resort of famous men.

But in numerous instances, including the three early buildings of William and Mary College, Bruton Parish Church, immediate and direct descendant of the Jamestown church, the Public Magazine, or "Powder Horn," and the Public Gaol, the buildings had not disappeared and it has been possible to repair, stabilize, and restore them to their former condition. To date, some 80 buildings have been restored, and more than 200 reconstructed.

So large is the number of buildings now assured of preservation that the visitor can see practically every type of colonial structure.

To the list of well-known structures should be added the Wythe House, with its impressive complement of gardens and outhouses, once the home of George Wythe, signer of the Declaration of Independence. He was also the first professor of law in English America and taught such notable men as Jefferson, Monroe, and John Marshall (page 636).

There are numerous other homes to be seen, including the smaller as well as the more elegant. Among those recently completed and on exhibit are the Allen-Byrd House, at one time the home of William Byrd III of Westover (page 648); the Taliaferro-Cole House and Shop, the establishment of a prosperous colonial merchant; and the Peyton Randolph House, one of the largest and handsomest.

But restored Williamsburg is more than a collection of buildings; the picture has been rounded out with life and activity. In the early years visitors showed extraordinary interest in small places, such as the kitchen of the Governor's Palace where a venerable negro cook presides.

Candlemaking also was developed as one of the dependencies of the Palace, and in addition a variety of craft shops, appropriate to colonial times, in which the crafts are actually carried on, have been restored.

At first a cabinetmaker, a smithy, and a pewterer were established in their shops, and about two years ago the wigmaker and the bootmaker were added (page 649).

Among the recent restorations have been numerous small taverns and ordinaries, including Chowning's Tavern, now operated as a place of refreshment, just as it was in colonial times (page 619).

The larger Williamsburg buildings have a special historic interest because they inspired and influenced the design and plan of many of the great houses on the more prosperous plantations.

Williamsburg Once a Crowded Capital

Everyone of importance went to Williamsburg when the House of Burgesses or courts were meeting, and planters from outlying districts often built town houses for their convenience at such "Publick Times."

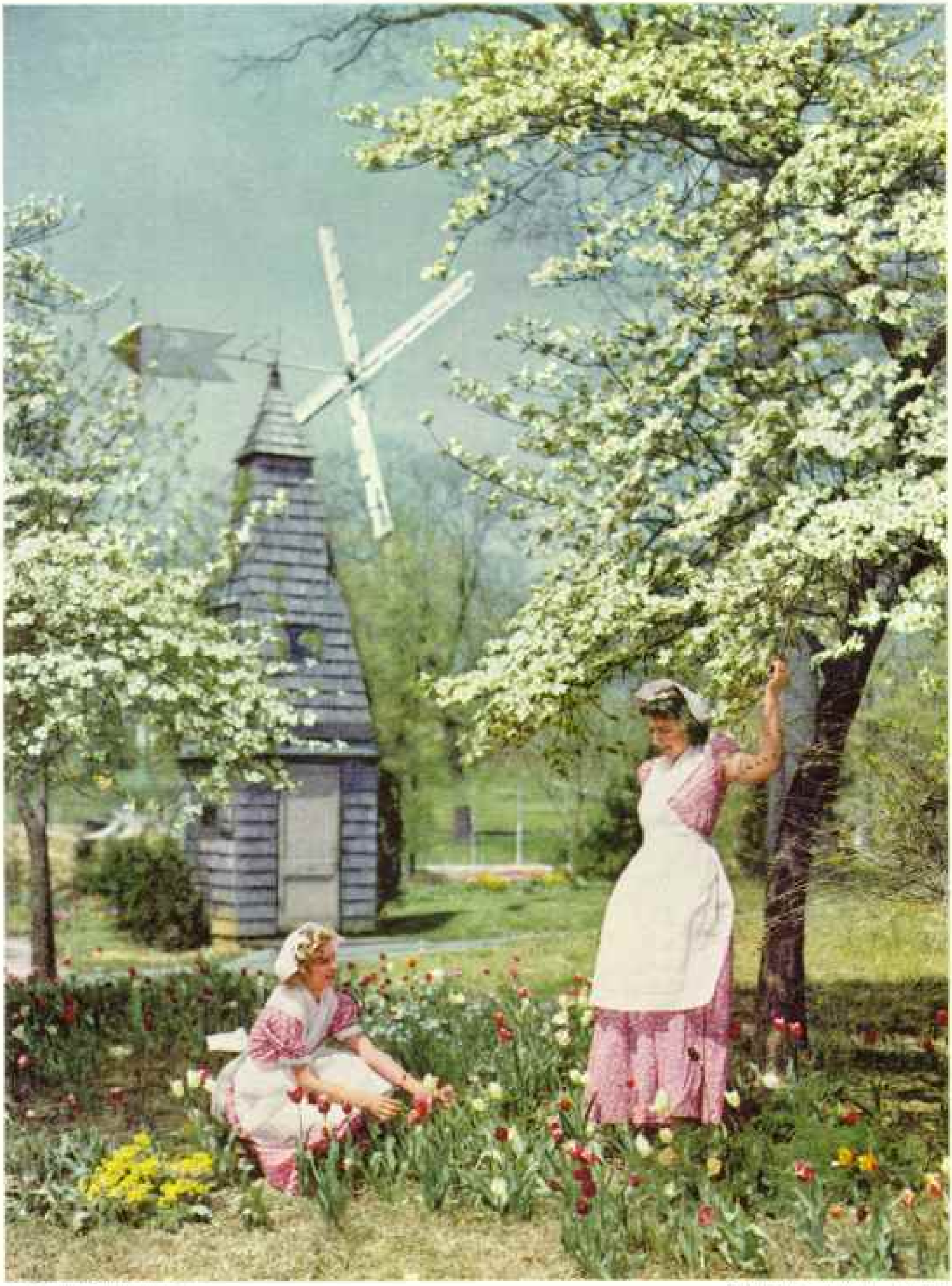
Five or six thousand people would crowd into the little town, with 10 or 15 in a single tavern bedroom. There were never more than 300 houses or 2,000 permanent residents.

But this was a large proportion of the total colony, which then included what is now West Virginia, Kentucky, Ohio, Indiana, Illinois, Michigan, and Wisconsin, as well as present-day Virginia. For all of these Williamsburg

© National Geographic Society Kodachrome by H. Anthony Stewart

"The Love and Gratitude of United America Settle upon It in One Eternal Sunshine"

Edward Everett's allusion to Mount Vernon applies today as well as when his oration was delivered 84 years ago. "While it stands," he added, "the latest generations of the grateful children of America will make this pilgrimage to it as to a shrine." In 1941, 900,000 persons visited George Washington's estate on the Potomac.



 Kodachrome by B. Anthony Stewart

Even a Miniature Dutch Windmill Turns When It's Tulip Time in Lynchburg

A prewar corner of the Netherlands is revived in the city's public gardens when tulips and dogwood are at their best. English primroses, lower left, and bright Dutch costumes worn by the girls add their bit of color. The display is one of the features of Virginia's Garden Week.

Dazzling Spring Blooms Mass against a Garden Wall

Iris foliage pokes through the bank of moss phlox and candytuft here on the Rose Hill estate of Mrs. William R. Massie, west of Charlottesville. Yellow alyssum grows from the rocks at left. Clipped arborvitae at right.

 Kodachromes by B. Anthony Stewart

Myriad Blossoms Transform Drab Stones into an Alpine Garden at Rose Hill

Kodachrome by B. Anthony Stewart

Patriotic Women of Fredericksburg Saved and Restored Colonial Kenmore, Home of George Washington's Sister

Colonel Fielding Lewis built this red-brick house for his 19-year-old bride, Betty Washington. Passing into other hands in 1796, the building was turned into a military hospital during the War between the States, and later housed a boys' academy. About to be torn down in 1922, it was bought by the Kenmore Association.

© National Geographic Society

Fredericksburg Revives a Colonial Market for Garden Week

The last week of April, scores of famous private gardens are thrown open to the public through arrangement with the Garden Club of Virginia. Thousands of visitors enjoy this State-wide display of boxwood and spring flowers.

Kodachrome by B. Anthony Stewart

Historic Brandon Preserves Its Old Gardens

This plantation on the James River once was owned by a companion of Captain John Smith. Its colonial atmosphere is carefully maintained by the present owner, Mrs. Robert W. Daniel, who restored the old estate.

Kodachrome by B. Anthony Stewart

Stair Rails in Carter's Grove Mansion Still Bear Saber Cuts Made by Colonel Tarleton's Redcoats during the Revolution

The plantation house, shaded by lofty oaks, was built by Carter Burwell in 1751. It overlooks the James River near Williamsburg. Mr. and Mrs. Archibald McCrea acquired the estate 15 years ago and restored it. Carefully preserved was the interior Georgian woodwork of carved Virginia pine.

Kodachrome by B. Anthony Stewart

Once More Parishioners of 17th-century St. Luke's "Come to the Church in the Wildwood"

Flowering dogwood and spreading beeches and oaks enclose the mellow red-brick building, restored half a century ago after decades of neglect. On a country road 60 miles southeast of Richmond, the church is near Smithfield, home of Virginia's celebrated Smithfield ham—hickory-smoked from peanut-fed hogs.

On May Day, Hoop Skirts Billow in the Boxwood Circle at Sweet Briar College
The 3,000-acre campus in the Blue Ridge foothills near Lynchburg was once a plantation.

 Kodachromes by B. Anthony Stewart

Miss Gloria Galban Turns Her Pony Over to a Tireless Groom at Gallison Hall
Such cast-iron figures, now curiosities, served as hitching posts for thousands of homes in horse-and-buggy days.

was not only the seat of government but a center of religion, education, commerce, fashion, and society.

Williamsburg, of course, was not the only seat of culture in the Colonies. But following the rude and primitive conditions of early settlement there did develop in Virginia, from about 1730 or 1740 on, a truly remarkable gentility and public spirit.

Today Williamsburg has a many-sided appeal. No one had ever restored a living town before and there was no precedent. During the first ten years the primary emphasis was upon physical restoration; now the endeavor is to interpret for the visitor's benefit what has been done.

Besides the obvious historical, archeological, and architectural interests, as well as the crafts which are being carried on, there are the many re-created gardens and the educational and research work.

Certainly Williamsburg has become one of the most popular places in the country. Upon many who go there the deepest impression is not that of the buildings themselves, but of the spirit of former times which seems to pervade the community.

In entering Williamsburg you step directly into another age, part of America's stirring heritage, but with a change of tempo and a different way of life.

Yet mundane things are not neglected; Mr. Rockefeller has built two large, comfortable modern inns, for varying purses, but both alike in harmonious architectural keeping with their surroundings.

The Williamsburg appeal is to youth as well as to age. From near-by camps come soldiers and sailors on leave, and many school children are among the visitors.

The presence of some 1,300 students, boys and girls, at William and Mary College, lends another touch of youth, and the many visitors to the town, including parents, make this college group more cosmopolitan than it would otherwise be (page 653).

At one end of Williamsburg's main thoroughfare, Duke of Gloucester Street, stands the Capitol, and at the other end the three original college buildings, just as they were first designed and erected.

On the right is the President's House, since 1732 the residence of every one of the twenty presidents of the country's second oldest college. Used first by General Cornwallis, and then as a hospital for French troops during the Siege of Yorktown, it accidentally burned and later was restored by Louis XVI of France.

On the left is Brafferton Hall, now used as a faculty club and guest house for distinguished visitors, and in the center is the main building, named after its famous architect, Sir Christopher Wren. It is a great edifice indeed for colonial times.

Always open to visitors, it is one of America's most storied structures, its many vicissitudes including three burnings and military use in both the Revolutionary and Civil Wars.

Birthplace of College Fraternities

Behind the three original buildings is the modern campus, including the Phi Beta Kappa building, the center of undergraduate life (page 651). No one knows in what building the first meeting of this Greek-letter society, the progenitor and model of all college fraternities, was held. Tradition says it was in the Raleigh Tavern, and it is a fact that two or three years after its founding by William and Mary students on December 5, 1776, the members began to hold social gatherings in the tavern's Apollo Room.

William and Mary was prosperous at first, with large grants of land, excises on tobacco, and gifts even from pirates who wished to be freed from prison. But fire, revolution, and civil war swept up and down the Peninsula.

The tobacco lands became impoverished, population emigrated, the plantations fell into decay, and, worst of all, the college's greatest alumnus, Thomas Jefferson, turned his imagination and creative genius to founding the University of Virginia (Plate XIII).

Closed during the Civil War, William and Mary opened afterwards, but the population was too poor to support it. With no faculty and only a handful of students, the president himself rang the college bell and lectured at times to a single student. The college closed again from 1881 to 1888, when State help began, and it has progressed ever since.

John Stewart Bryan, now its president, says rightly that its chief characteristic is indestructibility.

It furnished the Revolution and early Republican periods with many great statesmen, including Presidents Monroe and Tyler and Chief Justice Marshall, as well as Jefferson. The students lived in the atmosphere of government; their fathers made laws at the other end of Duke of Gloucester Street. They observed political science in the making, not merely from textbooks.

Graduates of the college have always felt themselves dedicated to the public service. A considerable proportion of Virginia's teachers and social workers in more recent times have studied at William and Mary, and Virginia's reputation for ability and integrity in public office is partly due to the role of the college.

Virginia State Chamber of Commerce

His Trained Toes Bring Clams up from the Sea

This Chincoteague Bay clammer feels along the shallow bottom with his feet. When he touches a clam, his toes close on it. He raises his knee, reaches down with one hand, and retrieves the prize.

From Williamsburg one naturally goes next to Yorktown, 13 miles by the landscaped Colonial Parkway, much of it along the wide, blue York River. Yorktown is where the projecting opposite shore narrows the ordinarily broad river to less than half a mile.

From here, after the decline of Jamestown, were shipped large quantities of tobacco, while slaves, clothing, furniture, hardware, salt, rum, wine, and molasses were imported.

Since the Revolution, except for a brief period during the Civil War, Yorktown has remained a quiet, peaceful, tiny village, retaining much of its colonial atmosphere.

But it is the battlefield where Washington besieged and forced Lord Cornwallis to surrender that constitutes the outstanding development and point of interest. Here the National Park Service has concentrated upon recreating the battlefield's physical appearance, such as its roads, trenches, redoubts and batteries, including some of the actual guns which were used to besiege and defend the town.

Up to the very end of the Revolution the British had a great advantage because they controlled the sea and could shift troops quickly and easily, whereas the American forces had to make long, slow, and enervating marches.

In the early summer of 1781 Cornwallis had pursued Lafayette across the Virginia Piedmont without cornering him, and finally took up headquarters at Yorktown.

Here Washington displayed naval as well as military genius. When he learned where Cornwallis was, he urged the French admiral, De Grasse, either to bottle up Cornwallis in Yorktown or Clinton in New York. Learning that De Grasse would go to Chesapeake Bay but not to New York, Washington—at that time encamped before New York City—acted instantly and gathered in front of Yorktown, in only a month's time, a large, superior army of both French and American troops from many distant points.

The French had stored a large supply of the most modern siege guns at Newport, Rhode Island, and managed to send these past the British fleet, landing them near Carter's Grove, on the bank of the James River, between Jamestown and what is now Newport News.

Some weighed two tons, but all were hauled overland, in many cases by hand, to York-

town. Meanwhile De Grasse, having defeated a British fleet near Capes Henry and Charles, closed Chesapeake Bay and the mouth of the York River. Completely overwhelmed by the force of the French artillery, and naturally unable to get supplies by sea, Cornwallis was forced to surrender on October 19, 1781.

The trenches built by Washington's forces were known as "parallels" because they were dug parallel to the outline of the British fortifications. When the National Park Service took over, some years ago, it was possible to find exact emplacements in the mud, at the bottom of the parallels, where the siege guns stood, and to put back into place some of the original cannon.

The allied forces were able to approach undetected very close to Cornwallis's lines and drag their big siege guns into place, because several ravines stretch out from Yorktown, like the fingers of a hand, relatively shallow but deep enough to conceal approaching armies before the day of airplanes. Better protection, for that day, cannot be imagined.

This is perfectly apparent to any modern visitor to the battlefield, because he is routed up one of these very same ravines, exactly as were the troops of Washington, Rochambeau, and Lafayette.

U. S. National Park Service

A Buried Kiln Yields Colonial Bricks and Tile

The early brickmaker apparently abandoned his work suddenly, for the bricks and roofing tiles, here being uncovered by J. C. Harrington, associate archeologist, were unfired. The work is part of the excavation project now under way at Jamestown (page 618).

York River Mud a Treasure House of Relics and Oysters

The roads and signs are so arranged that the visitor can guide himself from one fortification to another. Modern troops are brought from near-by Fort Eustis, sometimes in consignments of 800, to view the old guns (page 652).

Nothing, however, makes the siege more vivid today than to see the relics fished up from the bottom of York River, where a number of Cornwallis's warships or transports were sunk, either by allied hot shots or scuttled by the British themselves to make a breakwater against attack from the sea. This salvaging was begun in 1934 jointly by the National Park Service and the Mariners' Museum, located a few miles from Newport News on the Peninsula (pages 654 and 656).

One of Yorktown's chief industries, as in many other Tidewater communities, is

U. S. National Park Service

Scientists Find a Colonial Treasure-trove as They Excavate the Foundations of Vanished Jamestown

Remains of streets, walks, and fence lines, and hundreds of thousands of small relics such as pottery, glassware, tools, and weapons, have been uncovered (page 618). Existence in colonial America of many of these objects had not previously been known. The National Park Service and the Association for the Preservation of Virginia Antiquities are doing the work.

Staff Photographer Newton Blakeslee

Youthful Owners Parade Their Pets through Fredericksburg to Usher in the Annual One-day Dog Mart

Nearly 250 years ago the auction was established when colonists and Indians declared a one-day truce in their constant warfare to trade furs and dogs. The custom died out gradually, but recently was revived, with a rapid-fire tobacco auctioneer presiding. Offerings range from pedigreed beauties to coon hounds and "just dogs."

Staff Photographer B. Anthony Stewart

They Tread Historic Ground, But Their Thoughts Are on "Short'nin' Bread"

The youngsters live with their mother in the kitchen of the Wythe House in Williamsburg. This restored mansion was the home of George Wythe, first professor of law in English America. Among his pupils were Thomas Jefferson, James Monroe, John Marshall, and Henry Clay. The building was Washington's headquarters before the Siege of Yorktown (page 622).

Staff Photographer B. Anthony Stewart

Long-buried Glazed Pottery Gleams Again With Old-time Luster

The pieces are known as sgraffito ware, in which decorative designs have been made by scratching through the slip to the base of different color. They were excavated in fragments at Jamestown (page 618). The technique is Mediterranean, but whether these 17th-century vessels were made in the colony or in England has not yet been determined.

oystering. The oystermen had long complained of fouling their lines or breaking their tongs on submarine obstructions.

It was not possible to bring up an entire frigate, or any other ship, because the wrecks were almost completely disintegrated and buried in the mud. But the material lying within what was left of a few of the hulls was recovered in great quantity. No doubt the mud at the bottom of the York still remains a treasure house.

Cannon, muskets, shot, tools, anchors, hogsheads, olive oil jugs, bells, and many other objects were recovered. Rum bottles are noteworthy among them for number and for the spectacular changes in color wrought by the action of sea water. Originally olive green, they are now every color of the spectrum.

The various objects recovered are divided between the Yorktown Historical Museum of the National Park Service, and the Mariners' Museum.

Despite the fact that four deep, navigable rivers flow through Tidewater, a trip to the colonial estates along their banks must be made by automobile and not by boat.

A few steamship lines still operate between the larger cities, such as Washington and Norfolk, and Baltimore and Norfolk, but the former leisurely and delightful practice which smaller river boats had of stopping for freight and passengers at every plantation landing has passed away. Yet the houses themselves still face on the rivers as of old, and this explains much of their beauty and charm.

The settlers located their homes along the

waterways because these afforded the safest, most convenient, and, in fact, the best means of travel between friends and neighbors and, of course, to English markets.

In early times even oceangoing vessels were so small and of such shallow draft that they were able to go far up the rivers and stop at the private landings which every planter had, and which existed until very recent years.

Thus thousands of home sites, though isolated, remote, and highly decentralized from the standpoint of the modern motorist, had equal footing as to access and the freighting of produce.

River Highways to the World

Naturally, the houses faced the rivers, just as houses in a town face the streets, for the rivers were the streets. Each planter knew that in due season a ship would bring supplies from England and in return take his tobacco to London, Bristol, and Glasgow.

Under these circumstances towns did not develop after the fashion of New England.

Most of the Tidewater plantations were self-contained village units, which is evident to the modern visitor who sees the notable mansions standing in the midst of manorlike groups of outbuildings, guest houses, and slave quarters. With a church near by, each plantation became a parish and was in addition a factory, a school, a matrimonial bureau, and a nursery.

Servants were taught to be blacksmiths, carpenters, masons, millers, shoemakers, weavers, and spinners. Bricks were easily made from the clay as the cellars were dug, and there was abundant native timber, such as oak, tulip, gum, walnut, and pine. At first labor was supplied by indentured servants purchased from England for a period of years, and later by negro slaves.

Along both banks of the James several impressive 18th-century houses survive. Until recent years some of the old houses on the Southside were practically inaccessible because of lack of good roads, but the counties there are rich in colonial history.

On the north side the many creeks and estuaries gave the plantations especially favorable water transportation.

Carter's Grove, five miles southeast of Williamsburg on U. S. 60, is one of the greatest of the remaining colonial houses in Virginia. Its main unit and two wings stretch out nearly 200 feet as a single structure on an eminence well above the river. It stands behind some giant tulip poplars, and its proportions are unusually fine (Plate VI).

"King" Carter, an outstanding figure of his day, gave the property to his daughter Elizabeth when she married Nathaniel Burwell in 1690, and the house was built by Burwell and his son Carter, who even went to the length of bringing a master builder, or architect, from England.

The usual English oak not being available for interior paneling, pine and other woods from near-by forests were used; the mansion's extensive pine paneling is one of the finest known. Bricks for the exterior were made between the site of the house and the river.

