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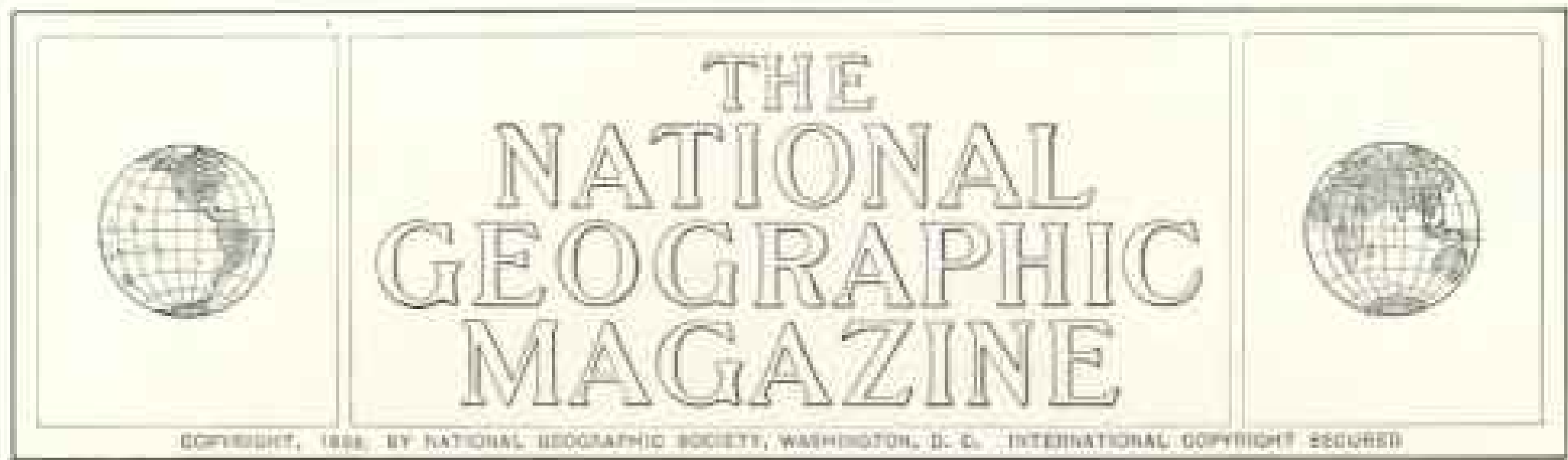
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MY FLIGHT ACROSS ANTARCTICA

BY LINCOLN ELLSWORTH

ONE day recently, while I was in Atlantic City doing some writing, the elevator man in my hotel remarked to me, "It must be mighty quiet down there around the South Pole."

"Yes," I replied, "it is. That's why I like it."

"I am a sort of poet myself," he answered.

Several weeks later he sent me the manuscript of some of his poems, asking if I would write a foreword to them. Idealists and dreamers, perhaps, most explorers are.

After the flight I made with Amundsen in 1926 from Spitsbergen over the North Polar Basin, restlessness beset me.* Desire nagged me continually until I was able to settle on the last great adventure of South Polar exploration—the crossing of Antarctica.

I made three trips to the Far South to accomplish this aim.

TWO MAJOR GEOGRAPHIC QUESTIONS

I hoped to span the 1,700 miles of continental ice that separates the Ross Sea on one side from the Weddell Sea on the other, because two major geographic problems remained to be solved there (map, page 4).

The questions were these:

Did the highlands of the Antarctic Archipelago on the Weddell Sea side continue on across Antarctica to join the mountains of South Victoria Land on the Ross Sea side?

Or, did this southern continent consist of at least two great land masses cut by a channel joining the Ross Sea and the Weddell Sea? (Page 35.)

* "Navigating the *Norge* from Rome to the North Pole and Beyond," by General Umberto Nobile, NATIONAL GEOGRAPHIC MAGAZINE, August 1927.

My plan for the first expedition in 1933 was to fly from the Bay of Whales on the Ross Sea to the Weddell Sea and back.

My base ship—a staunch, single-deck, motor-driven vessel of 400 tons—I bought in Norway. She was built in 1919 of Norwegian pine and oak, and had served as a herring boat until I sheathed her with oak and armor plate for an icebreaker. Her engine was a semi-Diesel type. She could do seven to eight knots, and had a cruising radius of 11,000 miles.