Most of the prominent figures in colonial Virginia were entertained in the house. It is said that George Washington and Thomas Jefferson used the drawing room at different times to propose unsuccessfully, the one to Mary Cary of Williamsburg, and the other to his "fair Belinda," a niece of the owner.

Like most of the old Virginia houses, Carter's Grove is also credited with its own particular ghosts.

Westover, Early Home of the Byrds

State Route 5 from Williamsburg to Richmond follows an old road and brings the traveler to Westover, one of the earliest, most stately, and magnificent of Virginia's great houses. The visitor is impressed not merely by the mansion itself but by its superb river location, the walls which surround it, the variety of its trees, and the beauty of its rare old garden (page 648 and Plate XIII).

The entrance gates, with the Byrd monogram and two large leaden eagles with wings half spread, representing the family crest, are among the finest old English ironwork in America. The visitor is permitted to enter the tunnel which led from the house to the river. In the garden is buried the mansion's builder, William Byrd II, talented, cultured, and temperamental grandee of his time.

William Byrd II, from whom Rear Admiral Richard Evelyn Byrd, the explorer, and his brother, Senator Harry Flood Byrd, are directly descended, studied law in the Middle Temple, London, astonished England with his elegance, and became a member of the Royal Society. He regularly read Hebrew, Greek, Latin, French, Italian, and Dutch.

He studied mathematics, he managed in minute detail the affairs of several plantations, he carried on many business enterprises, he founded the city of Richmond, he doctored his family and slaves and attended to their personal affairs.

When in London he refused to allow his daughter Evelyn to marry the son of an earl, and she returned to Westover to die a disconsolate spinster at 29.

 Kodachrome by B. Anthony Stewart

Young America Makes a Pilgrimage to the Governor's Palace at Williamsburg

The original executive mansion in Virginia's colonial capital burned while it was serving as a military hospital in the Revolutionary War. Its reconstruction, on the old foundations, was the climax of the rebuilding of Williamsburg under the sponsorship of John D. Rockefeller, Jr.

Kodachrome © B. Anthony Stewart

"All My Wishes End Where I Hope My Days Will End, at Monticello"—Thomas Jefferson

Building the domed mansion atop "Little Mountain," near Charlottesville, fulfilled a boyhood dream of the author of the Declaration of Independence. Jefferson began its construction before he was married in 1772, but the house as it stands today was not completed until after he became President of the United States.

© National Geographic Society

Kodachrome by J. Baylor Roberts

Still Waters Mirror Historic Gunston Hall, Where Lived George Mason, Author of Virginia's Bill of Rights

Here he entertained his Potomac River neighbor, George Washington. Rochambeau and Lafayette were other guests. Louis Hertle, who restored the mansion, deeded it to Virginia in custody of the Colonial Dames of America, but he may occupy it for life.

Kodachrome by B. Anthony Stewart

In the Virginia Hunt Country—Horsemen and Hounds Set out from Gallison Hall, Modern Julio S. Galban Estate

Many a Courtly Cavalier Passed through This Portal

The door to Westover is a door to colonial romance and history, for this is the ancestral home of a famous Virginia family. William Byrd II built the house in 1730. Here lived his charming daughter, Evelyn, celebrated for her beauty in the Colonies and in England. The present owner is Mrs. Richard Crane.

Kodachromes by B. Anthony Stewart

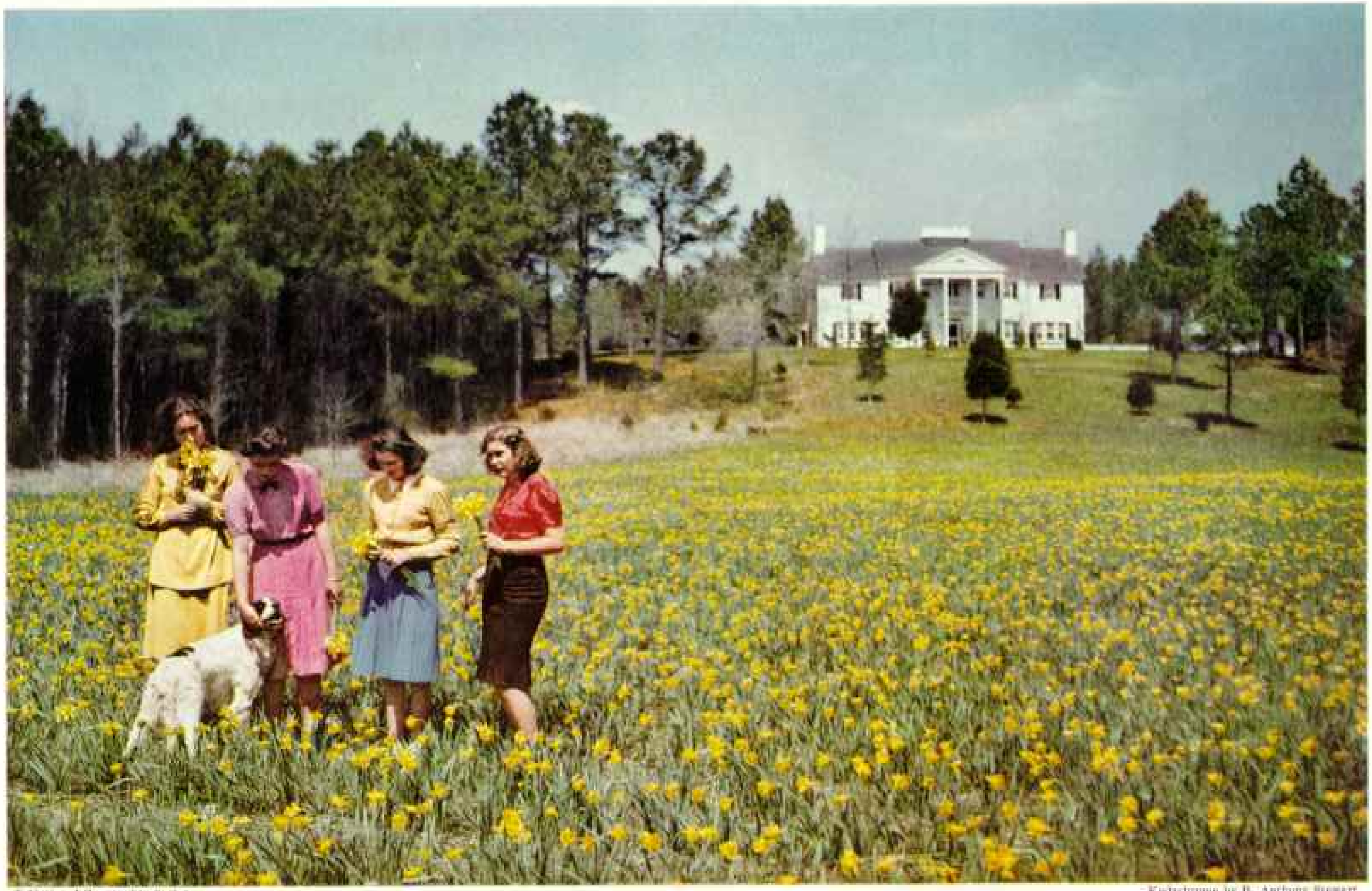
Thomas Jefferson Designed This Serpentine Wall

On the University of Virginia campus at Charlottesville, it combines charm and economy. Because of the undulations, the wall is sturdy even though it is only one brick thick. Jefferson founded the University, selected its faculty, mapped its curriculum, and planned its buildings.

Kodachrome by B. Anthony Stewart

"When All at Once I Saw a Cloud, a Host, of Golden Daffodils"—Wordsworth

Costumed pickers invade this field near Gloucester, to mark the opening of the daffodil season. Here the yellow trumpets, one of the main divisions of the narcissus family, are grown commercially. The variety in these rows is of modern origin, developed by horticulturists.



Kodachrome by B. Anthony Stewart

Since Early Colonial Days Old-fashioned Daffodils Have Bloomed in Tidewater Virginia

This variety on the Pig Hill estate is particularly valued because it is so old. Fields of yellow trumpets burst into bloom each spring in Gloucester County.

 Kodachromes by B. Anthony Stewart

Unpredictable Spring Blankets Daring Daffodils and Tender Branches with Snow

Serious menace to the narcissus fields of Gloucester County are such late snows, which beat the blooms to the ground and change the landscape overnight. Not far away are the fields of waving daffodils shown in Plates XIV and XV. They were photographed in bright warm sunshine only the day before.

Byrd left a very extensive diary, valuable picture of his day. With the possible exception of Cotton Mather, Byrd had the largest and best library in America at the time, some 4,000 volumes. In fact, from earliest days many of the settlers in Virginia had books, and fairly large libraries were common in the old houses, very few inventories of which fail to mention books. A number of the houses still retain their colonial libraries intact.

Along Route 5 are Sherwood Forest, home of John Tyler, tenth President of the United States, and Berkeley, birthplace of Benjamin Harrison, signer of the Declaration of Independence, and of another President, William Henry Harrison, as well as ancestral home of a third President, Benjamin Harrison.

The House of the Hanging Stair

To many visitors Shirley, reached by the same route, has a peculiar charm. It is one of the least "restored" of the river estates, having remained continuously in the Carter-Hill families, and is still being operated as a farm. Naturally it has a sense of being lived in and is devoid of the show-place atmosphere. Here you really feel as if you had been carried back to a colonial plantation (page 655).

Shirley is noted for the number of its completely paneled rooms and for its portraits of the Carters, including one of "King" Carter, a son of whom owned the house. But Shirley has two other distinctions. One is the "hanging stair," three stories in height, which swings far out into the center of the main hall without apparent means of support.

Shirley also has retained a remarkable proportion of the original plantation outbuildings, including even a big brick dovecote. Two of these buildings, the kitchen and the laundry, simple but dignified of line, seem almost as large as the house itself.

On the south side of the James are two dwellings, the Rolfe House and Bacon's Castle, that go back upwards of a century beyond the more pretentious river mansions.

The small, severely plain Rolfe House, now restored, and also known as the Warren House, stands on land given either to John Rolfe or to his son Thomas by Thomas's grandfather, Chief Powhatan. Near it is a remnant of Smith's Fort, erected in 1609 and called "The New Fort" on John Smith's map.

The York is much the shortest of the four major rivers of Tidewater and does not boast the colonial show places that mark the James.

Not far from Gloucester but remote from main highways, with a fine, expansive river location, are the massive and impressive ruins of Rosewell, with its four towering chimney stacks. These huge, gaunt ruins are eloquent of a mansion so spacious that its existence in what was almost a wilderness seems to us moderns incredible. It outdid even the Governor's Palace at Williamsburg in the ground covered and in the number of stories.

Indeed, Rosewell is supposed to have beggared its owners, impoverished by hospitality and the cost of maintaining such an establishment.

Tidewater eventually decayed not only because tobacco used up the soil but in a reaction against the cult of the magnificent. Even William Byrd II, who, according to the inscription on his tombstone, was heir to "one of the amplest fortunes in this country," was so hard up at times that he vainly sought a buyer for Westover.

Traveling north, one leaves the Middle Neck at Tappahannock, crossing the broad, deep, clean Rappahannock River. Straight ahead, on an unusual eminence, is Mount Airy, and a few miles away, Sabine Hall, two of the most beautiful of the colonial homes, both still in possession of the original families. Sabine Hall is open to the public, and has about it a quiet, noble dignity, an Old World charm.

The house is approached from the river across a mile of fields and up through a many-terraced formal garden; the land approach is through an inviting park. The outside walls are of mottled pink and gray.

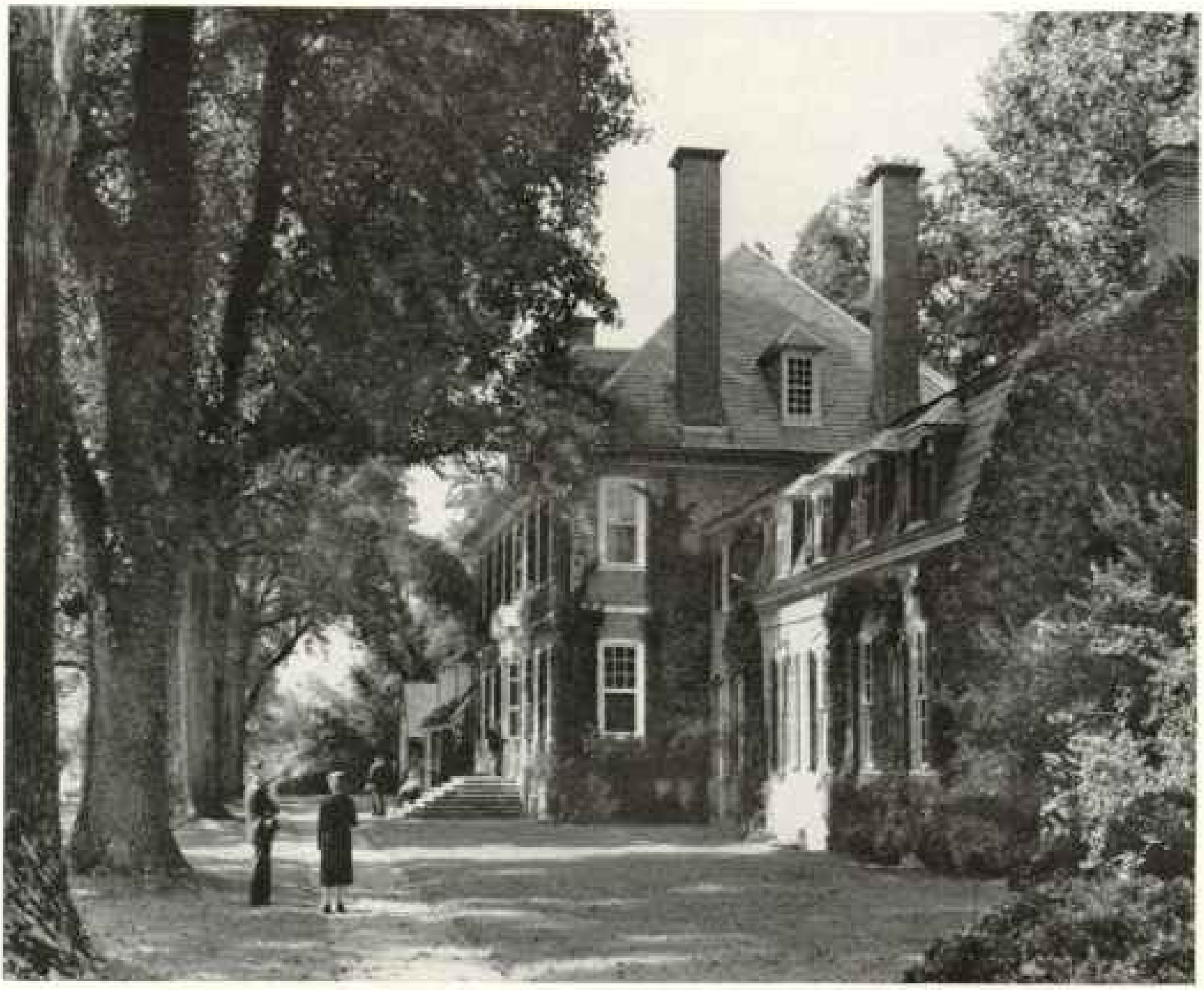
Sabine Hall has suffered very little change. The dignity and beauty of the large central hall are just as they were in the eighteenth century; the colonial library is still intact. On the walls are many portraits of the Carters, including "King" Carter, who built the house.

A River of Famous Men

The Potomac River borders Tidewater Virginia on the north, and it has been called the river of the Washingtons, Lees, Fairfaxes, and Fitzhughs. In a single county bordering the river, Westmoreland, were born two Presidents—Washington and Monroe.

Not many of the old houses remain, but Stratford, massive ancestral home of the Lees and birthplace of the family's most famous member, Robert E. Lee; Wakefield, a reconstruction of Washington's birthplace; Gunston Hall (Plate XI), Rippon Lodge, Mount Vernon (Plate I), and Arlington, are all of preeminent historic interest. While they are in Tidewater from a strictly geographic standpoint, they really constitute another story, being more a part of the Washington area.

Naturally many of the early Tidewater homes have disappeared, the prey of fires, of two wars that swept the section, of aban-



Staff Photographer Willard R. Culver

Westover—Hallmark of Gracious Living for More Than Two Centuries

Twice war has disrupted the charm of this ancestral home of the Byrd family on the James (Plate XIII and page 638). During the Revolution Benedict Arnold and Lord Cornwallis invaded its privacy. McClellan's army camped here during the War between the States, and another northern general, John Pope, once used the mansion for his headquarters. In the garden lies the body of Westover's builder, William Byrd II.

donment, and of decay. Much of the population moved westward to the Piedmont hills even before the Revolution, and after the Civil War there was another outward and northward movement of young men.

Not many houses were actually destroyed in the Civil War, but many were damaged, and outbuildings were torn up for necessary firewood or used as stables for the cavalry.

Only a few houses have remained in the same family continuously, and there are only the rarest instances where a house has stayed in the same direct male line. Most of the mansions have changed ownership many times. In some cases wealthy strangers have sought and restored them to ancient glories.

Others have been restored by distant relatives grown rich in the North and able to gratify their sentimental attachments. Still others have been turned into shrines by patriotic organizations.

Some are complete reconstructions; others are originals. A few are never open to the public, others only at stated intervals, and still others, either house, grounds, and garden, or only grounds and garden, are open practically all the time.

But the point is that enough of the houses have been saved, in one way or another, and enough are open to visitors, to turn back the hands of time and to make the past live again for those who have eyes to see. For no modern imitations, no matter how skillful, seem to equal the old houses in grace or grandeur.

Fortunately the life of the past is pictured today in the colonial churches as well as in the dwellings. At the time of the Revolution there were nearly 100 parishes and 250 church and chapel buildings of the Church of England in the Colony of Virginia. Of these nearly forty still stand and are owned

Staff Photographer B. Anthony Stewart

With White Hair, a Williamsburg Craftsman Deftly Shapes a Bagwig

This style was so called because hair at the back of the head was enclosed in a silk bag. With his firebox and curling irons on the table (left), and a head block from the cabinet (right) mounted on his stand, the wigmaker can complete a job in about two weeks. He may use human, horse, or goat hair. Wig models in the window are high military, bag, morocco, soldier, and trader of the early 18th century. Bob and ordinary wigs are even earlier (page 622). These wigs now are used with colonial costumes in pageants and parties.

and used by the Protestant Episcopal Church.

About a dozen more, also standing, are owned and used by other religious bodies. Many, if not most, of the 50 buildings remaining are in Tidewater. With few exceptions, only brick churches have survived; there was no stone, and most of the frame structures disappeared long ago.

Some Historic Churches

A few of the old churches are in cities: Christ Church in Alexandria, St. John's in Richmond (one of the surviving frame churches), St. John's in Hampton, and St. Paul's in Norfolk. But most are in rural sections, remote from towns. They were crossroads churches, set in fields or woods, at points convenient to a group of plantations covering a large stretch of country.

Almost every one of the churches has a point of particular interest. In a grove of trees, and surrounded by little ponds, on the south side of the James, a few miles from Smithfield, home of Smithfield hams, is St. Luke's Church. It is among the oldest Protestant church buildings remaining in America and possibly antedates even the church tower in Jamestown (page 617), although the precise dates of the construction of both are difficult to determine.

St. Luke's in appearance is very like the early rural churches of England, and its massive square tower is distinctly Norman in character (Plate VII).

Aquia Church, on the main north and south highway, near the Marine base at Quantico, has its original colonial three-decker pulpit, one deck above the other.

Staff Photographer B. Anthony Stewart

Here the Author of the Monroe Doctrine Practiced Law

Prized relic now housed in the little brick building in Fredericksburg is the desk at which President Monroe sat in 1823 when he wrote his principles of American foreign policy. The venerable Negro calls himself the town's "official unofficial guide" and escorts visitors to historic sites.

It is a mistake to visit Tidewater without including the Mariners' Museum. Late in 1929 Mr. Archer M. Huntington, then principal owner of the shipyard at Newport News, decided to build near that place a museum "devoted to the culture of the sea and its tributaries, its conquest by man, and its influence upon civilization."

He wanted it to be near sailors, both those of the merchant marine and of the Navy, and near a shipyard so that the present state of the art as well as its past glories could be shown. His father, Collis P. Huntington, had built the shipyard, as well as the only railroad that runs down the Peninsula of Virginia.

Since its comparatively recent founding, several other museums devoted to the sea have been started in other parts of the country.

The Mariners' Museum is in an extensive park and game sanctuary bordering the James River and includes a large fresh-water lake. It is near historic Hampton Roads, scene of the famous *Monitor-Virginia* (ex-*Merrimac*) battle, and models of these two vessels are among the many objects to be seen.

Entering the main exhibit room, one is struck by the huge wooden figureheads from the prows of old British men-of-war and other notable vessels. One of the largest consists of the American eagle, with a wing-spread of 18 feet 8 inches. Among the British figureheads the lion is conventional (page 654).

Everywhere are ship models, from the earliest Indian canoe to the modern liner. Skilled model makers who formerly worked in the museum have had to return to the shipyard to help in the naval building program.

A library, also open to the public, is a storehouse of adventure and romance. Among the many subjects covered in detail are pirates, shipwrecks, polar regions, fisheries, armor plate, and lighthouses. One treasure is a log-book of John Paul Jones's *Ranger*.

Mark Twain's Pilot License and Blackbeard's Anchor

There is no concentration in the museum upon antiquities or antiques; up-to-the-minute turbines and riveting machines are also shown. But the visitor is pleased to see the pilot license granted to Mark Twain in 1859, permitting him to pilot boats between St. Louis and New Orleans on the Mississippi River.

One may see the anchor which Blackbeard the Pirate is believed to have used, a vise from Captain Bligh's *Bounty*, the purser's window from the *Priscilla*, which bore the flag of the proud Fall River Line, and steering wheels and paddle wheels from other notable steamers now gone forever.

There also is a comprehensive collection of prints, paintings, drawings, sketches, posters, and photographs of famous steamships, covering all parts of the world and running into tens of thousands of separate items.

Five miles beyond the Mariners' Museum one passes through the swiftly growing industrial city of Newport News, with its gigantic shipyard, on the way to the little city of Hampton, oldest continuous English community in America, and scene of the first free school in the Colonies.

"Cut by the jagged arms of Hampton Creek," the little city is now one of the country's leading crab and oyster centers, shipping 75,000 barrels of crabs a year. Hampton Institute, a Negro educational center, stretches along the east bank of Hampton Creek.

A few miles beyond Hampton, at the very end of the Virginia Peninsula, is Old Point Comfort and Fort Monroe, on substantially the same location as the first fort which the Jamestown inhabitants built in 1609. Fort Monroe was erected between 1819 and 1834, and in peacetime visitors may wander about this pleasing old monument to admire the picturesque casements and moats.

Edgar Allan Poe served here as a private, Chief Black Hawk was held a prisoner, and so was Jefferson Davis after the Civil War, in Casement No. 2. President Lincoln and Vice President Stephens of the Confederacy held a futile peace conference in a steamer just off the Point in February, 1865.

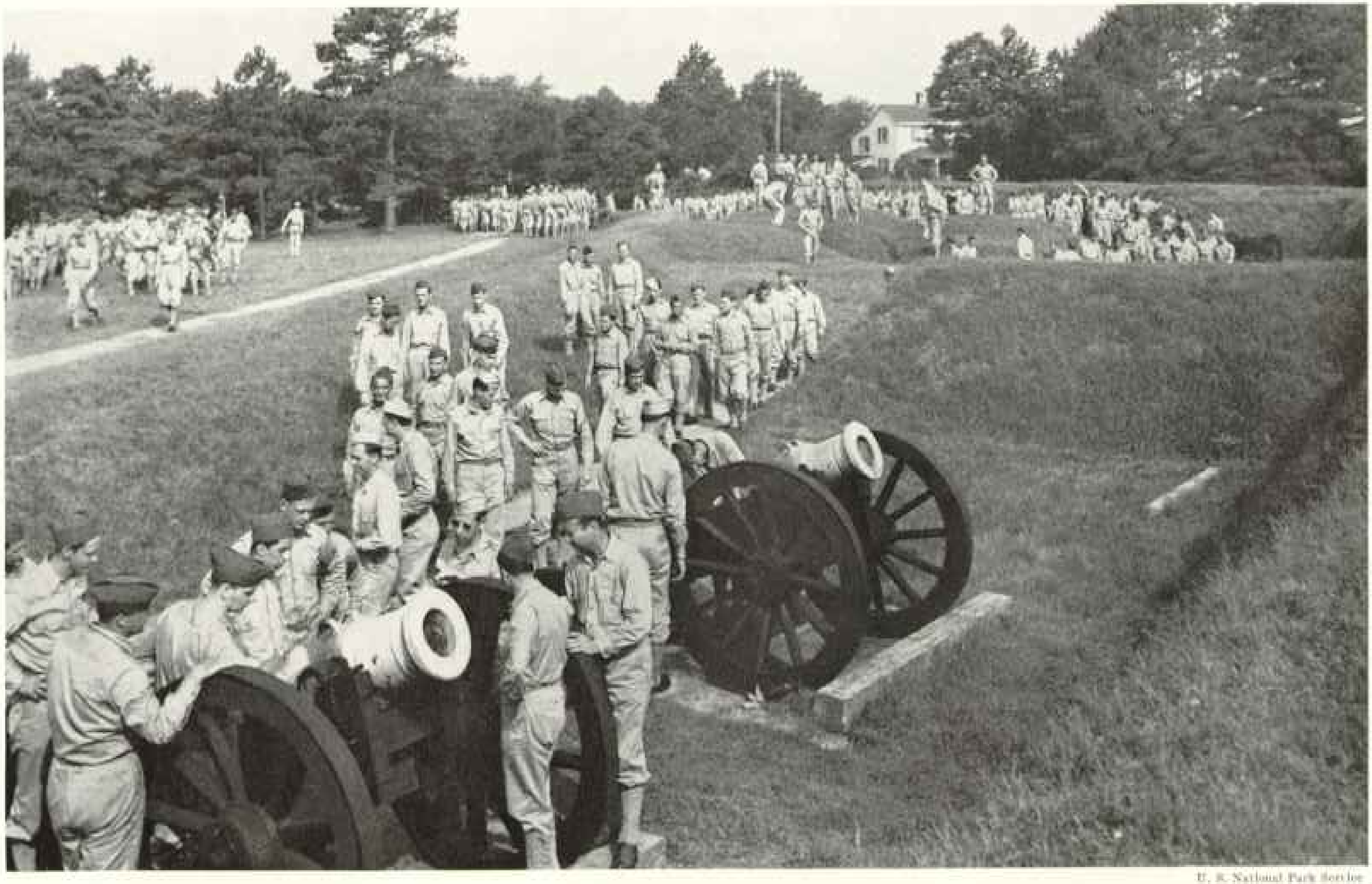
Staff Photographer B. Anthony Stewart

In Williamsburg, American College Fraternities Were Born

Two Phi Beta Kappas stand beside the tablet which marks the founding, by William and Mary students in 1776, of the first Greek-letter society in North America (page 631). The girl wears on her necklace her prized gold key, symbol of scholastic achievement.

History in Busy Norfolk

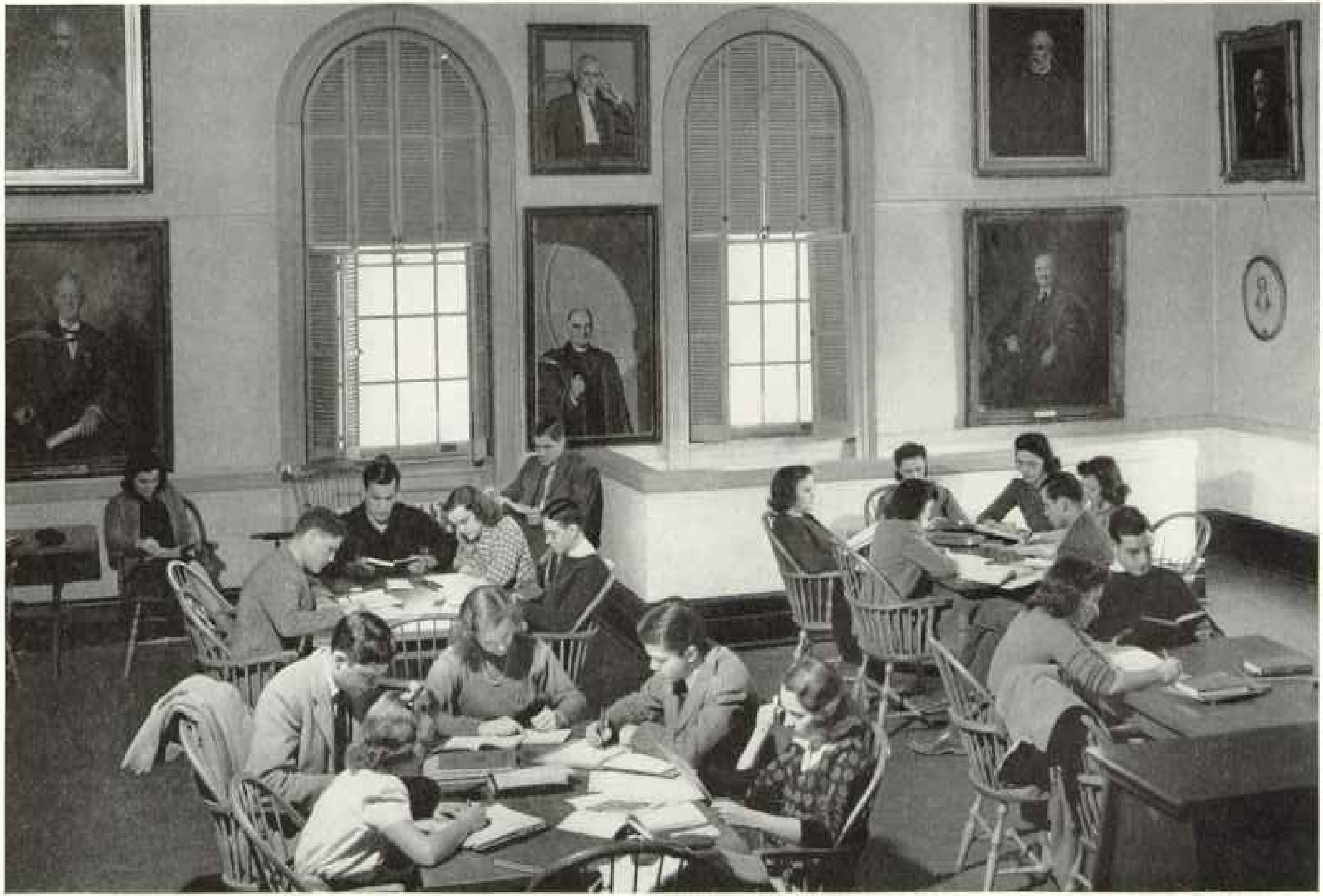
Norfolk, across Hampton Roads, has several historic landmarks, including St. Paul's Church, the walls of which antedate the burning of the city in 1776 by Dunmore's fleet: a cannon ball is still embedded in the south wall. The large Myers House, also open to the public, has one of the finest Adam-style interiors in America. Norfolk's pure-silver



U. S. National Park Service

Coast Artillerymen from Near-by Fort Eustis Visit the Grand French Battery on the Revolutionary War Battlefield of Yorktown

Exact emplacements where stood the French guns during the siege were located in the recent reconstruction project of the National Park Service. Visitors today go up one of the very ravines in which the troops of Washington, Rochambeau, and Lafayette were deployed. Here Cornwallis was forced to surrender in 1781, when a French fleet under Admiral de Grasse closed the mouth of the York River, and the American and French forces surrounded the British on land (page 632).



Staff Photographer B. Anthony Stewart

Portraits of Eminent Americans Grace William and Mary Library: Robert E. Lee (right, top); College President Bryan (lower, left)

Staff Photographer B. Anthony Stewart

This Moorish Pirate Cleft the Seas at the Bow of an East Indiaman

Although waves no longer rush below his spear, the old figurehead is still surrounded by ships' bells, masts and rudders, barometers and compasses, and other things nautical. It stands, along with many others, in the Mariners' Museum near Newport News. The Museum was built by Archer M. Huntington to house his superb collection of maritime relics (page 650).

Staff Photographer B. Anthony Stewart

In His Boyhood, Robert E. Lee Romped on the Lawns of Stately Shirley

Here Anne Hill Carter, wife of Light-Horse Harry Lee, Revolutionary War hero, and mother of the famous Confederate general, was born. She made frequent visits to the old three-story mansion on the James, accompanied by her son. For more than 200 years the Carter and Hill families have been in continuous possession of Shirley (page 647).

mace, 41 inches long, presented by the British lieutenant governor in 1754, was buried and lost, or forgotten, at various times, but is now in a bank vault.

From Norfolk one visits the seaside resort of Virginia Beach; also Cape Henry, where the Jamestown settlers first landed, and where still stands the first Federally built lighthouse. The Adam Thoroughgood House, between Norfolk and Cape Henry, vies in age with Bacon's Castle and the Rolfe House.

But Norfolk's historic interest is overshadowed at present by the fact that, together with the cities of Portsmouth, Newport News, and Hampton, it constitutes one of the world's foremost maritime, shipbuilding, transportation, naval, military, and aviation centers.

Hampton Roads is the nautical gateway leading to the Nation's Capital and lies between the North and the South, about halfway along the Atlantic coastline of the United States. Because of its vast offshore anchorage, it is the finest natural harbor between New York and Rio de Janeiro and one of the most spacious in the world.

In peacetime more than 10,000 ship arrivals and departures are recorded each year through Cape Henry, with some fifty steamship lines represented.

Of Atlantic coast ports, Hampton Roads is exceeded only by New York and Philadelphia in the volume of traffic handled in normal times.

"Rolling" Coal Down to the Sea

Eight railroads enter the Hampton Roads area, three of these being major coal-carrying trunk lines that roll some 20,000,000 tons a year down from the coalfields in the hills of southwestern Virginia, West Virginia, and eastern Kentucky to sea level at Norfolk and Newport News.

Staff Photographer B. Anthony Stewart

Submerged 150 Years, This British Gun Was Salvaged from a Burned Ship Embedded in York River Mud

Here in a Yorktown museum, part of the gun deck of an 18th-century frigate is reproduced in detail. Sometimes during storms rope fastenings would break, loosing the cannon and imperiling the tossing ship. Victor Hugo in his novel *Ninety-three* vividly describes such an incident: "The monster . . . darts like an arrow from one end of the ship to the other, whirls around, turns aside, evades, rears, hits out, kills, exterminates . . . crushing men like flies" (page 633).

This traffic makes Hampton Roads the leading coal transshipment port in America. It also far exceeds all others in the export of leaf tobacco.

In wartime it is inexpedient to list or describe in any detail the naval, military, and aviation establishments already built or being built around Hampton Roads.

Rendezvous of the U. S. Navy

But this great roadstead has been a rendezvous for the American Navy ever since there was one, and Norfolk has one of the oldest of our navy yards (across the Elizabeth River at its sister community of Portsmouth), and one of the earliest navy yard dry docks.

In World War I nearly 50,000 men were trained at the Norfolk Naval Training Station.

The impact of the present war upon the Peninsula and the Hampton Roads area is evident to any visitor in the enormous growth of population and in the expanded street, water, school, recreation, housing, and other municipal facilities.

Tidewater Virginia has been described as the "cradle of the Nation," and for good historic reason.

But it is more than that. After its notable part in the Revolution, in the Civil War, and as a naval base and military center in World War I, it is to-day, with its shipyards, naval establishments, military camps, and aviation fields, one of the mightiest arsenals of democracy and freedom.

Philadelphia Evening Bulletin — John L. Mansill

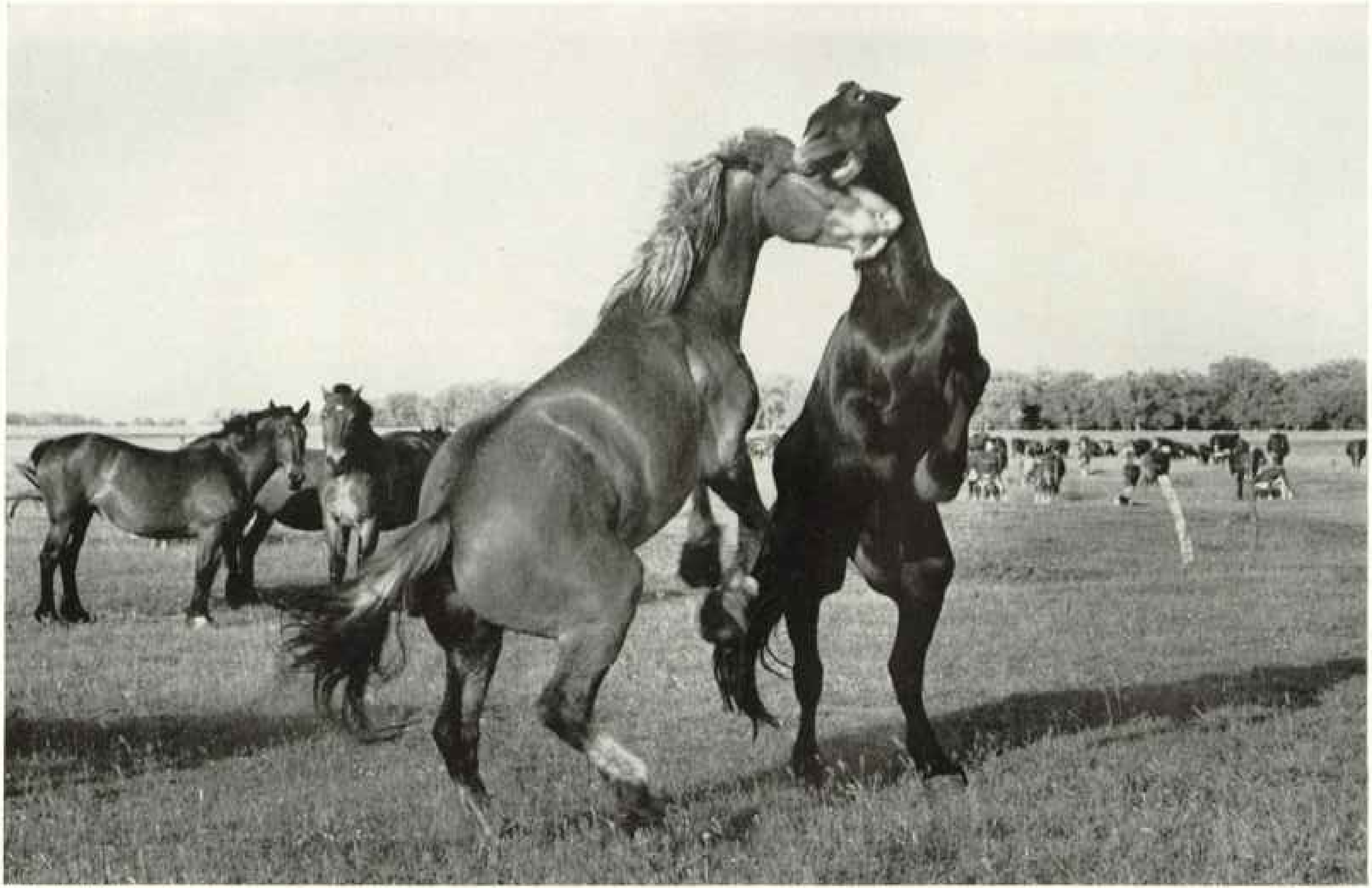
"From the Mountains to the Prairies, to the Oceans White with Foam . . . ."

Eleven of the winning photographs in the Seventh Annual Newspaper National Snapshot Awards appear in this series. Amateur photographers participated in the contest conducted by 97 newspapers in the United States and Canada. These photographs were exhibited in Explorers' Hall, National Geographic Society Headquarters.

Lexington Herald and Leader

Van Doren Coke

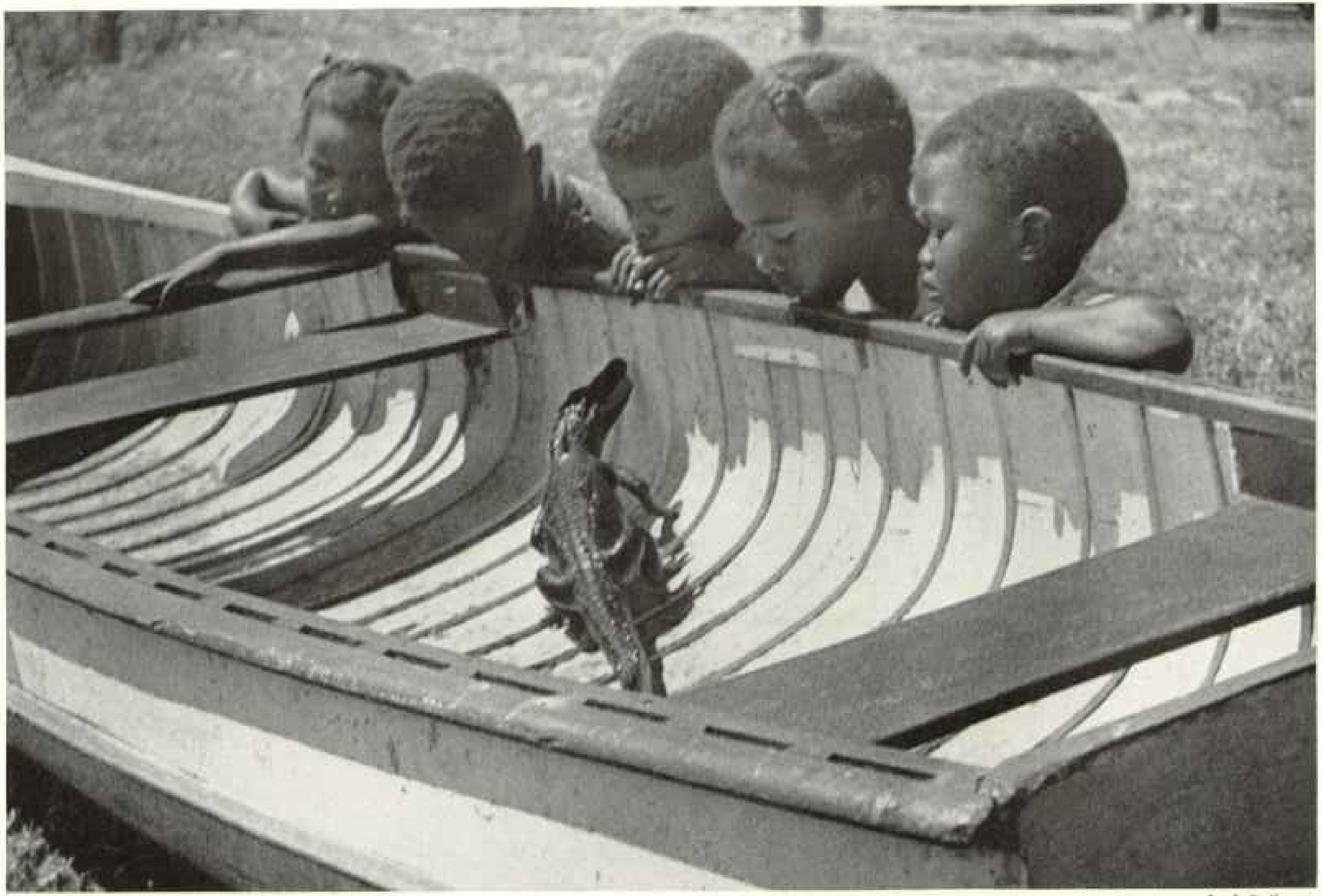
Kentucky Farmers Do Their Part to Make the United States a Granary for Democracy



Omaha World-Herald

K. E. Aldrich

"Feeling Their Oats"—Forefeet Lash Out and Teeth Snap as Two Nebraska Farm Horses Duel in the Paddock



St. Petersburg (Fla.) Times

Lee L. D. Hutto

"Will Dat Gator Bite?" Asks this Quintet of Youthful Nature Students

Winnipeg Free Press — R. B. Sheppard

"Anybody See a Bone?" Sad-faced, Happy-tailed Spaniels Out for a Midsummer Stroll Near Winnipeg