I named this little ship the *Wyatt Earp* for the unbelievably brave frontier marshal of Dodge City and Tombstone, who, more than any other man of his time, perhaps, typified the pioneer empire builders of the West.

THE FIRST EXPEDITION

Our first expedition reached Dunedin, New Zealand, November 9, 1933.

After a month of refueling and refitting, we started south and spent 22 days pushing through the ice pack into the open water of the Ross Sea. We reached the Bay of Whales January 9, 1934, and unloaded my airplane on the bay ice.

The *Polar Star* was a Northrup all-metal, low-wing monoplane, 31 feet long, with a span of 48 feet, built in California, and designed especially for my flight in Antarctica. It was fitted with a 600-horsepower Wasp motor.

Loaded to its capacity with gasoline, this plane would have a cruising radius of more than 5,000 miles. Thus three essentials for flying in the Antarctic were emphasized: large cruising radius, high top speed (230



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THE "WVATT EARP" SKIRTS ALONG THE BARRIER, STARTING POINT AND GOAL OF MANY ANTARCTIC EXPEDITIONS

On the ship's arrival at the Bay of Whales, January 9, 1934, for Ellsworth's first attempt to fly across Antarctica, an iceblink on the horizon (left) indicated that the ice face stretched on and on. A milky-white sky, such as that shown here, denotes ice and snow beneath, whereas a slate-colored water sky signifies open water. The width of the band, or blink, gives a scale to estimate the distance of the ice or open water from the beholder.

miles per hour), and low wings, so that the plane, after landing on the snow, could have its skis sunk and its wings lowered to the surface. Thus the wind could not get under them.

A unique feature of the plane was the flaps, which permitted it to land at less than 50 miles an hour.

We made a trial flight three days after our arrival and landed again on the bay ice. Heavy seas lashed the ice front, so we moved the plane a mile inland from the ship.

Then came disaster. The ice broke up for five miles inland from the ship, an occurrence unprecedented at this season, so far as records show.

In the break-up the plane was strained out of alignment and the skis crushed between moving ice cakes, so that flying it would be unsafe. There was nothing to do but end our expedition for the year and take the *Polar Star* back to the factory in America for repairs.

By the middle of the following Septem-

ber, 1934, the plane and I and my companions were back in New Zealand, ready for another try. This time I decided to make the flight in the other direction, from Weddell Sea to Ross Sea, because on the Weddell Sea side we could get to a flying base at least a month earlier. We first landed on Deception Island, in the northern part of the Antarctic Archipelago; but the snow on our runway melted before we could get the plane ready for flying.

OFF FOR THE SECOND ATTEMPT

While waiting here, we passed part of our time collecting penguin eggs.

You can't just take the eggs. You must leave your hat or a rock, or something, in the nest for the mother to sit on. As long as she feels something under her, she is content. Otherwise, she comes after you with her stubby wings and they are strong enough to break your ankle!

We caught two of the Adélie penguins and took them aboard our ship. One was



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ELLSWORTH PLAYS HOST TO A SAUCY LITTLE "NEIGHBOR" IN ANTARCTICA

While waiting for a break in the weather at Deception Island on the second expedition in 1934, some of the men collected penguin eggs and caught several of the birds and took them on shipboard. These Adélies are among the few creatures living on the ice-covered lands of the far south.

captured by putting a coal sack over his head. We dirtied his white "shirt front," and this apparently made him feel bad, for he sulked all the time he was on board.

When the disappearance of the snow made a flight from Deception Island impossible, we turned the *Wyatt Earp* south to find another take-off field and cruised down the west coast of the Antarctic Archipelago. I have never seen finer scenery anywhere in the world than this coast (p. 15).

After a search of 44 days on both coasts we selected Snow Hill Island (page 4).

On this island we found fossils in the bleak, bare ground—fossils of creatures related to crawfish, oysters and clams, and various forms of crustacea, which were perhaps 100 million years old (page 8). They indicate that at one time the vast frozen expanse which now is Antarctica was a temperate land, and had a warm climate. We even found fossils of wood that are related to the Sequoia trees in California.