Roanoke (Va.) Times — John A. Kelley

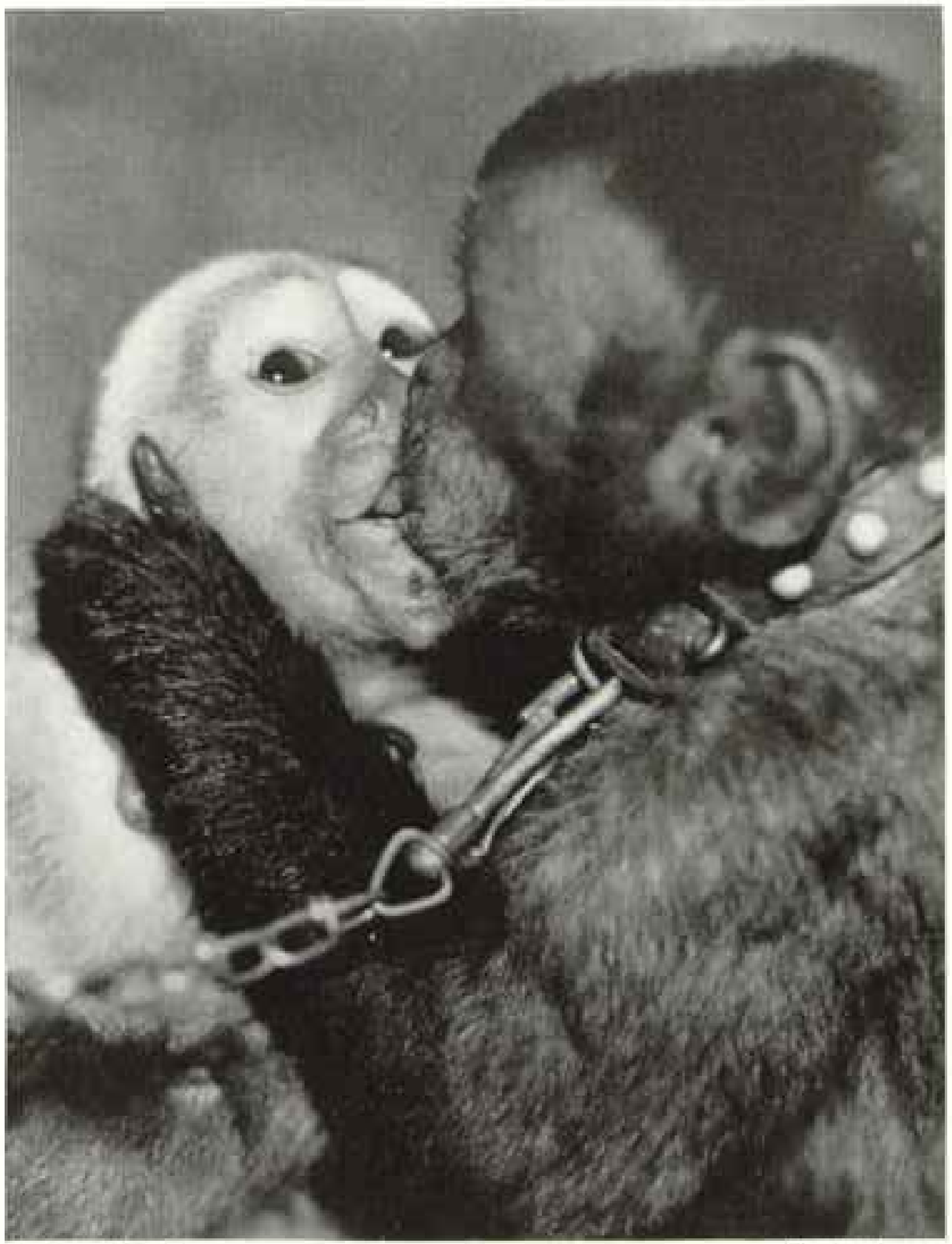
Roanoke Reverie—"Gee, When I Grow Up I'd Like to Be an Engineer"

Chattanooga Times — Earl Murray

On a Ferris Wheel with a Pretty Girl, Even a Sergeant Smiles

Wilkes-Barre Times-Leader — S. M. Stapinski

A Feline Dive Bomber Swoops on Its Target—Reward for a Long Vigil in a Nanticoke, Pa., Granary Was This Photoflash

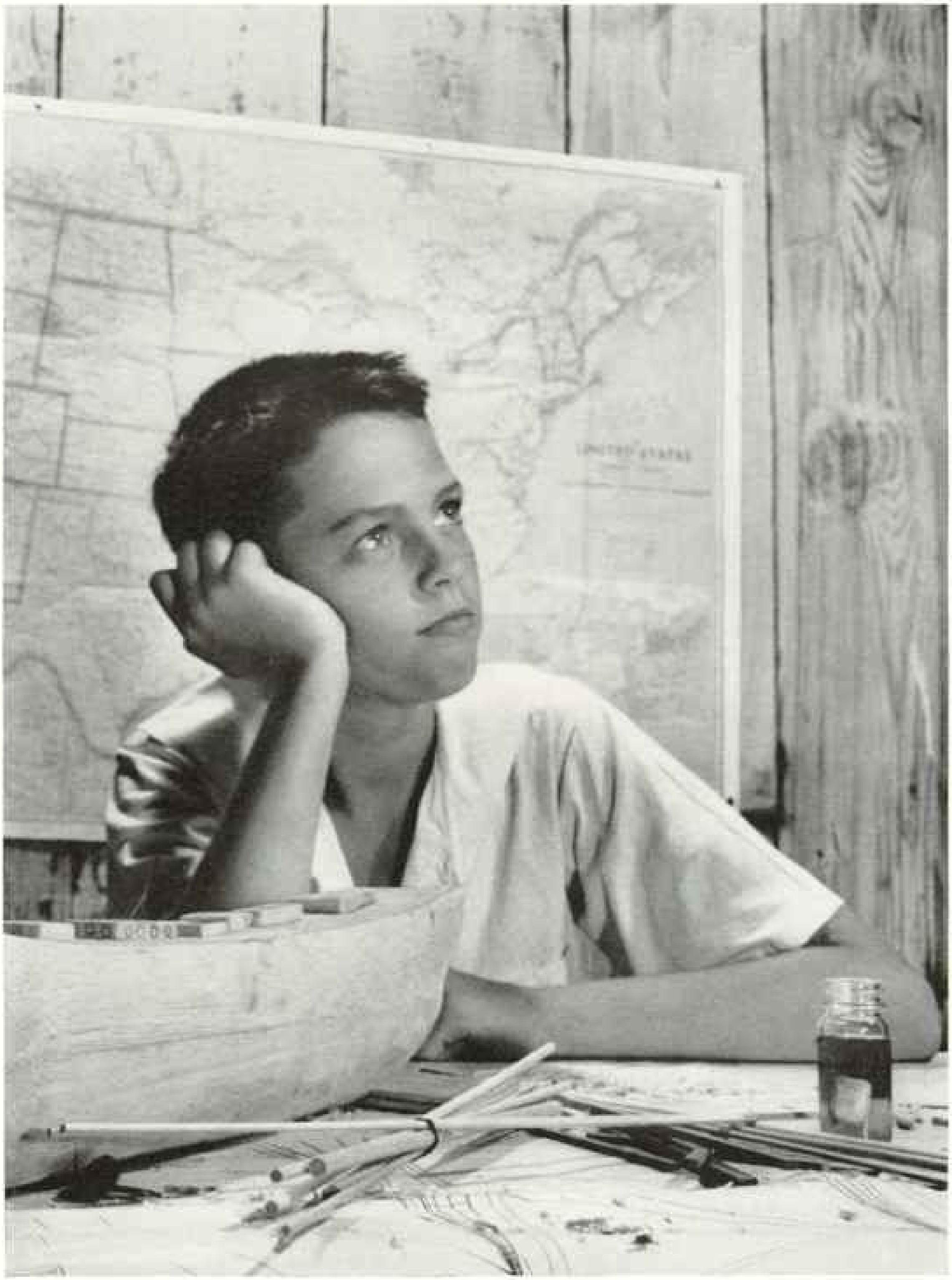


Muskegon Chronicle — John R. Sturgeon

Maternal Affection in Muskegon

Chicago Herald-American — Herbert W. Fiedler

Winner by a Neck! Giraffes in a Chicago Zoo



Richmond News Leader J. E. Ward and R. G. Hamilton

Far Places, Strange Faces Come to Life on His National Geographic Maps

Maps for Victory

National Geographic Society's Charts Used in War on Land, Sea, and in the Air

By Gilbert Grosvenor

President, National Geographic Society

IN WARDROOMS of the Navy's ships at sea, in the "flying offices" of Army generals, in the halls of Congress and in the White House, in confidential chambers of the State Department, the Army War College, and General Staff Headquarters, at the U. S. Weather Bureau, and in myriad other front-line places of wartime activity, your National Geographic Society maps are helping your country fight World War II.

A much-used copy of your Society's West Indies Map hangs in Explorers' Hall, at the Washington, D. C., headquarters of the National Geographic Society. Mounted with it is this letter:

February 9, 1942.

Dr. Gilbert Grosvenor,
President, National Geographic Society:

Attached is one of your maps which I have used for two round trips to the Panama Canal Zone. It is getting pretty badly messed up, and I thought I might trade you for a new one.

Sincerely,
(Signed) H. H. Arnold,
Lieutenant General, U. S. Army,
Deputy Chief of Staff for Air.

A member of The Society, Mrs. E. G. Allen, of Albrook Field, Canal Zone, writes, February 17, 1942:

"My husband has used your maps while navigating for Lieutenant General Frank M. Andrews on his flight through South America. It is the best map of South America available."

Maps Reprinted for Government Use

Nine times within a year the plates for big ten-color wall-map supplements of the National Geographic Magazine have had to be put back on the presses to meet needs of the Army, Navy, and other Government agencies.

Maps thus reprinted were: Asia; Europe and the Near East; Mexico, Central America, and the West Indies; Africa; Pacific Ocean; South America, and Indian Ocean. The Pacific and South America maps each had to be reprinted a second time.

Members of the National Geographic Society have a deep satisfaction in knowing that their Society's map program, unique in the quality and number of the charts issued, now is America's biggest stock pile of cartographic information which their Government recognizes as an important war weapon.

"Take out and spread before you the map of the whole earth," President Roosevelt requested radio listeners in his Washington's Birthday address on the night of February 23.

"Look at your map," he repeated three more times in the course of his historic broadcast.

The 1,165,000 member-families of the National Geographic Society—some five million men, women, and children—had available the Map of the World supplement to their December, 1941, National Geographic Magazine.

On The Society's charts they could locate every one of the 128 mentions of place names made by the President.

Members received their ten-color World Map in December, the fateful month when the attack on Pearl Harbor plunged the United States into a war which the President described as "different from all other wars of the past, not only in its methods and weapons but also in its *geography*."

Distances, Distances, Distances

Again and again the President asked his hearers to consider the vast spaces between the Pacific lands; he used the word "distant" or "distances" six times in his talk.

To answer today's pressing question—"How far is it?"—National Geographic members had with the February, 1942, issue of their Magazine a map of the Theater of War in the Pacific Ocean bearing a table of 861 airline distances. The War Department cooperated with The Society's cartographers in selecting the strategic places in the Pacific area between which distances were shown.

By careful interpretation of news events your Editors time the issuance of supplement maps with events of living geography. Yet these maps take months to make and each requires more than a score of cartographers, draftsmen, research workers, and checkers before the completed drawings are ready for the engraver and printer.

They tap surveys, data, and exploration notes of decades, accumulated by The Society's expeditions, staff writers, and pho-

U. S. Army Signal Corps, Official

Uncle Sam's Newly Streamlined Army Command Plans Asiatic Strategy

Studying The National Geographic Map of Asia, four-starred General George C. Marshall (center), Chief of Staff, is flanked by his air and land commanders. Seated at left is Lieutenant General H. H. Arnold, Commanding General of the Army Air Forces, and at right is Lieutenant General Lesley J. McNair, in charge of ground forces. Behind them stand Major General Joseph T. McNarney, new Deputy Chief of Staff, and Lieutenant General Brehon B. Somervell, in charge of supply.

tographers and correspondents abroad; also reports garnered from foreign governments and geographic societies all over the world, and correspondence carefully collated and classified.

The National Geographic Maps Form a Complete Atlas of the World

This incomparable reservoir of facts about the face and features of Mother Earth is used by the Government not only as delineated on The Society's maps, but it is consulted almost hourly now in answering letters and telephone requests for specific information from scores of government agencies.

First printings of each map run up to a million and a half copies. Reprints recently have been ordered by tens of thousands to fill governmental and member demands.

This map program the National Geographic Society has carried on for many years as an important altruistic public service. The membership fees have paid for it as well as for the National Geographic Magazine and the many explorations and other researches of The Society.

Members who have preserved their maps and indexes now have the equivalent of a magnificent atlas of the world and a gazetteer of geographic information unequaled for its scope, accuracy, legibility, and timeliness.

The National Geographic series comprises 21 big ten-color maps with nearly 100,000 place names (for list see pages 688-690).

In *A Key to Maps*, Brigadier H. S. L. Winterbotham, C.B., C.M.G., D.S.O., sometime Director-General of the British Ordnance Survey, writes:

"In this matter of the general map the members of the National Geographic Society

Staff Photographer B. Anthony Stewart

"Take Out and Spread before You the Map of the Whole Earth"

Members of the National Geographic Society found it easy to follow the advice of President Roosevelt in his Washington's Birthday radio address to the Nation, for their December NATIONAL GEOGRAPHIC had brought them this new map of the World (page 667).

of the United States are lucky, for they, and apparently only they, can get copies of the excellent series produced by that body."

At the urgent request of the British War Office, the National Geographic Society has sent sheets of its maps of the continents and oceans to the General Staff, London, for official and military use.

Men Who Invented Projections Are the Immortals of Cartography

Since mapping began, makers have faced the dilemma of charting on a flat surface areas which involve a curvature because the earth is spherical.

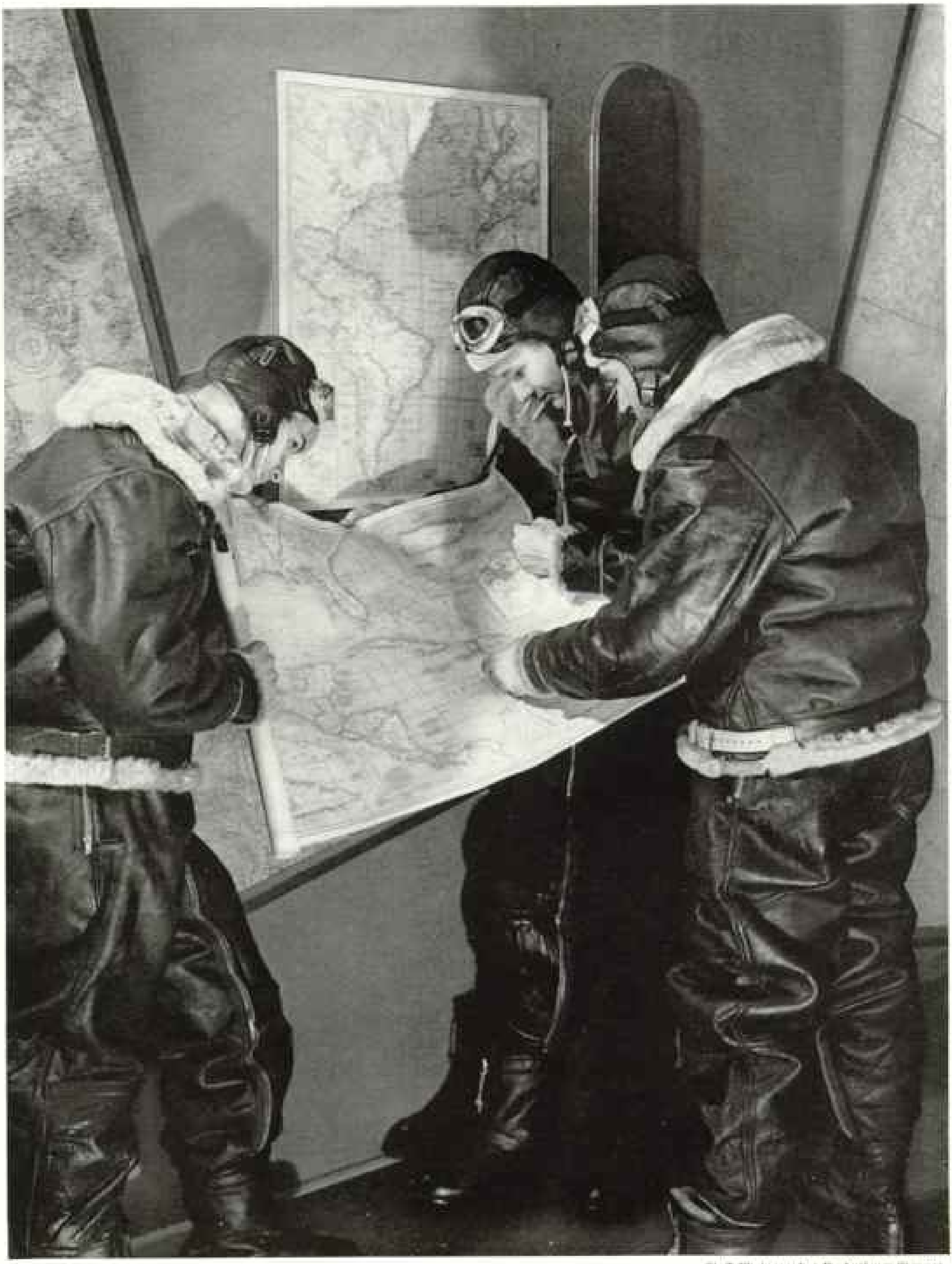
To achieve this end requires a compromise called a "projection," or a grid of lines to represent latitude and longitude. The men who devised the classic projections are the immortals of cartography.

To Hipparchus, who charted his Greek world more than a century before Christ was born, moderns owe the projection known as "stereographic." Mercator, father of Dutch cartography, invented his projection for his map of the world issued in 1569. Widely used, too, is the grid of Lambert, whose conformic conic projection first appeared in 1772.

C. H. Deetz, of the United States Coast and Geodetic Survey, worked out the transverse polyconic projection in 1900. The Society's new Map of Asia, to be issued this year, will use this projection because it achieves least distortion for the great distances involved—all the way from Gibraltar east to the mid-Pacific Midway Islands.

Maps Printed by the Millions

For each National Geographic map the projection is worked out to best show the area; in the 21 maps listed below, these four projections and six others have been used. Their origins span more than 20 centuries of man's attempt to delineate the earth's surface.



Staff Photographer B. Anthony Stewart

"Our Planes out of Puerto Rico Will Get That Sub"

Three flyers of the Interceptor Command at Bolling Field, Washington, D. C., look over a NATIONAL GEOGRAPHIC map of the Caribbean region. Another copy of this map was used by Lieutenant General H. H. Arnold, Commanding General of the Army Air Forces, on two flying trips to the Canal Zone (page 667). On the wall hangs The Society's Atlantic Ocean map.

Army

Admiral Ernest J. King—a Fighter, on, over, or under the Sea

Football-minded colleagues call him a triple threat, for the Navy's aggressive chief is a trained naval flyer, submarine expert, and master of surface warfare. Here, on a NATIONAL GEOGRAPHIC map, he points to the world's biggest battle arena. Hanging near by are NATIONAL GEOGRAPHIC maps of the Atlantic Ocean, Europe, and the Indian Ocean. Admiral King is the first man in American history to hold jointly the posts of Commander in Chief of the United States Fleet and Chief of Naval Operations.

Your Society is maintaining an unprecedented program of distributing each year about six million big, comprehensive, authoritative maps in color.

Meanwhile, the NATIONAL GEOGRAPHIC MAGAZINE has continued to print each year on its text pages some 30 maps in black and white—detailed charts of areas to accompany its articles. Frequently these maps are of immediate timely interest in following news events.

Thus, in the past 12 months, THE GEOGRAPHIC presented maps ranging up to two-page size of Australia, Singapore, the Moluccas, Iceland, West Indies, Oil Wells and Pipe Lines of the Near East, New Guinea, St. Pierre and Miquelon, French West Africa, and many more.

Some of these maps contained such recent and detailed information not hitherto shown about strategic areas that enlargements of them were requested by the Army and Navy for officers' use and for instruction in classes.

State maps of Oklahoma, Maryland, and North Carolina, and maps of the Florida Keys, the Pennsylvania Dutch Country, and the New York Finger Lakes Region added to the up-to-the-month surveys of areas in our own country.

Maps for Newspapers and Schools

At the request of newspaper editors The Society recently prepared a series of 12 large newspaper maps of Vital Regions of the World, and another series of ten maps of World Areas in the day's news. These were distributed weekly among some 50 of the country's leading newspapers as a contribution to national education in geography.

Because textbooks necessarily cannot keep pace with swift-changing geography of today, scores of school superintendents instructed

Staff Photographer J. Baylor Roberts

Speaker Sam Rayburn Points to the Proud Banner over Bataan to Which General MacArthur Says, "I Shall Return"

So the Speaker and other members of the House of Representatives can follow day-to-day developments, the Library of Congress supplied this pin-studded National Geographic Map of the Indian Ocean. It stands in the Speaker's Lobby, adjoining the House Chamber at the Capitol. Red pins mark Japanese-captured points and blue pins indicate territories held by the United Nations.

teachers to have pupils make scrapbooks of these maps for their study of geography, current events, and modern history. Some schools arranged for radio broadcasts of weekly geography lessons in connection with the maps.

R. M. McKelway, managing editor of The Star, Washington, D. C., wrote:

"I wish to express the deep appreciation which we feel for the friendly participation by the National Geographic Society in connection with the use of National Geographic maps. . . .

"The junior high schools are setting aside a period every Monday afternoon in which the students listen to a half-hour broadcast, followed by a discussion of the subject matter in which The Geographic maps appearing in The Star of Latin American countries will be used."