NORDENSKJÖLD CABIN FOUND INTACT

It was upon Snow Hill Island that Dr. Otto Nordenskjöld established his head-

quarters and built a cabin where he spent the winters of 1902 and 1903. The cabin is still intact and the human warmth that once made its interior hospitable is today replaced by a huge block of sea-blue ice.

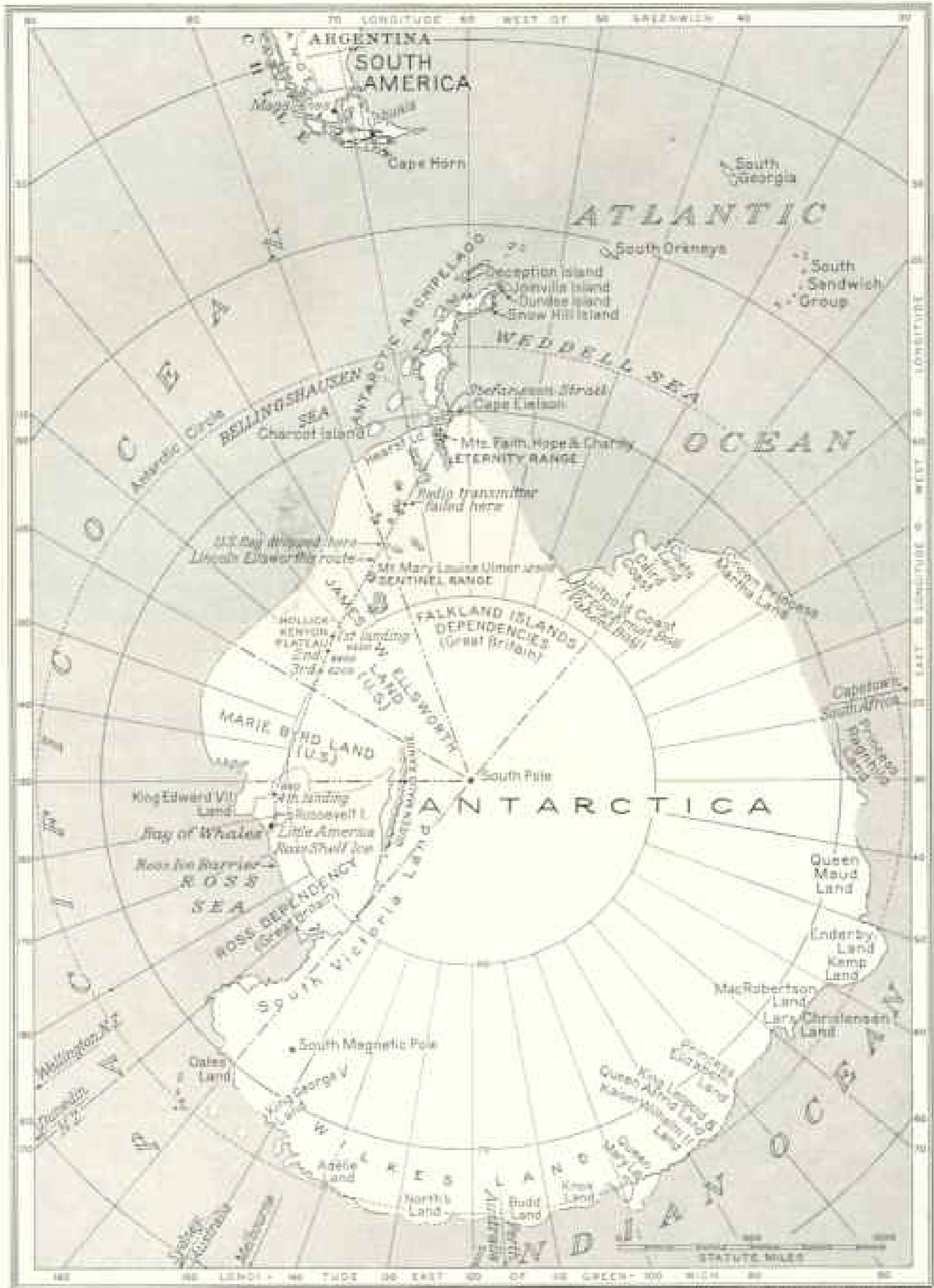
We were undoubtedly the first humans to visit it since he left it so hurriedly. The four corners were guyed with steel cables to withstand the 90-mile gales which he recorded there.

The ground round about showed the helter-skelter scene enacted there 33 years ago, after Nordenskjöld's ship had been crushed, when the men rushed to catch the rescue ship before the ice should close in upon them for the third season.

The mummified bodies of three white sledge dogs lay in front of the cabin, just where they had been shot. A pair of ice skates lay near the door; and a pair of boot trees. Against the cabin were several boxes of cans of sardines, pepper and mustard, and cakes of chocolate.

The chocolate tasted all right, but the thought of fish of a vintage of 33 years ago was too much for us.

The Swedish expedition led by Dr. Otto



Drawn by Albert H. Bumstead

ELLSWORTH'S FLIGHT BRIDGED ANTARCTICA FOR THE FIRST TIME

North is not just at the top of this map, as is usually the case, but all around its four sides! South is in the center at the South Pole. The *Polar Star* followed a straight course from Cape Eielson to Little America, yet it was headed southwest at the start and west-northwest at the end. Roughly circular, and nearly filling the Antarctic Circle, this vast ice-covered continent of some 5,000,000 square miles is larger than Europe, yet it has no permanent population! The huge pie-shaped territory claimed for the United States by the author was named for his father, James W. Ellsworth Land.



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COLLECTING PENGUIN EGGS FOR THE SHIP'S MESS

Give an Adélie a stone in its nest in place of an egg and it makes no protest. But take the egg without substitution and the bird flies into a rage, thumping the intruder with its short stubby wings. "The eggs are delicious when made into omelets, but ye gods, when they are boiled! Then they are like rubber balls, and fishy besides" (page 7).

Nordenskjöld was one of the most adventurous and successful that ever went into the Antarctic, for it was the geological work of Nordenskjöld and J. Gunnar Andersson which showed why the highlands of the Antarctic Archipelago must be considered a continuation of the South American Andes.

Weather proved our stumbling block on our second expedition. In the two months we were there we had only 12 continuous hours of cloudless sky.

On January 3, 1935, the weather cleared and we hurriedly got the *Polar Star* into the air. This was our last chance because it was so late in the season.

We flew southward toward the mainland of Antarctica, but soon the clouds closed in and snow squalls appeared ahead. We spent several hours mapping the Antarctic Archipelago and returned to our base.

Thus the weather defeated us for one

more year. So we turned north and returned home by way of South America.

On our way home from our second expedition we had noticed Dundee Island, north of Snow Hill Island, and decided that it might be a better base for our next flight. So we landed, in November, 1935, on this island, 500 miles farther south than Cape Horn, and separated from it by the stormiest ocean in the world.

PLANE TRAVELS 48,000 MILES FOR A 20-HOUR FLIGHT

The *Wyatt Earp* had carried me and my plane in the last three years 48,000 miles in search of a suitable taking-off ground for our 20-hour flight across Antarctica.

A good-natured friend had remarked to me when he bade me farewell in New York, "Your *Polar Star* has traveled farther and flown less than any other plane!"

In addition to my pilot and myself, oil



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A GIANT FOOT AND ITS BROKEN SHIN

A landing ski and its attachment post, crushed when the *Polar Star* was caught in the ice break-up at Bay of Whales, January 13, 1934. The plane is on the *Wyatt Earp* ready for the long voyage back to America for repairs (page 2).

and gas, we were to carry on the airplane food, a hand sledge with cover and lashings, tent, food box, primus stove, one snow shovel, snow knife, two pairs of snowshoes, and also a radio trail set and a portable generator, reindeer-hide sleeping bags, and photographic equipment.

Our food consisted of pemmican, wheat biscuits, sugar, bouillon cubes, bacon, oatmeal, butter, powdered milk, dried apricots. We had three months' emergency rations in sacks and tins.

Our radio equipment was constructed to transmit on any wave length between 20 and 80 meters. The power output was 100 watts and it was intended throughout the progress of our flight that the *Wyatt Earp* should receive news which could be relayed to New York. We also had an emergency transmitter and receiver which could be carried on the trail.