Present-day demand for maps is shown in other letters from editors and educators.

N. C. McCombs, Superintendent of the Des Moines, Iowa, schools, writes:

"The Des Moines Sunday Register has recently completed the publication of a series of maps on 'Vital Regions of the World' which was prepared by the National Geographic Society. . . .

"We are realizing as never before that we have the entire world for our neighbors. If we are to understand them and get along with them, we must know more about them. . . . We cannot wait for textbooks to be published. Your services such as your own magazine and releases to the public press of the nature referred to above are invaluable to teachers and students alike."

William H. Johnson, Superintendent of Schools, Chicago, Illinois, writes:

Staff Photographer B. Anthony Stewart

Many a Battle of Words Is Fought in the National Press Club, Washington, D. C.

Hot from automatic typewriters comes spot news. With the aid of the National Geographic Society's Pacific map the experts, near-experts, and "Monday-morning quarterbacks" refight the latest engagement.

"I have noted with much interest in a number of local newspapers maps which have been prepared by the National Geographic Society. . . .

"Many of us are prone to accept these fine services on the part of our newspapers and other organizations as a matter of course, with little appreciation of the expense and work required to provide this service. Sometimes a 'thank you' on our part will make it seem more worthwhile to organizations such as the National Geographic Society to continue a service as beneficial as this present contribution."

Donald H. Higgins, managing editor of the New Orleans Item, writes:

"In New Orleans many of the public schools used the series of the National Geographic Society, 'Vital Regions of the World,' as adjuncts to their geographical texts.

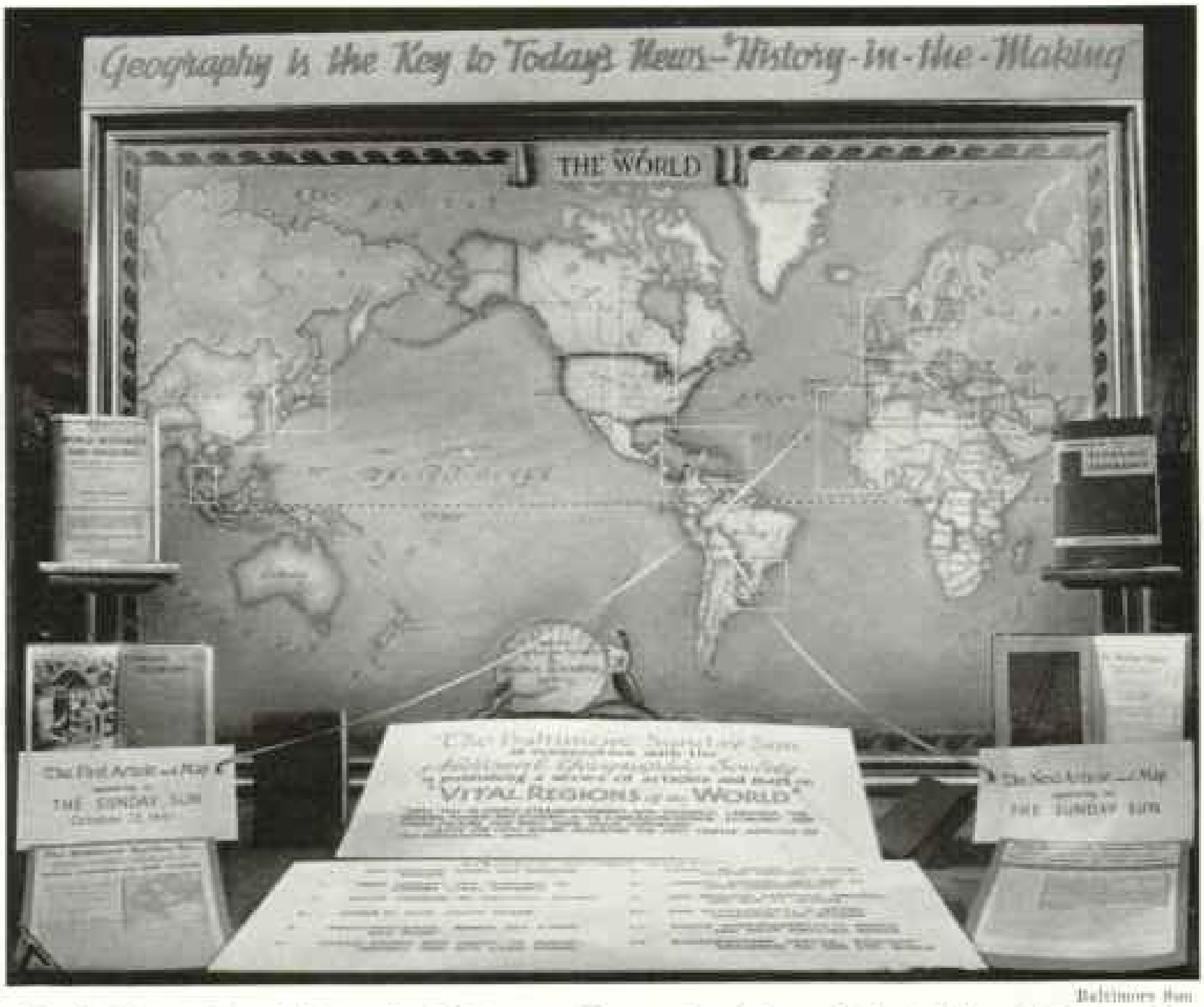
"Both the public and parochial school systems sent out letters in advance to notify the principals of schools that we were carrying the series. The principals, in turn, informed their teachers, and the result was that many children in this community received valuable education concerning geography that was unavailable to them in textbooks printed before our world map had changed so radically."

Weekly illustrated School Bulletins which your Society mails direct to 26,000 teachers who have requested them for classroom use also contain maps. These School Bulletins, with their smaller sketch maps, aid teachers in tapping the wealth of maps, illustrations, and reading matter in the NATIONAL GEOGRAPHIC MAGAZINE itself, which is the most widely used publication in American schools.

The New Map of North America

To meet the heightened need for maps by members, the Government, and schools, the National Geographic Society in 1942 will issue *five* map supplements.

In February was published the Theater of War in the Pacific Ocean. This May issue



Baltimore Sun

Enoch Pratt Free Library in Baltimore Dramatizes One of the National Geographic Society's Activities for "Increase and Diffusion of Geographic Knowledge"

In response to requests from publishers and educators, the National Geographic Society prepared for leading newspapers a series of maps and articles portraying vital areas of the earth. By cooperation of schools, radio, and newspapers, the charts formed subjects for special classroom studies. This library window display points out that the dozen articles included "The English Language Empire, and How It Spread," "Mediterranean, Where Sea Power Was Born," and "The Mississippi: A River Scatters Its Riches."

has the large chart of North America. Later this year members will receive new maps of the Theater of War in Europe and Africa, of Asia, and of South America.

Requests from the War Department, in addition to those from members, prompted the publication of this new Map of North America.

The 673 copies first off the presses went to fill a single War Department order. To supply members and also other Government requests, 1,335,000 copies of the North America map have been printed.

Members of the National Geographic Society therefore are contributing to Government needs in making possible by their annual dues the publication of their Society's maps.

The North America Map which accompanies this issue presents a complete portrait of our continent, including all North America's coast lines and the islands which guard sea and plane approaches.*

The North America map area reaches from the North Pole to south of the Panama Canal and far out into the oceans to east and west. Indicating North America's relationship to its three nearest neighbor continents, it takes in northern South America, a section of Siberia, and even a bit of Norway.

All of the West Indies are shown—a noteworthy feature, since most maps of this continent cut off part of that important island area. Also included are Bermuda, Iceland, and the Faeroes, Orkneys, and Shetlands. The

* Members wishing additional copies of the new Map of North America may obtain them by writing the National Geographic Society, Washington, D. C. Prices, in United States and Possessions, 50¢ on paper (unfolded); Index, 25¢. Outside of United States and Possessions, 75¢ on paper; Index, 50¢—all remittances payable in U. S. funds. Postage prepaid.

Surveys Made by Bradford Washburn on a National Geographic Society Expedition in Alaska Are Transferred to the North America Map

The long-armed instrument used by H. E. Eastwood is a pantograph, which "makes little ones out of big ones," or the reverse. As the pointer at the draftsman's right is moved over the Mount Logan survey sheet, the mechanical hand at his left makes an exact but smaller-scale copy on the map drawing.

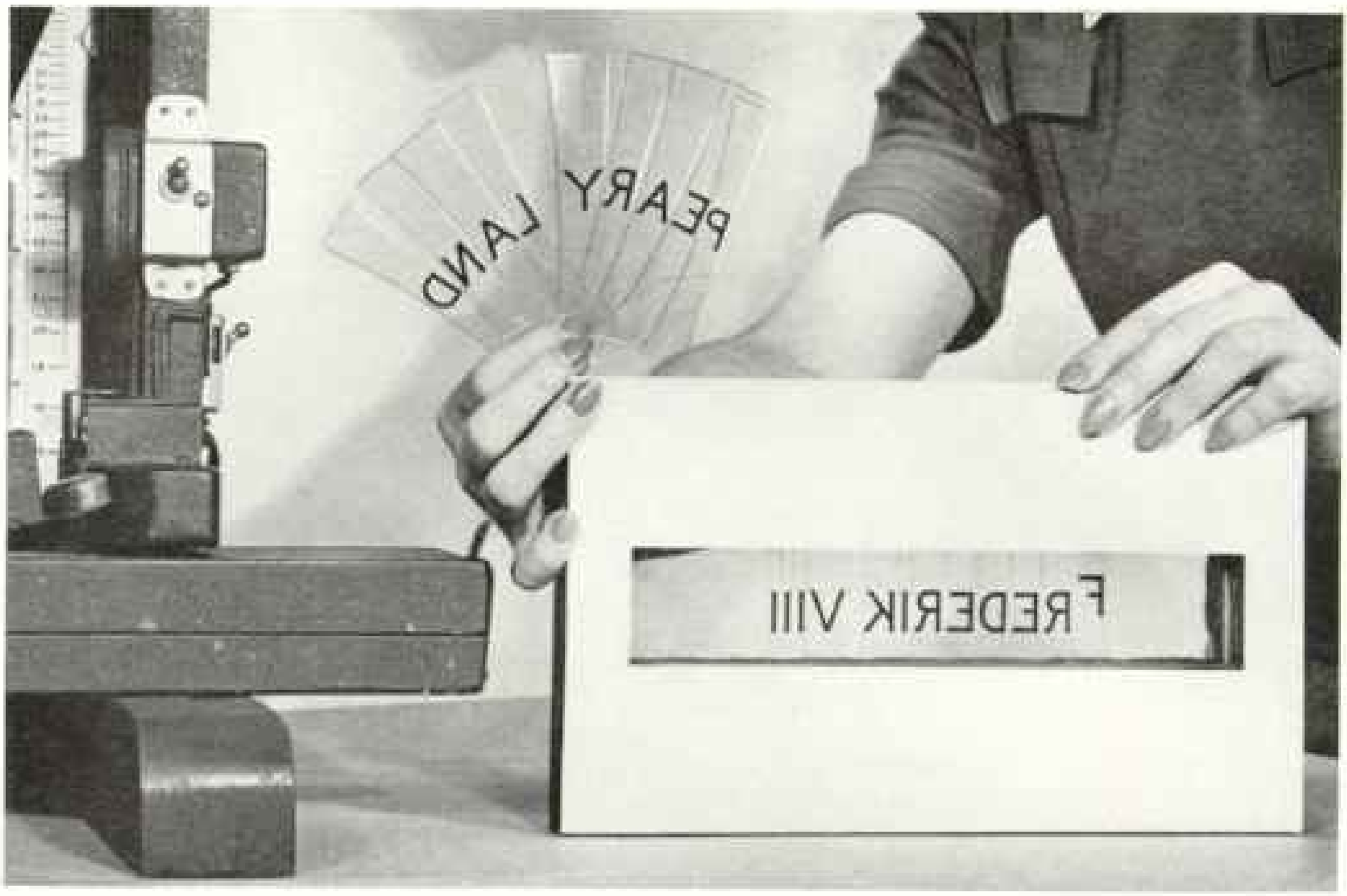
These Pictures Tell the Story of a Map, from Mind to Magazine

First stage in making a map is computing and drawing a grid of lines to represent latitude and longitude. The cartographer uses a set of celluloid curves, each of different radius, to draw the map skeleton.

Staff Photographer B. Anthony Stewart

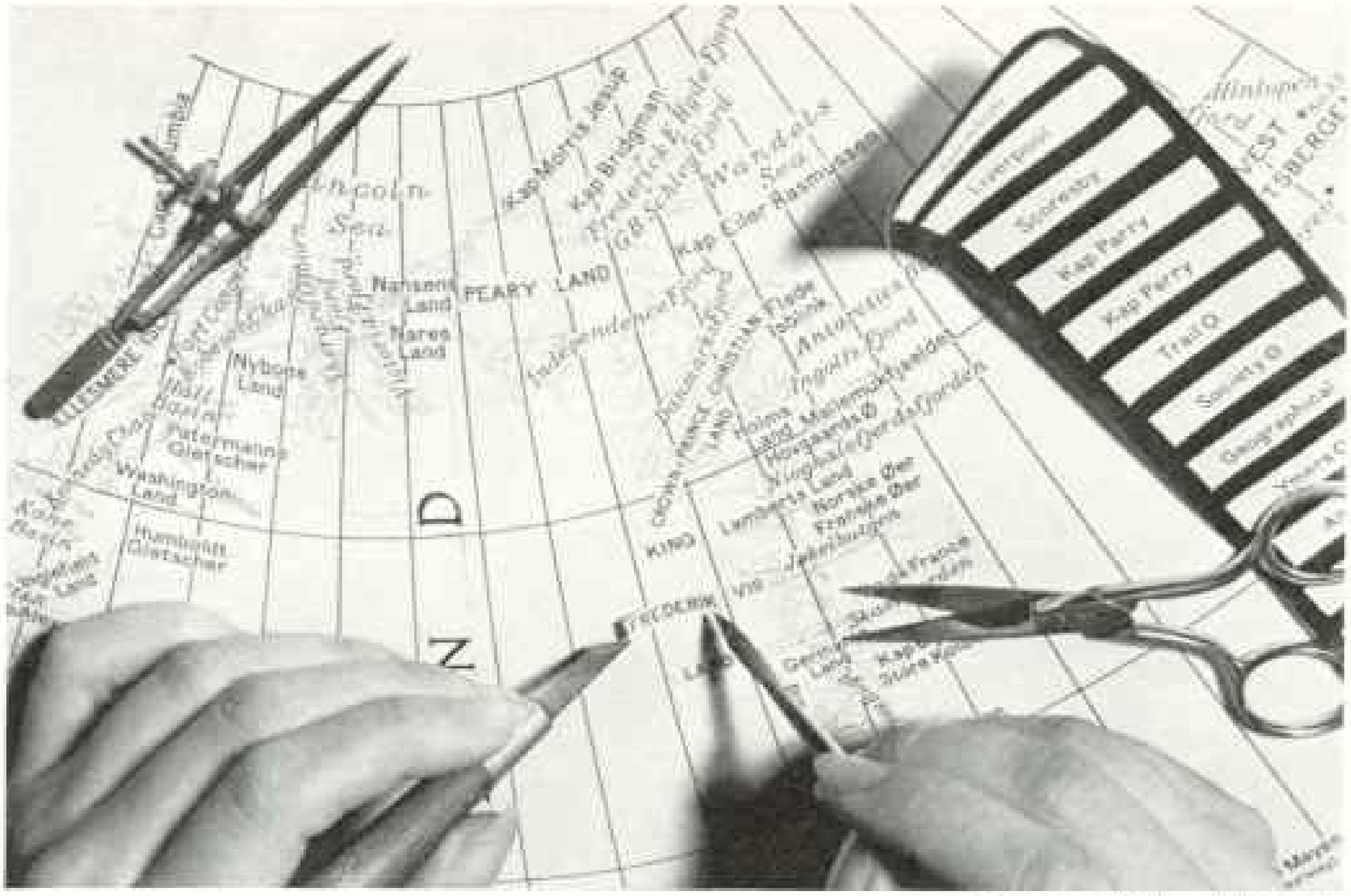
Data from Danish Explorers Make Greenland's Icy Image More Nearly Complete

Here a measurement is being made with the upper points of the scissorslike proportional dividers. Automatically the points at their opposite end indicate the same distance on the reduced scale.



For One Man to Letter a Whole Map Would Be Slow, and Letters Would Lack Uniformity

So an expert draws the alphabet and each letter is photographed. Transparent film positives are set like type (above) and the name is printed. The late A. H. Bumstead and his son developed the method.



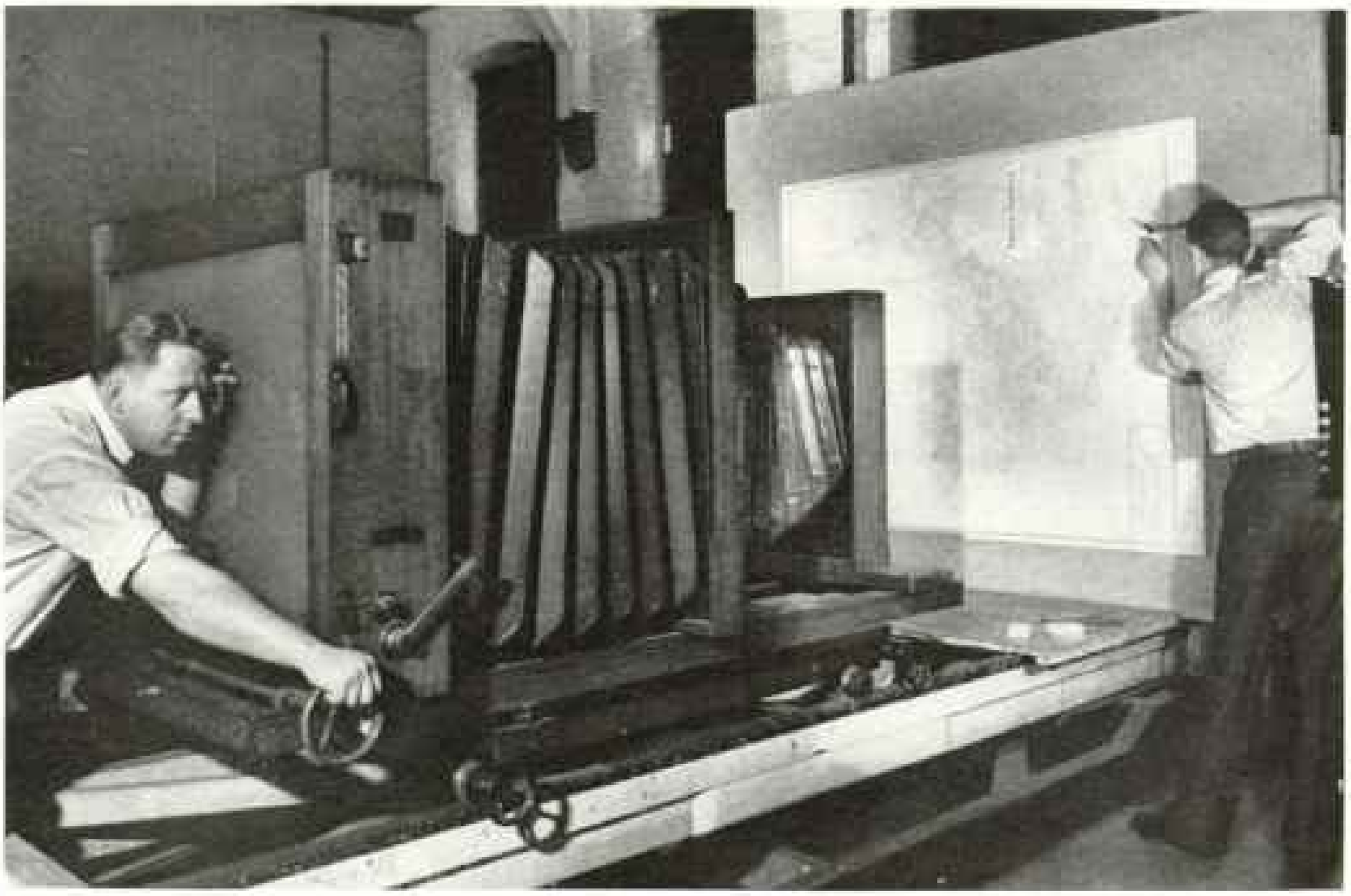
Staff Photographer B. Anthony Stewart

King Frederik VIII Land Takes Its Place on the North America Map

The photographically printed names are clipped off the strip (right) and pasted in place. This sheet contains the projection, place names, railroads, and other detail appearing in black on the finished map.

Drawings for Each Map Have to Be Tacked Down for Photographing

One sheet (lower right) shows parallels, meridians, place names, railroads, and other works of man on the continent. Another shows relief by myriad tiny pen strokes—450 man-hours of work. A third shows drainage; a fourth the roads. Drawings are made in sections so several experts can work on them at once.



Staff Photographer B. Anthony Stewart

One of the Drawings for the Map Gets Its Picture Taken

Printer's cameras photograph a National Geographic map on a single plate. One takes pictures 4 feet square.

Water's Magic Touch Reveals the Map Developed on a Metal Plate

After a sensitized plate of aluminum or zinc has been exposed to light under the photographic negative, it is coated with greasy ink and put under the tap. Water dissolves the coating where light has not struck, but does not affect the light-hardened areas. Plant of A. Hoen and Company, National Geographic map printers.

Staff Photographer B. Anthony Stewart

Locked on the Big Rotary Presses, the Plates Are Ready to Start Rolling

Printing is by offset process. Impression is transferred from plate to rubber roller (lower), thence to paper.

Staff Photographer Luis Marden

"Restore Dot over I—Repair Railroad—Connect River," Say these Margin Corrections

Every square inch of a map proof is inspected with a magnifying glass. Here a proof is being checked by Chief Cartographer James M. Darley, Research Cartographer Newman Rumstead, and Miss Eleanor Barton. Eloquent of infinite pains are such notations as "Improve letters," "Move town spot," and "Add canal symbol."