Our total weight was 7,789 pounds; our gasoline alone weighed 2,796 pounds.

In our party on shipboard were 17 men, six of whom stuck through all three expeditions: Sir Hubert Wilkins, without whose assistance the flight could never have been made; Lanz, the radio operator; Captain Olsen, of the *Wyatt Earp*; Liavaag, the first mate; Chief Engineer Holmboe; and Larsen, the cabin boy. Money could not buy such loyalty as theirs.

"THE QUIETEST MAN I EVER KNEW"

I was fortunate in obtaining for pilot of the *Polar Star* Herbert Hollick-Kenyon, of the Canadian Airways. Kenyon already had varied experience flying under sub-arctic conditions of northern Canada. He was a fine fellow, a grand pilot, and the quietest man I ever knew.

We had planned to make the 2,500-mile flight along the Antarctic Archipelago and across the continent to the Bay of Whales on the Ross Sea in 14 hours, but it took us just 22 days to get across.

It was conceivable that the flight could be made in 14 hours. Our actual flying time was not badly estimated, for we were in the air only 20 hours and 15 minutes. The rest of the 22 days was spent in overcoming the odds which that area provides with inconsiderate abundance.

A short distance away from where the plane was moored on the shelf ice of Dundee Island was an Adélie penguin rookery. Members of our party gathered the eggs in a bucket for the ship's mess. Penguin eggs are delicious when made into omelets, but ye gods, when they are boiled! Then they are like rubber balls, and fishy besides (page 5). My first experience with these eggs was when they were boiled. Consequently, I have never since been able to eat them in any form.

TURNED BACK AGAIN—WITHIN SIGHT OF THE UNKNOWN

We took off in perfect weather November 21 for what we supposed was to be our flight across the continent. We were going along beautifully. I was elated.

Then, after we had flown almost 600 miles, just after crossing Stefansson Strait, which separated the known from the unknown, the celluloid in a fuel gauge bulged and was in imminent danger of bursting in Kenyon's face. If we landed where we were to repair the defective part, there was a question whether we could take off again with our heavy load and make altitude.

There, just ahead, lay a great unknown mountain range, with peaks rising majestically to 12,000 feet. These had never before been seen by the eye of man. I had lived for this moment. Only one who has known intense anticipation of some great event can imagine the depth of my despair at being forced back after coming so far along the path to victory.

After 10½ hours of flying, we landed back at Dundee Island to make preparations anew. Weary hours the crew worked cheerfully, again hauling gas to the hilltop, checking the engine and repairing the gauge. No one complained. Work and anxiety are inevitable parts of exploration.

While the men labored with the plane, I worked out new navigation graphs based on an 8-o'clock (G. C. T.)* start for the following morning.

* Greenwich Civil Time is referred to throughout this article.

This year we had no meteorologists with us, for I was convinced that the only way to make this flight was to start off when it was clear, be prepared to land in case of bad weather ahead, and to camp until conditions again were favorable for flying.

Although on November 22 the weather promised to remain clear, I had grown distrustful and scarcely drew a free breath until 3 a. m. the next day, when Hollick-Kenyon and I were called and told the weather was clear.

We ate a hearty breakfast, then dressed in heavy clothing. We wore snowshoes and purposely made slow time walking the five miles to the plane because we did not wish to dampen our clothing with perspiration before taking off. After two hours we reached the place where the *Polar Star* lay groomed, ready for flight.

As Kenyon busied himself with last adjustments, I had only one thought: "This time we must make it!" There was a finality about it all I had not experienced before. Subconsciously I heard the whir of the propeller and mechanically noted 8:05 o'clock as we took off to the south in renewed pursuit of the unknown (page 14).

Weddell Sea was quite open for the first 300 miles, an unusual phenomenon in the Antarctic springtime.

For 600 miles we flew along the eastern coast of the Antarctic Archipelago, previously explored by Wilkins, until we came to the frozen channel which we identified as Stefansson Strait, named by Wilkins.

This strait appeared to be not more than three miles wide, which is much narrower than it is shown on the maps. We could not see far enough to determine whether it actually connected Weddell Sea and Bellingshausen Sea, or was merely a deep fiord.

At 12:22 we crossed Stefansson Strait and took compass bearings of the continental coast. The low, black, conical peaks of Cape Eielson rose conspicuously out of a mantle of white on our left.

OVER THE UNKNOWN—AT LAST!

We climbed to 13,000 feet, where the temperature was 10 degrees, Fahrenheit. We were now over the unknown.

It falls to the lot of few men to view land not previously seen by human eyes. It was with a feeling of keen curiosity and awe that we gazed ahead at the great mountain range which we were to cross. Bold and rugged peaks, bare of snow, rose



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SNOW HILL ISLAND, WHERE THE WEATHER WAS ALWAYS BAD!

The low ice face made it possible to land the *Polar Star* here on the second expedition. A two months' wait gave only 12 continuous hours of cloudless sky. Fossils were found in the bleak area beyond.

sheer to some 12,000 feet above sea level.

Again I felt a supreme happiness for my share in the opportunity to unveil the last continent in human history.

We were indeed the first intruding mortals in this age-old land, and, looking down on the rugged peaks, I thought of eternity and man's insignificance. So these first new mountains we saw I named Eternity Range (pages 16 and 17). The three most prominent peaks on our right I named Faith, Hope, and Charity, because we had to have faith, and we hoped for charity in the midst of cold hospitality.

In striking contrast to these rugged mountains were the flat, low peaks of the Antarctic Archipelago we had followed south—peaks which dwindled down into low isolated nunataks as they neared Stefansson Strait. Undoubtedly both ranges are of sedimentary origin. I wondered whether valuable coal deposits might one day be unearthed here.

The range which we now were crossing was a loosely formed one, with none of the crowded topography of peaks with glacier-filled valleys and highly crevassed bottoms,

such as the Queen Maud Range shows. We saw neither glaciers nor crevassed surfaces in this part of our crossing.

We fully realized that this was the most dangerous area of our flight, for on one side lay the frozen Weddell Sea, which no ship could penetrate, and on the other an unknown continent larger than the United States and Mexico.

On we went, the mighty panorama of the vast Antarctic Continent unrolling before our eyes. On and on, for three hours more, and the mountains beneath us gave place to a vast polar ice plateau from which emerged a few nunataks, the last evidence of the mountain chain just passed. We were flying at 10,000 feet above sea level, which was the average altitude of our flight.

At 4:15 o'clock, when we had traversed 1,000 miles, and were yet 1,500 miles from the Bay of Whales, the radio broke down because of a defective switch and antenna lead. Not hearing from us, the world began to worry, as we learned later.

At that instant on the distant right horizon we sighted a mountain range with isolated black peaks, which soon faded out.



© Ellsworth Antarctic Expedition

DUNDEE ISLAND'S HAIR SEALS HAD NO FEAR OF MAN.

The creatures apparently had never before been disturbed and, like dogs, seemed to enjoy having their sides scratched.

After 45 minutes more a few additional peaks showed on the same skyline, and in another 25 minutes more mountains 120 to 140 miles away appeared on our left horizon; also a few peaks to the right.

PEAK NAMED FOR MRS. ELLSWORTH

Half an hour passed and it became very hazy ahead; below it was dead flat, with a patch of sastrugi (frozen windrows of snow) on our left.

One hundred and ten miles farther on, again as we looked to the left, we came abeam of a solitary little range to which I took bearings.

It was symmetrically formed with a central pyramid rising to 13,000 feet and dwindling down at either extremity to merge into the surrounding plain. I named it Sentinel Range and its central peak Mount Mary Louise Ulmer, for my wife, whose unfailing help was a bulwark of support (page 18).

Fifteen minutes later, on the south horizon and 100 miles distant, appeared a long, black, flat-topped range which visibly extended through at least one degree of lati-

tude. This appeared to be the last of the mountains we were to see, for ahead and around swept only a vast plateau meeting the horizon in an expanse of white.

Throughout the journey so far visibility had been from 120 to 150 miles.

For two hours we flew on, with nothing ahead to break the monotony of the level ice plain stretching out beneath. We had been in the air nearly 14 hours, flying at about 112 miles per hour. Visibility began to get poor because of clouds ahead. We determined to land and take an observation, for we had no gas to spare.