Paul Pryor

Girls Slip 264 Acres of Maps into a Mountain of Magazines

A million and a quarter map supplements for one month's NATIONAL GEOGRAPHICS are folded by machine but inserted by hand. This is the map of Central Europe and the Mediterranean, which reached members immediately after the outbreak of the war.

long disjointed finger of the Aleutian Islands to the west is portrayed in an inset.

Greenland is mapped with a wealth of new detail gleaned from recent surveys (page 676).

Black and red lines indicate the continent's principal railroads and highways. Projected roads are shown by red dashes. The black lines show that one can now travel from Hudson Bay to the Gulf of Honduras or the Gulf of Fonseca by rail. By highway it will be possible to drive from Alaska to Panama City when projected roads are finished.

"Alaska's Burma Road"

The Society's cartographers have shown the projected route of the new highway which is to connect Fairbanks, Alaska, with the highway systems of Canada and the United States. With the outbreak of war in the Pacific, this important project has been referred to as "Alaska's Burma Road."

Southward, through Mexico and the republics of Central America, the solid or dashed red line points out progress on the Pan-American Highway. Nearly two-thirds of the distance from Laredo, Texas, to Panama is now served by hard-surfaced or graded all-weather road. Another 15 percent is passable over dry-weather road, while the remainder is as yet impassable.

When completed, the highway distance from Fairbanks, Alaska, to Panama will total 8,000 miles, and then, if this road is connected with the South American system, another 5,500 miles to Buenos Aires will be added.

The geographical center of the continent lies just west of Devils Lake, North Dakota, but the pole of projection of the map—the center of the system of lines which form its skeleton—is about 400 miles to the southeast, at 45° north latitude, 92° 30′ west longitude, which is just east of St. Paul, Minnesota.

Thus distances measured from Minneapolis or St. Paul at the scale of 189.4 miles to the

Staff Photographer B. Anthony Stewart

They Visit Their Faraway Australia Home with the National Geographic

The Honorable Richard G. Casey, first Australian member of the British War Cabinet, and his children, Jane and Donn, look at Howell Walker's article, "The Making of an Anzac," in the April, 1942, issue of the National Geographic Magazine. On the desk is The Society's new map of the Indian Ocean, and in left background a Geographic map of Asia. The photograph was made at the Australian Legation in Washington, D. C., just after Mr. Casey had relinquished his duties as Minister to the United States to depart for his new British Cabinet post in Cairo, Egypt.

inch will be approximately correct, because the map is drawn on the azimuthal equidistant projection, which means that all points are shown in their true direction and distance from the pole of projection.

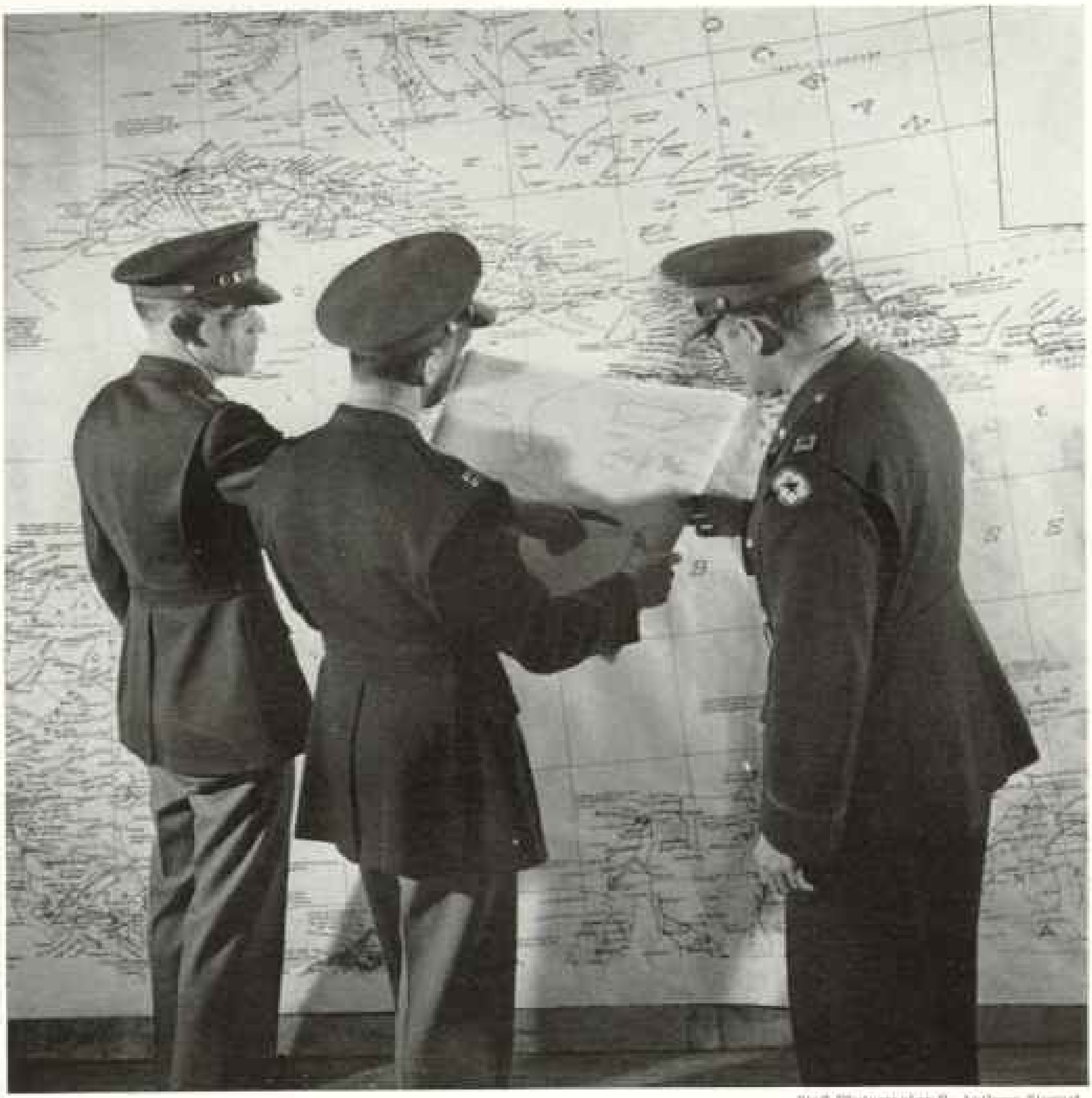
The mainland of the continent extends through 66 degrees of latitude, from the tip of Boothia Peninsula to southernmost Panama. If the Arctic islands are considered, this extent becomes more than 76 degrees, making North America the second-longest continent.

If the Great Lakes were moved some 90 degrees eastward and superimposed on central Europe, they would reach from the Adriatic nearly to the North Sea.

Name Comes from an Inspired Mistake

This vast continent owes its name to an adventurer who did not discover it and to a geographer who thought one of the continents should be named for a man.

The adventurer was an Italian, Amerigo Vespucci, or, in Latin, Americus Vespucius, who visited the American coast, wrote about it entertainingly, and proclaimed it a New World. The geographer was Martin Waldsee-



Staff Photographer B. Anthony Stewart

Geographic Maps Are Blown Up to Giant Size by the Army War College

Covering the whole wall is a six-fold enlargement of The Society's Caribbean map held by the officer in the center. Supplement maps of other areas have also been selected by the Army War College and the Naval War College for vast enlargement and constant use in planning strategy.

müller of Lorraine, who wrote in a book published in 1507: "I do not see what is rightly to hinder us from calling it Amerige or America, *i. e.*, the land of Americus, after its discoverer (*sic*) Americus, a man of sagacious mind, since both Europe and Asia have got their names from Women."

Waldseemüller later apparently discovered his error and tried to kill the name, but the word "America" had been seized upon eagerly and already it was in wide use.

Strategic Aleutian Islands

The Aleutian Islands, south and west of Alaska, where United States defense works are being rushed to completion, extend within about 750 miles of Japan's northern islands.

The normal Great Circle steamer route between northwestern United States ports and Japan passes only about 200 miles south of the long, curving chain.

Dutch Harbor, Unalaska Island, lies about 2,300 miles from San Francisco and the same distance from Honolulu.

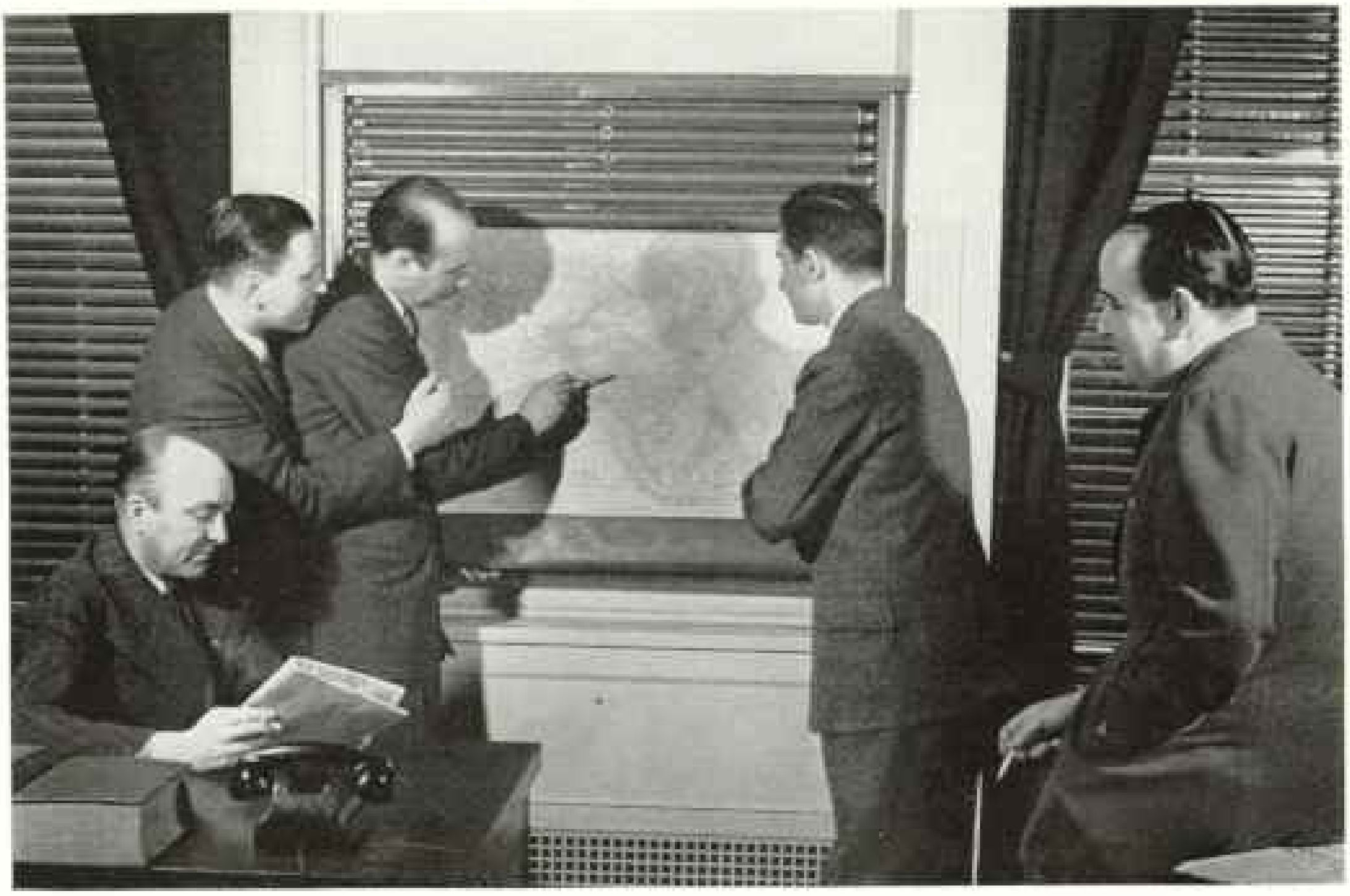
The Aleutians form a sort of Wagnerian world of their own, with volcanoes puffing huge steam rings, with islets popping out of the sea and vanishing again, and with fog-chilled winds howling over grassy moors.

Largest is Unimak Island, which measures

Staff Photographer B. Anthony Stewart

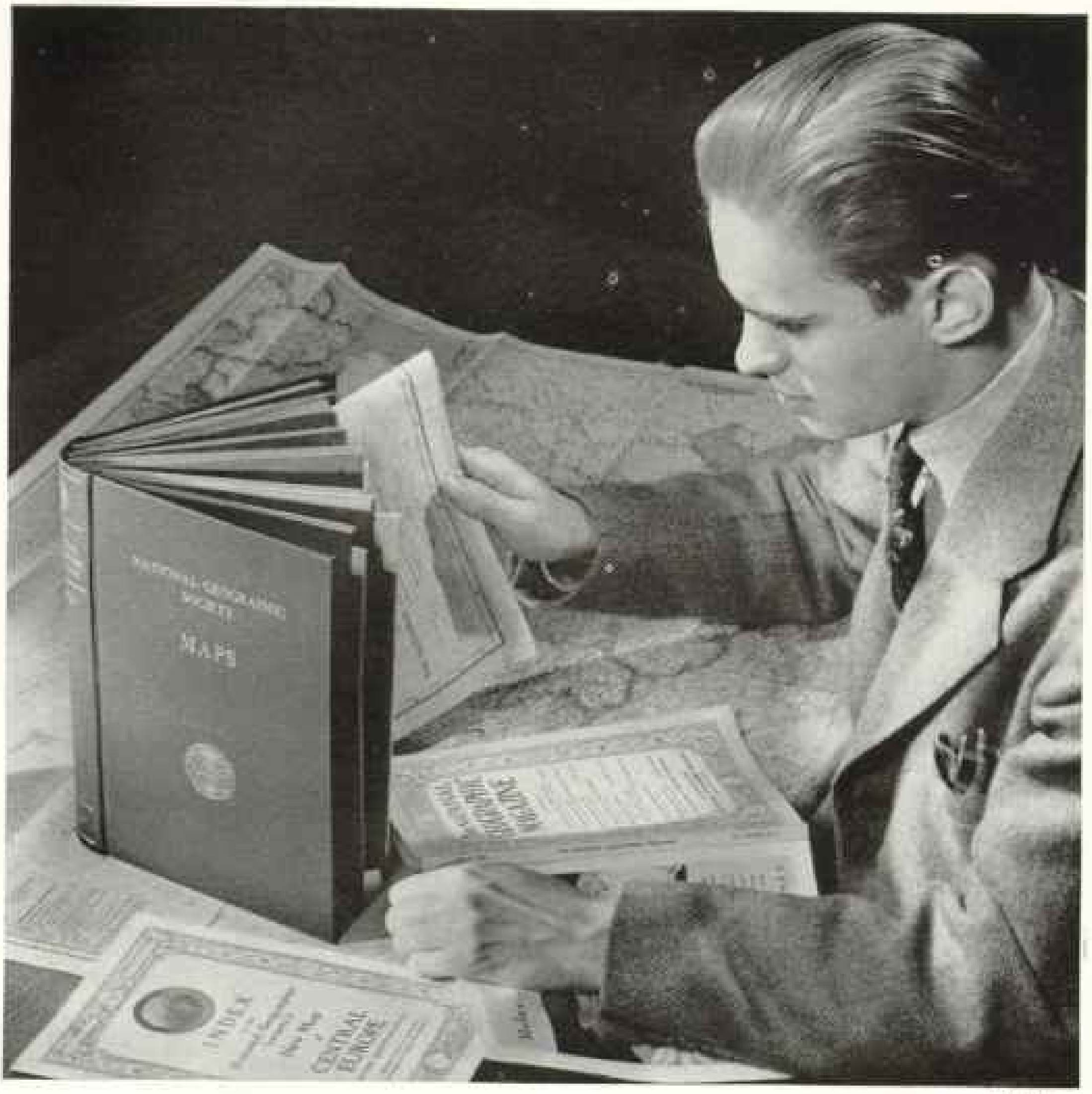
No, This Officer in the Navy Department Is Not Playing with Toy Ships

These are scale models and drawings of foreign men-of-war. The originals may be located somewhere on The Geographic maps of the Indian, Pacific, and Atlantic Oceans which paper the walls over his head.



Maps Are "Must" Reading for Crack Reporters Covering the White House

Correspondents consult a rack of The Society's maps in the White House Press Room with its blackout curtains. John C. Henry, President of the White House Correspondents' Association, points out embattled Burma.



Paul Payne

He Roams the World with NATIONAL GEOGRAPHIC Maps

By saving their supplements, members soon acquire a valuable atlas of the world. This new map file with gold-embossed maroon covers holds 20 folded maps or 10 maps with indexes. The Society has been issuing four map supplements a year, but is planning five for 1942.

65 by 22 miles. Unimak also has the highest peak—the symmetrical 9,387-foot Shishaldin volcano. Most of the islands are bold and rocky. Not a tree grows in the group; natives depend on driftwood and animal oils for fuel. There are grasses and flowering plants, however, and on Umnak Island an American operates a sheep ranch with 15,000 head.

Average annual temperatures are remarkably uniform because of the warm Japan Current. The warm air from the Japan Current, mixing with the cold air of Bering Sea makes the Aleutians a "northern weather-kitchen" which brews storms that affect the climate of the United States.

Akutan, also in the eastern Aleutians, assails one's nostrils before it is seen; it has a big whaling station.

Westward from Umnak Island lie the Islands of the Four Mountains and the long Andreanof chain. Almost uninhabited, the islands continue for 500 miles to Attu, westernmost of the American Aleutians.

In area, North America, with its 7,918,000 square miles, ranks third among the great land masses; yet it contains only 14 percent of the earth's total land area.

North America's population of 182,810,000 is only 8½ percent of the world's total, but the continent contains 24 percent of the

Staff Photographer J. Baylor Roberts

Fewer Travelers Get Passports Now That Much of the World Is "Closed for Alterations"

This room in the Passport Division of the State Department in Washington used to be thronged with light-hearted peacetime pilgrims. Now the applicants are chiefly serious souls who travel only because they must. Maps on the wall were supplied to the State Department by the National Geographic Society.

Staff Photographer B. Anthony Stewart

A Lieutenant in the Navy Press Room Points to Places Where the Atlantic Fleet Is Picking off Axis Submarines

NATIONAL GEOGRAPHIC maps, such as those of the Atlantic, Indian, and Pacific Oceans, and Hydrographic Office charts line the walls of this room from which come Navy communiqués reporting the battles of our far-flung fleet. Reporters here rush their stories over private telephone lines to press associations and newspapers.

Staff Photographer B. Anthony Stewart

Pictorial Maps Teach Young America Both Geography and Art

Ever since early map-makers decorated their handiwork with King Neptune and puffing cherubs to represent the wind, pictorial maps have been popular. Here The Society's decorative maps of the British Isles and the Reaches of New York and Washington are used in Mrs. Marian Louden's art class at Gordon Junior High School, Washington, D. C.

world's cultivated land. It produces nearly 42 percent of the earth's paper pulp, 35 percent of the lumber, 45 percent of the cotton, over 31 percent of the sugar cane, one-eighth of the wool.

Even before the present enormous wartime expansion of the mineral industries, North America produced 34 percent of the earth's aluminum, over 33 percent of the pig iron, over 36 percent of the steel, almost 45 percent of the copper and over two-fifths of the zinc, 45 percent of the lead, 38 percent of the coal, and 63 percent of the petroleum.

In fact, more than three-fourths of the world's petroleum comes from North America and the oil fields of Venezuela, Colombia, and Trinidad shown on the map.

This continent has nearly 53 percent of the world's telephones, over 44 percent of the railroads, and generates more than 45 percent of the electrical energy.

In addition to the Map of North America published as a supplement to this issue and described above, the National Geographic series includes 20 maps.

The National Geographic Society furnishes indexes for the maps marked with an asterisk. Each index contains alphabetical listings and location keys of all geographic names on the corresponding map and a foreword describing the geography of the area. The more than 25,000 words of text contained in these introductory pages constitute a concise and valuable descriptive geography of the world.

THE WORLD: 41 x 22 inches; in two hemispheres. Shows national boundaries as of September 1, 1939; insets show time zones, transoceanic airways, population density, land and water hemispheres. Ideal for following world-wide war strategy.

PACIFIC OCEAN: 38 x 31 inches. Includes 73 large-scale insets of islands and harbors; shows

Staff Photographer B. Anthony Stewart

Such Exhibits Help Thousands of School Children Know Their Latin American Neighbors

The National Geographic Society supplied maps and photographs for the 150 traveling exhibits prepared by the United States Office of Education in cooperation with the Coordinator of Inter-American Affairs. Coordinator Nelson A. Rockefeller (left) and Dr. John W. Studebaker, United States Commissioner of Education, here look over one of the exhibits for schools.

reef formations, time zones, ship and airway routes, distances. Covers in detail an area in which American forces are fighting on land and sea.*

THEATER OF WAR IN THE PACIFIC: 20½ x 26½ inches. Off the press January 20, 1942, this compact map extends from Calcutta to Bermuda, from the Antipodes to Bering Strait; features naval bases and table of 861 air distances between strategic points.*

ATLANTIC OCEAN: 25 x 31¼ inches. Reveals geographic relationship between continents that border the North and South Atlantic; includes naval bases, airways, ship routes, inset of Panama Canal; shows most of Europe, U. S. and Canada west to the Rockies, all South America, and western shore of Africa.

EUROPE AND THE NEAR EAST: 39 x 34 inches. Includes the British Isles, all of continental Europe, and parts of Asia and Africa as of April 10, 1940; shows oil pipe lines, railways, and 9,052 place names. A timely guide to the geography of military action.*

CENTRAL EUROPE AND THE MEDITERRANEAN: 36½ x 26½ inches. This map of great historical importance includes boundary revisions up to September 1, 1939, thus showing the status of Central European nations when hostilities began. Drawn on a large scale for easy reference, it shows contiguous areas of Asia and Africa and gives 6,810 place names.*

INDIAN OCEAN: 25½ x 32¾ inches. Shows all of Australia, Madagascar, eastern Africa, most of India, various strategic places and naval bases of the Orient. Includes insets of Suez, the Philippines, Guam, Singapore, Hong Kong, and New Zealand.