CAMPING 1,800 MILES FROM NEAREST SETTLEMENT

This was the first of four landings during the crossing and we passed 12 hours of our 19 hours here taking observations to check our position.

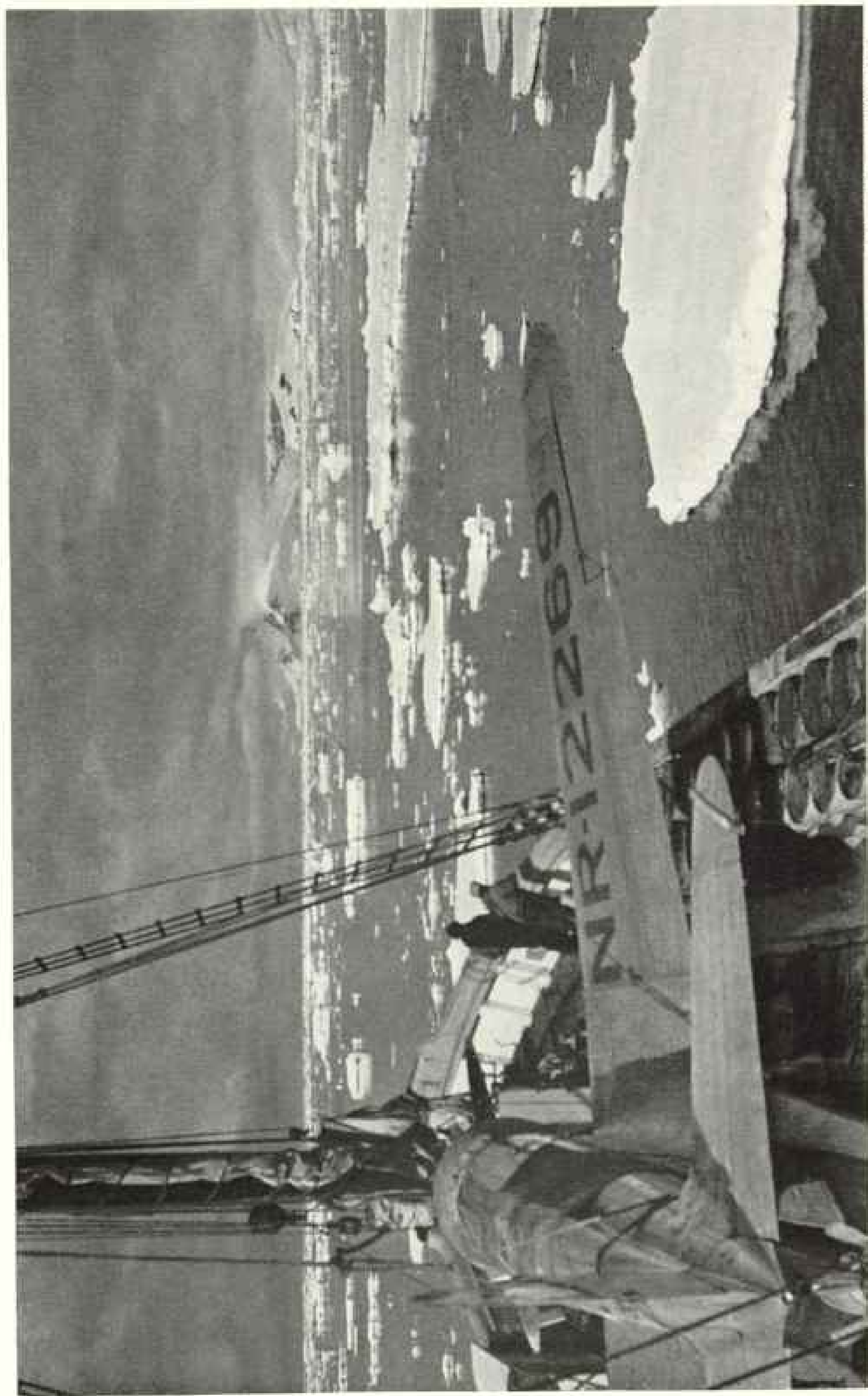
The snow on the high plateau was granular and packed so hard that the skis of the plane made little impression. The surface elevation at our first landing place was 6,400 feet, and the plateau extended with slight undulations in all directions.