UNITED STATES: 41 x 26½ inches. Emphasizes cities and towns according to population figures from the 1940 census; shows main highways, military divisions, defense data, 8,838 place names.*

BRITISH ISLES: 29 x 35 inches. Decorative design; beautifully illuminated with drawings of illustrious Britons, famous places, armorial ensigns; directing symbols to cathedral towns, charming villages, castles, churches, abbeys, historic battlefields, monuments, etc.

Staff Photographer B. Anthony Stewart

Geography and Good Advice on a War Department Wall

After Pearl Harbor the Government demand for NATIONAL GEOGRAPHIC maps increased 600 percent, and 98 percent of these orders came from the Army and Navy. Colonel A. I. Ennis of the Army Air Corps has close at hand the familiar Pacific Ocean map with its 73 insets showing islands and archipelagoes. His secretary has a copy, too, for Pacific place names such as Port Moresby, Pago Pago, and New Caledonia are bobbing up daily now.

ASIA: 38¼ x 31 inches. Includes all of Soviet Russia; gives 6,500 place names and indicates comparative size of cities, etc.*

SOUTH AMERICA: 26¼ x 37½ inches. Unique projection reduces distortion. Shows river routes, air lines, railways, new place names, chief natural resources, scenic and historic features.*

AFRICA: 29 x 31½ inches. 7,162 place names; railway routes, highways, other important data on this continent of strife and potential resources.*

MEXICO, CENTRAL AMERICA, WEST INDIES: 24 x 41 inches. 5,600 place names; large-scale insets of Cuba, Canal Zone, Bermuda Islands, Jamaica, St. Thomas, Puerto Rico, and Virgin Islands.*

CANADA: 40 x 27 inches. Shows important highways, railroads, main routes of exploration, general elevation, topography of former blind-spot areas, time zones, etc.*

CLASSICAL LANDS OF THE MEDITERRANEAN: 35¼ x 26 inches. Features 342 localized notes that highlight the classical history and mythology of Greece and Rome, and covers an area which includes the strategic Brenner Pass in the north and the vital Dardanelles in the east.*

BIBLE LANDS AND THE CRADLE OF WESTERN CIVILIZATION: 25 x 35 inches. Shows modern developments, ancient sites, travels of Biblical characters.*

HISTORIC AND SCENIC REACHES OF THE NATION'S CAPITAL: 27½ x 32½ inches. Features interesting sites and shrines in the vicinity of Washington and parts of six near-by States; richly decorated.

THE REACHES OF NEW YORK CITY: 26½ x 29 inches. A useful guide to this populous area, encompassing parts of five States.

NORTHWESTERN UNITED STATES AND NEIGHBORING CANADIAN PROVINCES: 24½ x 36 inches. Washington, Oregon, Idaho, Montana, Wyoming, parts of British Columbia, Alberta, Saskatchewan.

SOUTHWESTERN UNITED STATES: 35 x 26 inches. California, Nevada, Utah, Arizona, and New Mexico. Beautifully illuminated; 3,800 words of historical notes.

NATIONAL GEOGRAPHIC SOCIETY

GEOGRAPHIC ADMINISTRATION BUILDINGS

SIXTEENTH AND M STREETS NORTHWEST, WASHINGTON, D. C.

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded fifty-four years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

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

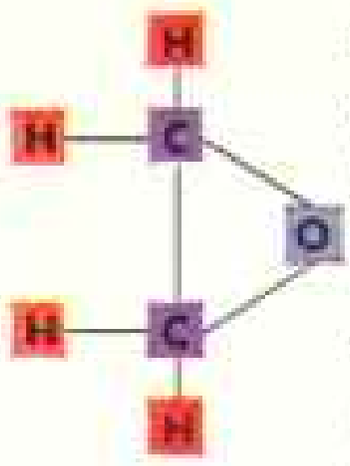
The National Geographic Society-U. S. Navy Expedition camped on desert Canton Island in mid-Pacific and successfully photographed and observed the solar eclipse of 1937. The Society has taken part in many projects to increase knowledge of the sun.

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

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

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

CAN YOU MAKE THESE SPELL HEALTH?



These are a few of Nature's great building blocks—Carbon, Hydrogen, Oxygen, Nitrogen, Chlorine. They seem inexhaustible in their abundance. By working with them . . . in ever new combinations . . . chemical science is bringing better health to millions.

Vitamins contribute to health. And now, thanks to chemical science, America is assured a plentiful supply of precious Vitamin B_1. Today, this vital material is created from *synthetic organic chemicals!* Using Ethyl Acetoacetate and Ethylene Oxide (whose structure appears at the left), pharmaceutical manufacturers can turn out Vitamin B_1 in huge quantities. Other vitamins, both A and D, are now being concentrated from cod liver oil through the use of Ethylene Dichloride.

Malaria a threat? Quinine was formerly essential in the treatment of this dread disease. In the face of a quinine shortage, chemical science has developed a *new antimalarial substance* . . . superior to the natural product in many ways. It can be manufactured in quantity from Ethyl Acetoacetate, Diethylethanolamine, and Acetone.

Facing an operation? Perhaps your surgeon will use Divinyl Ether, an *improved general anesthetic* made from Dichlorethyl Ether. Do you ever take *aspirin?* The present low price of this pain alleviator is possible because Acetic Anhydride used for making aspirin is produced economically by *synthesis.* Going to the dentist? He may give you "*Novocain*" *anesthetic* to avoid pain. Diethylethanolamine is one of the important raw materials for making this local anesthetic. A *heart remedy* is made through the use of Ethylenediamine.

Thus synthetic organic chemistry, complementing the field of pharmacology, is helping to extend life . . . to combat health menaces . . . to alleviate pain. Constant research, keying in with the work of others in many fields, can be counted upon to produce other great developments in the future.

Ethyl Acetoacetate, Ethylene Oxide, Ethylene Dichloride, Diethylethanolamine, Acetone, Dichlorethyl Ether, Acetic Anhydride, and Ethylenediamine are among the more than 160 synthetic organic chemicals produced commercially by Carbide and Carbon Chemicals Corporation. These products . . . all of them created by synthesis from Nature's building blocks . . . include vast quantities of such essentials as chemical raw materials, solvents, plastics, and anti-freezes . . . which serve all industry.

The great strides made in the field of synthetic organic chemistry by Carbide and Carbon Chemicals Corporation have been facilitated tremendously by technical assistance in the use of special alloys and metals developed by Electro Metallurgical Company and Haynes Stellite Company; by the special carbon products of National Carbon Company, Inc., and by the application of many engineering and processing methods perfected by The Linde Air Products Company—which companies also are Units of Union Carbide and Carbon Corporation.

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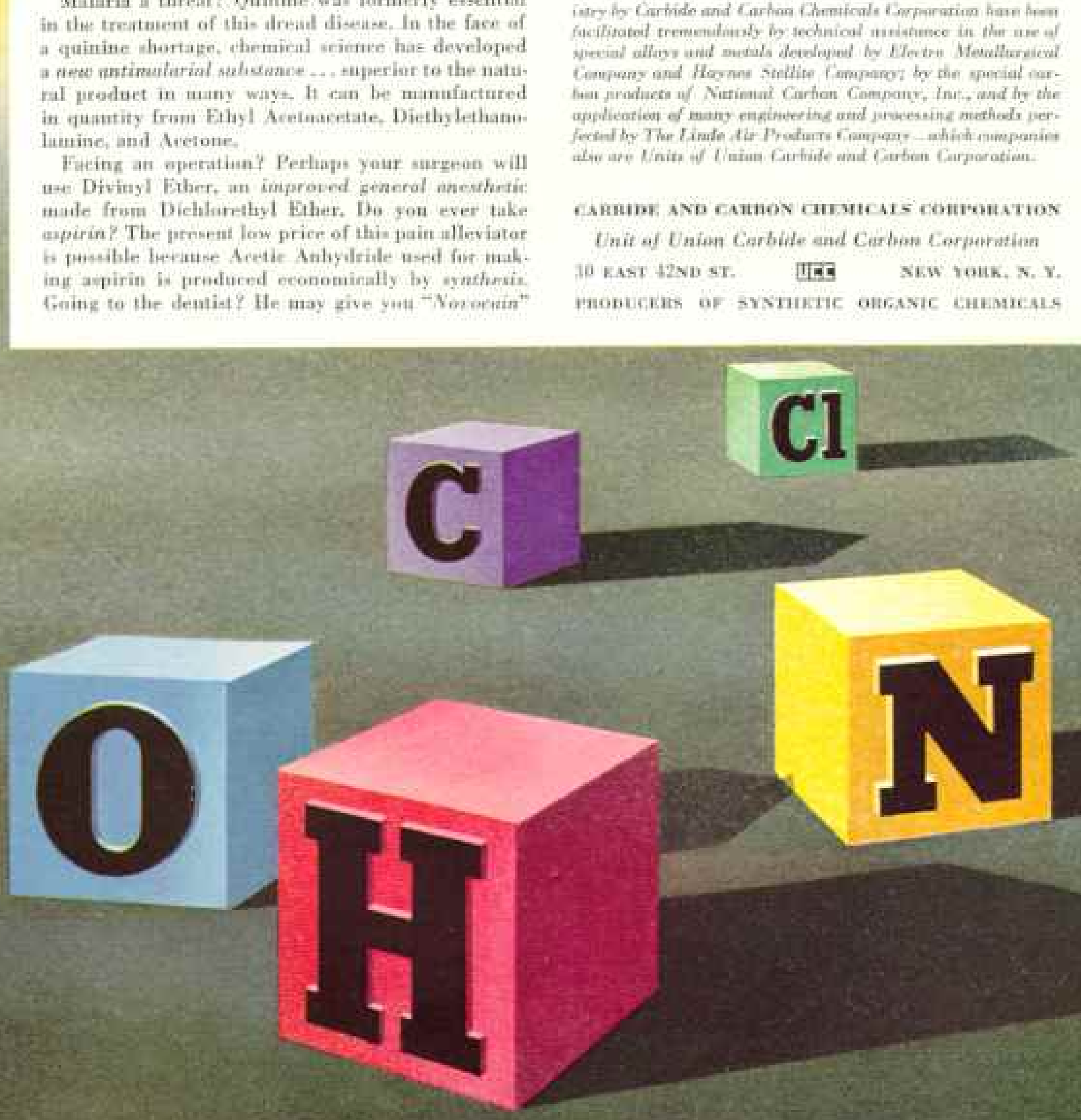

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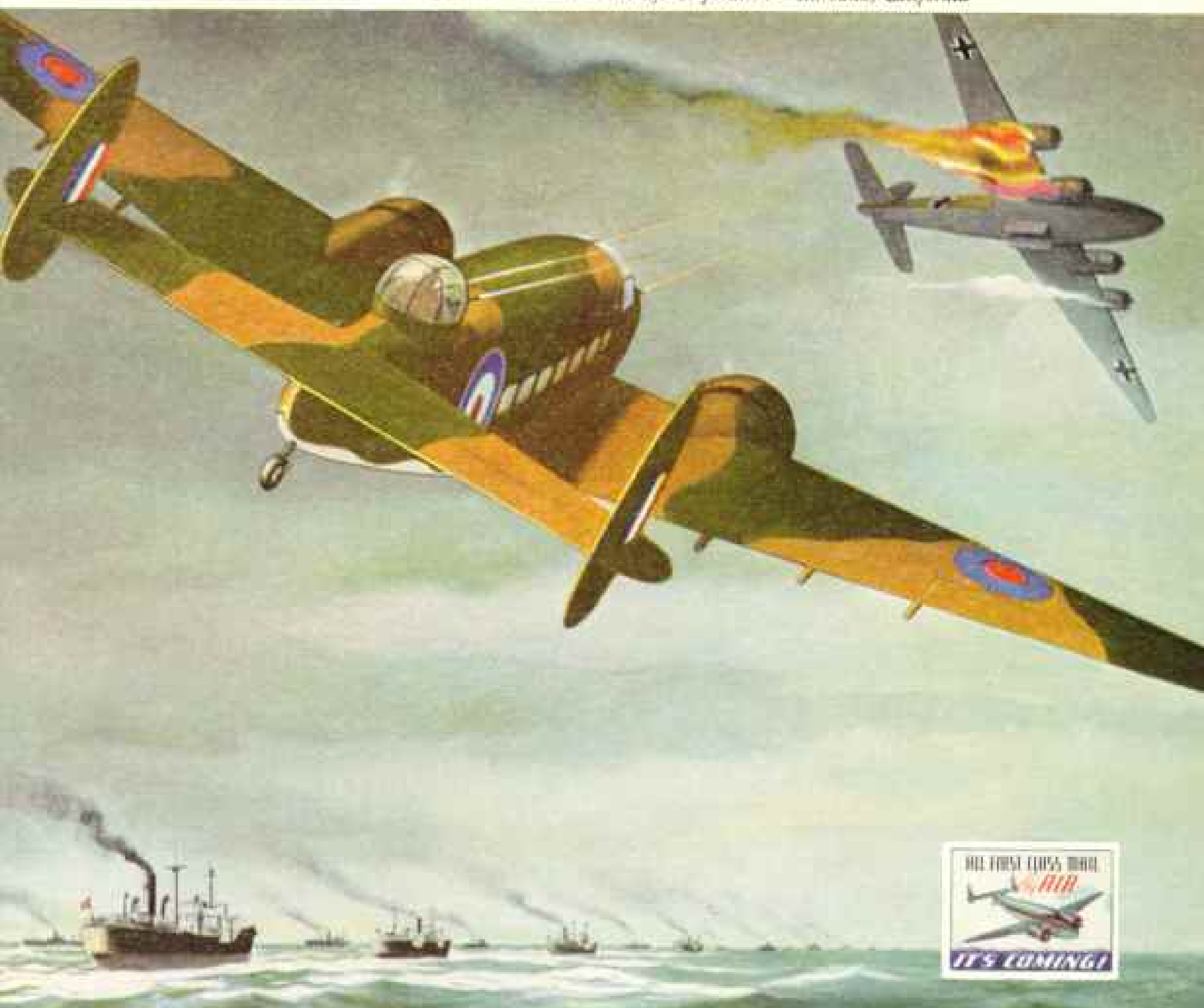

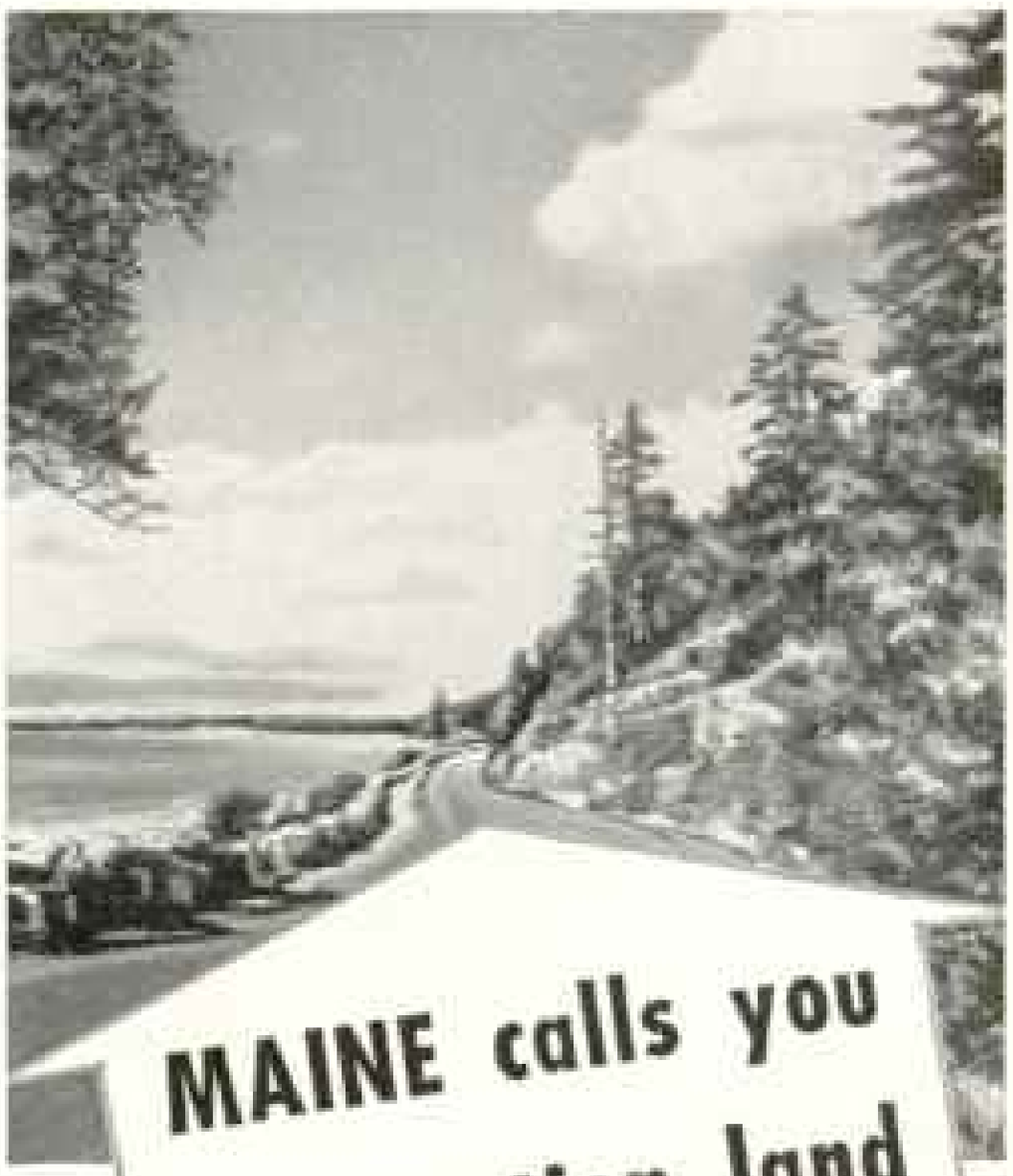

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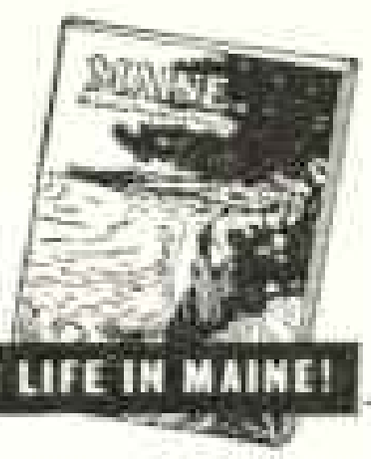
Maine packs the warm days full of hiking, camping, riding, playing tennis and golf. Swim, sail and fish in salt water or fresh. And then the cool nights bring glorious rest. Famous hotels and comfortable tourist homes make you welcome. Maine food is justly famous. Plan a Maine vacation. Write for the free picture-book with full details.



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Our factories and people are working day and night for Victory . . . but La Province de Québec has lost none of the quaintness and charm that brings visitors back again and again.

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- **SAVE TIME—PRE-ARRANGE YOUR TRIP.** To avoid unnecessary delay and confusion at departure time, get tickets and all trip information well in advance.
- **SAVE MONEY FOR DEFENSE BONDS . . .** at Greyhound's low fares. And save essential materials, too . . . buses carry a passenger several times as far as a car, per pound of rubber, per gallon of fuel.
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For special trip information, see your Greyhound agent, or write to nearest of these Greyhound Information Offices:

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"TO PROVIDE FOR THE COMMON DEFENSE, TO PROMOTE THE GENERAL WELFARE"

Bad medicine for big bombers

ONE WAY to spoil a bomber's aim is to hang a curtain of steel over your ship and dare him to come down through it. To get that curtain of steel up there requires quick-firing, flexible guns.

To the plant of the Westinghouse Electric Elevator Company the Navy, a few months ago, brought its plans for such a gun. And to Westinghouse was given the important job of building the mounts that would control the aiming of these batteries of quick-firing guns.

Today, over that Westinghouse plant, there floats the Navy's "E" pennant—for excellence—testimony to the manner in which this Westinghouse plant did the job. How was this plant able to get into growing production of these mounts so quickly? The answer lies in a Westinghouse characteristic called "know how"—the ability to get things done in the best possible way.

This Westinghouse "know how" makes itself felt wherever Westinghouse craftsmen build things. Whether for the common defense or the general welfare, this "know how" is doing a job. The same skill and ingenuity that made so many splendid things for peacetime living are now being applied to many important war weapons.

"Know how" will work for you again

We look forward to the day when we can give your home, your farm, or your factory the full benefit of Westinghouse "know how" again. To speed that day means just one thing to us: to produce, in ever-increasing quantities, the tools with which to get the victory job done.

Westinghouse

For the Common Defense

Steelamps
Bomb Fuses
Tank Equipment
Military Radio Equipment
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Motors and Controls

These lists mention only some of the many thousands of Westinghouse products.

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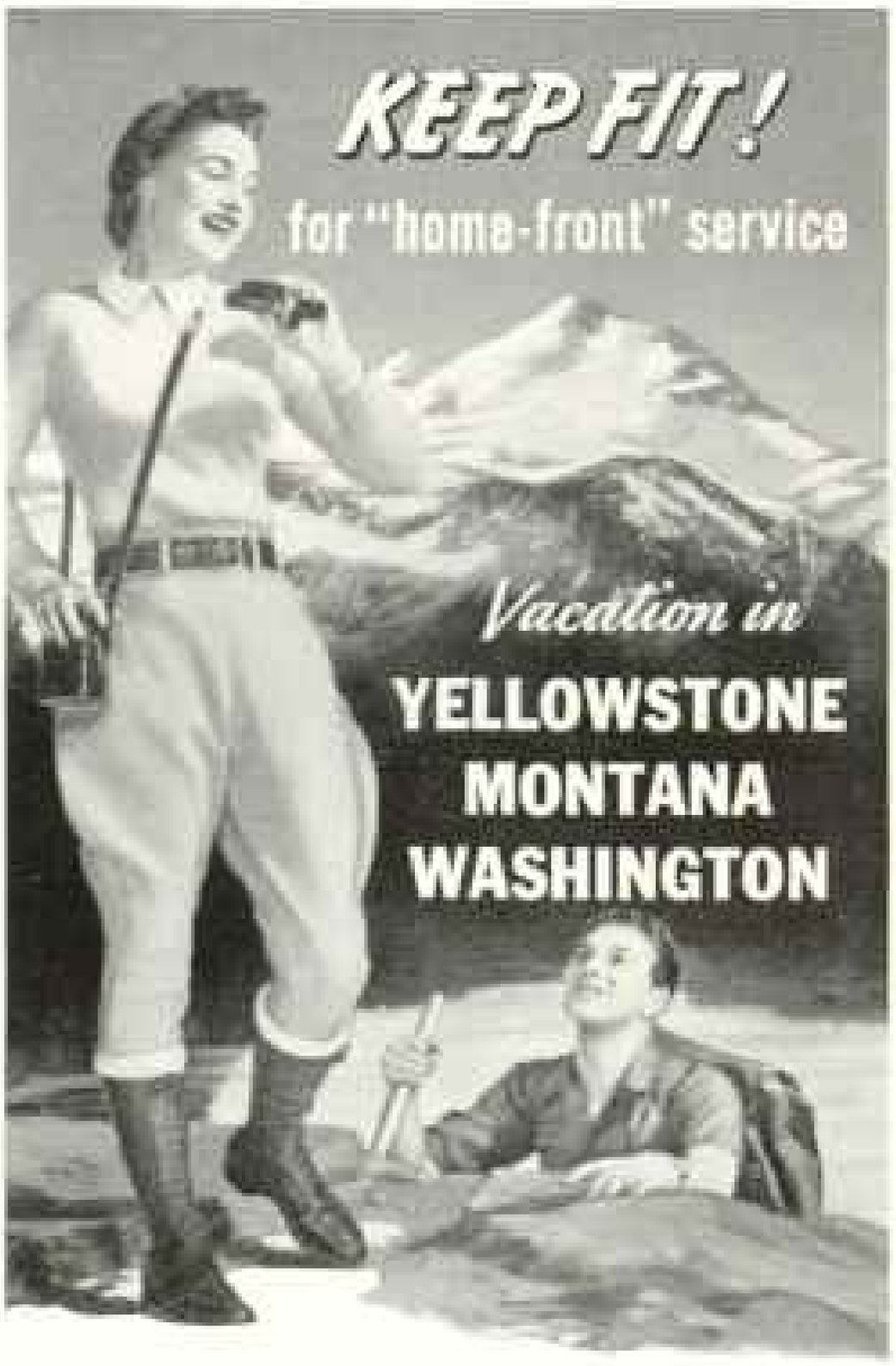

TUNE up, pep up for an all-out victory effort with a healthful out-door vacation in The Milwaukee Road's Northwest.

Come out to Yellowstone—land of Old Faithful, of the famous bears, Yellowstone Lake and the Grand Canyon. For extra pleasure, enter via Gallatin Gateway in the heart of the Rockies. Go independently or on escorted, all-expense tours.

Stay at Gallatin Gateway Inn, Montana. Enjoy riding, fishing and pack trips; motor trips to Morrison Cave, to historic Virginia City and to nearby dude and cattle ranches.

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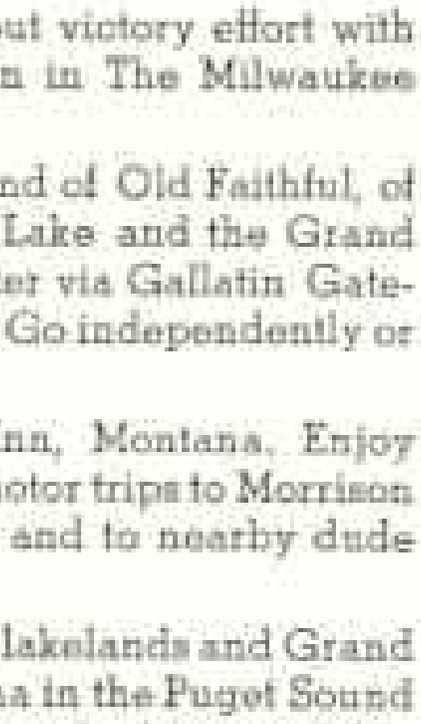
. . . electrified for 656 thrilling miles over the Belts, Rockies, Bitter Roots and Cascades. Bedrooms, standard berths, modern tourist sleepers and luxury coaches; also dining and club observation cars.



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Old Hands at new Jobs

THERE is a new look of grim satisfaction on the faces of many a veteran Buick worker these days.

There is the look of the seasoned infantryman who, having patiently waited while advance forces engaged in all the early skirmishing, at last gets the marching orders that let him move up front.

You didn't have to tell these old Buick hands why the whole Buick factory hadn't been called to action before.

They knew with the practical experience of men who work with their hands that, even if you had the orders, you can't stamp tanks out of automobile sheet metal, or machine rapid-fire cannon with the same tools and methods that make car assembly lines tick.

They knew that new methods had to be established, tried and tested – that new machines and fixtures had to be designed and built – that even such fine skills as their own had to be refreshed, redirected, reapplied.

They knew that normally this would take years – it took more than a year, didn't it, to "make ready" even a new car model?

So they noted with appreciative approval as new plants went up, new techniques were established and new skills developed in a matter of weeks.

They were assured that their chance would come months ago, when fellow workers in the same plants began to take on first one wartime job, then another. Their chance did come, and now they're making the most of it.

The job of change-over was handled, and like reservists called up, these quality-wise veterans went into action.

Old hands at the fine, precise, on-the-button work modern war equipment calls for, they relish their opportunity to prove that when Uncle Sam needs better war goods, Buick men can build them.

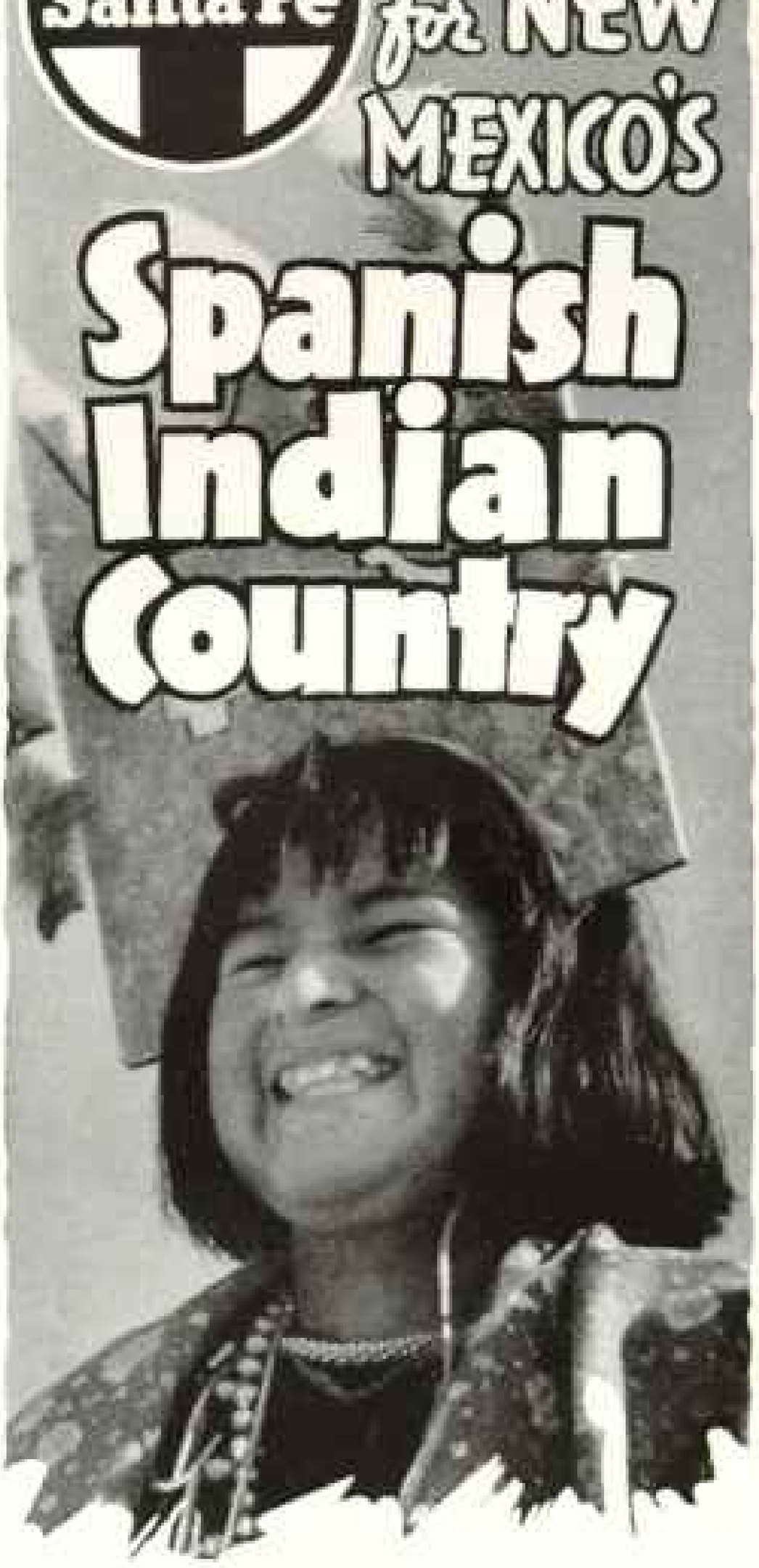
So there's new buoyance in their stride as these veteran craftsmen march to work. There's grim purpose in their intentness as they guide their planers and lathes.

For these old hands and Buick are all-out on new jobs to help win total victory.

WHEN BETTER AUTOMOBILES (*war goods*) ARE BUILT
BUICK WILL BUILD THEM

Santa Fe

for NEW MEXICO'S Spanish Indian Country



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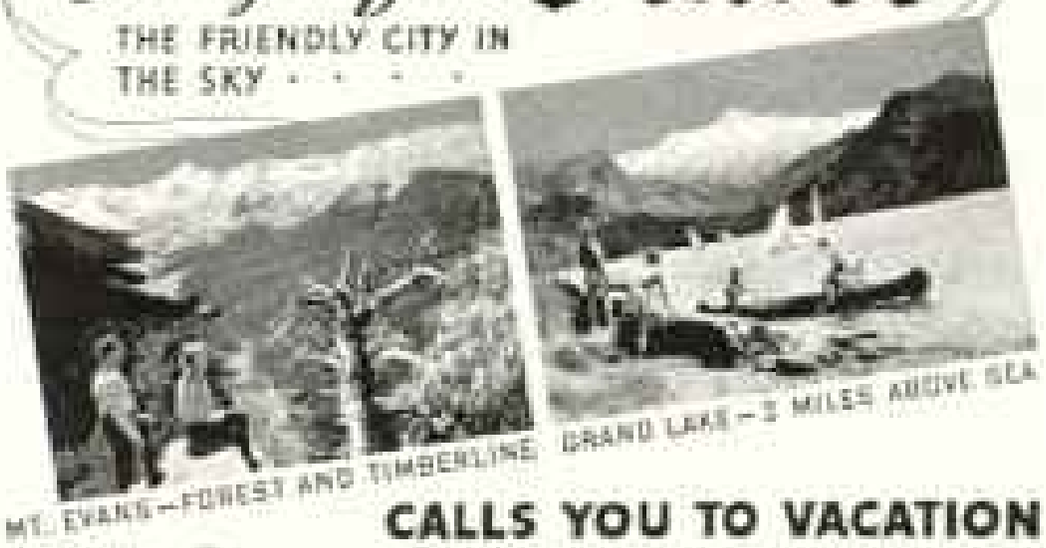

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Indeed you will, Susan. A wonderful house. We don't know exactly what it will be like. But it will be far nicer than today's houses, because *all* houses will be better in ever so many ways. And there will be many things in your house that aren't even invented yet.

"*I'll have a big, shiny automobile . . .*"

Or an airplane. Or even something like a magic carpet—who knows? Our radios and telephones and refrigerators all seemed like magic when we first heard of them.

"*I'll have lots and lots of money . . .*"

Money? Money isn't everything, Susan. But every nickel, every dollar will buy more than it does today. Go on.

"*And—and I'll always be happy, like you!*"

☆ ☆ ☆

Happier, we hope, Susan. For right now, in the laboratories, scientists are discovering things to make life happier, and in the factories engineers are finding ways to make products less expensive and more plentiful in years to come.

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HIGH ON THE ROLL

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FOR their stern facing of grim jobs ... for their splendid work in the delivery of essential War supplies throughout the world ... AGWI salutes the determined fighters of our sea-route fronts — the men and officers of America's Merchant Marine!

Theirs is a responsibility that can never be relaxed ... through long sea days ... in tense vigils of the night. On them, and their valiant efforts, much of the final Victory will depend. And when Victory is won — high on the roll of those who worked with fortitude to save our way of life will surely be the names of all who are so vitally contributing to the defense of the freedom of the seas.

It is a source of pride to AGWI that its employees ... loyal, alert Americans all ... will have their full share of that well-earned glory.

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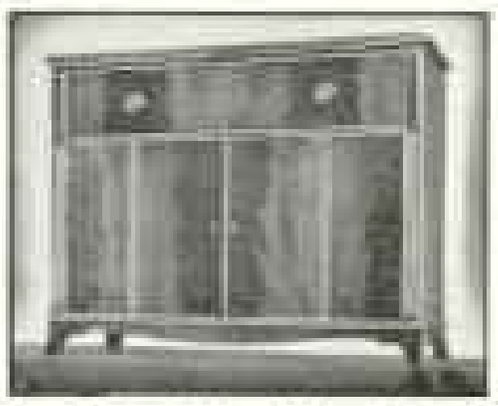

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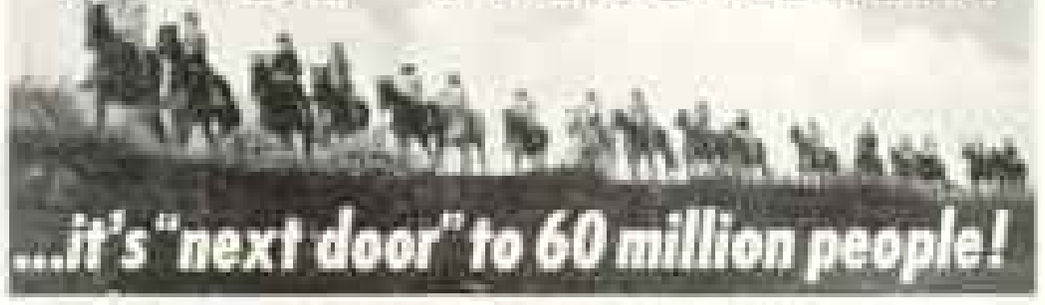

Uncle Sam favors war-time travel for health and relaxation...and more and more "neighbors" are favoring West Virginia's state parks and cabins, mountain resorts, and sports facilities to pep up spirits and energy. This inland recreation area is within 250 miles of 60,000,000 people . . . if you live nearby, you can take short restful trips to the "Mountain State" and still conserve resources vital to war efforts!

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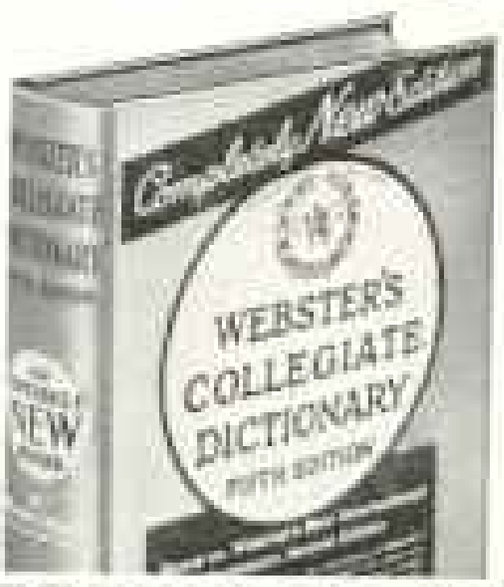

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That is why anyone with a suspicious cancer symptom should go to the doctor immediately. Some of the danger signals are:

1. Any unusual lump or thickening, especially in the breast.
2. Any irregular or unexplained bleeding.
3. Any sore that does not heal—particularly about the mouth, tongue, or lips.
4. Persistent indigestion, often accompanied by loss of weight.
5. Noticeable changes in the form, size, or color of a mole or wart.
6. Any persistent change from the normal action of elimination.

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The inventor of the "Blackout" has 8 arms

IF YOU'VE EVER poked around pools left by the tide, you may have happened across the octopus.

This unappetizing-looking creature is really regarded as a very choice morsel by many fish. So much so, that fishermen regard the octopus as excellent bait. His eight tentacles and parrot-like beak can be formidable to smaller fish. But unless he's a regular giant of his kind, he has precious little protection against the larger ones.

Any time friend octopus gets caught away from his hole in the rocks by a barracuda, for instance, his fate would be sealed, if it weren't for his ace-in-the-hole, the "Blackout."

Within the leathery sac that is the body of an octopus, he carries another sac—full of ink. When danger threatens, he squirts out this ink. The ink diffuses through the water with amazing speed. It effectually hides him from attackers and gives him a chance to scoot away to safety.

As the case of the octopus shows, Nature has been incredibly ingenious in devising protective apparatus for her creatures against the particular dangers that threaten them. But she has created nothing, perhaps, more ingenious than the device man has perfected for himself against the particular dangers that threaten him.

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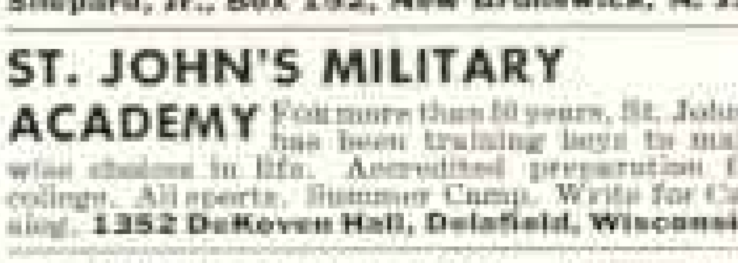

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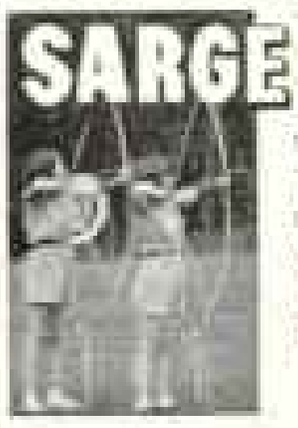

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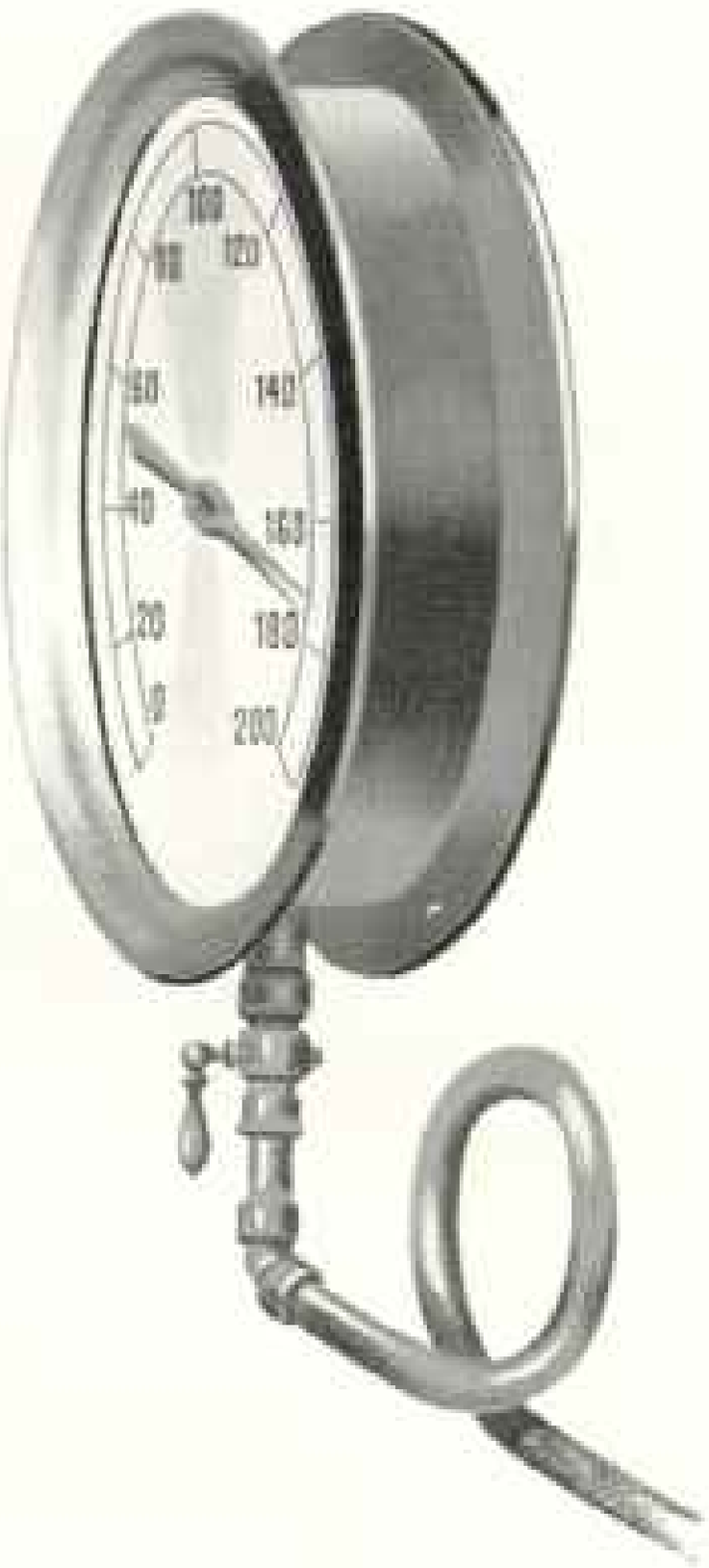

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