© Ellsworth A. Arctic Expedition

ALL THAT PROJECTS ABOVE THE SURFACE WHEN A BLIZZARD ENGULFS THE "POLAR STAR" IS THE SNOW-CHOKED ENGINE

Here is striking evidence of how the weather defeated the second expedition. Two members take advantage of the hard, smooth surface to ski down the steep slope above the camp on Deception Island. It seemed a hopeless task shoveling out the snow from around the plane. First storms, then melting snow on the take-off field, and continually cloudy skies made it impossible to start the transcontinental flight (page 5).



© Ellsworth Antarctic Expedition
NOSING THROUGH DRIFT ICE, THE "WYATT LARP" STEAMS ALONG THE ANTARCTIC ARCHIPELAGO IN QUEST OF A SNOW TAKE-OFF FIELD



© Ellsworth Antarctic Expedition

TO ENTER THIS TENT ON THE ICE ONE MUST CRAWL ON ALL-FOURS.

Ellsworth demonstrates the "bellows sleeve entrance" which kept snow and wind from getting inside. The sleeve also made it awkward for the explorers to enter (page 20). The floor cloth of the tent was sewed to the sides and ends, also to exclude wind and snow. The picture, taken on Dundee Island the day preceding the final take-off, shows Hollick-Kenyon on the left.



© Ellsworth Antarctic Expedition

SHIPPING CARGO FOR THE UNKNOWN.

On the wing of the *Polar Star* are the reindeer sleeping bags of Lincoln Ellsworth and Herbert Hollick-Kenyon. The box contains a primus stove which burns vaporized gasoline, and several days' rations. Stored in the airplane are three months' emergency rations. Since the skis were not stream-lined, they slowed the normal cruising speed, 150 miles per hour, to about 116.



© Ellsworth Antarctic Expedition

HERE "OLD GLOVEY" WAS FLOWN OVER THE EARTH'S LAST UNCLAIMED LAND

The photograph was taken after the flyers had made their first landing on the Antarctic plateau, November 23, 1955, in latitude $79^{\circ} 12'$ South, longitude $104^{\circ} 10'$ West, and had set up their tent. By raising the Stars and Stripes Ellsworth established a claim for the United States to a wedge-shaped area extending between the 80th and the 120th meridians west of Greenwich, and from the coast to the South Pole (see map, page 4). The surface elevation at this camp was 6,400 feet, and the plateau extended with slight undulations in all directions.

We climbed out of the plane rather stiffly and stood looking around in the heart of the Antarctic.

There we were—two lone human beings in the midst of an ice-capped continent two-thirds the size of North America. Perhaps this thought brought us closer together.

AMERICAN FLAG RAISED OVER VAST AREA

Suddenly I noted the fuselage was crumpled. Kenyon thought it must have been done on the take-off, but I had been writing my notes and had felt no jar then. Now I recalled that when we came down here I thought my teeth would go through the top of my head.

We had been flying for 14 hours, and, as we landed, there was a slight haze underneath. Besides, there was the uncertainty about what kind of landing surface we might find.

We fixed our position at latitude $79^{\circ} 12'$ S., longitude $104^{\circ} 10'$ W. We found we were 45 miles off our course.

The Pole lay 750 miles south of us, Dundee Island 1,550 miles behind us, the coast line of the continent several hundred miles to the north, and the Bay of Whales 750 miles ahead. It was here that I raised the American flag over the last unclaimed land on earth, comprising about 350,000 square miles. This area, extending from longitude 80° to 120° W. and from the coast line to the Pole, I named James W. Ellsworth Land, for my father.

That part of the plateau above 6,000 feet I called Hollick-Kenyon Plateau, for my pilot.

We set up our balloon-silk tent and took repeated observations, which consisted of shooting the sun with a sextant and getting the exact Greenwich time, then going into the tent and, with our tables and Nautical Almanac, working out our position.

After getting one position line, it was necessary to wait at least three hours to get another line crossing it at an angle sufficiently sharp to determine our exact location.



© Ellsworth Antarctic Expedition

FAREWELL TO DUNDEE ISLAND—ON SLOPING ICE THAT GAVE A TRICKY TAKE-OFF FOR THE TRANSCONTINENTAL FLIGHT

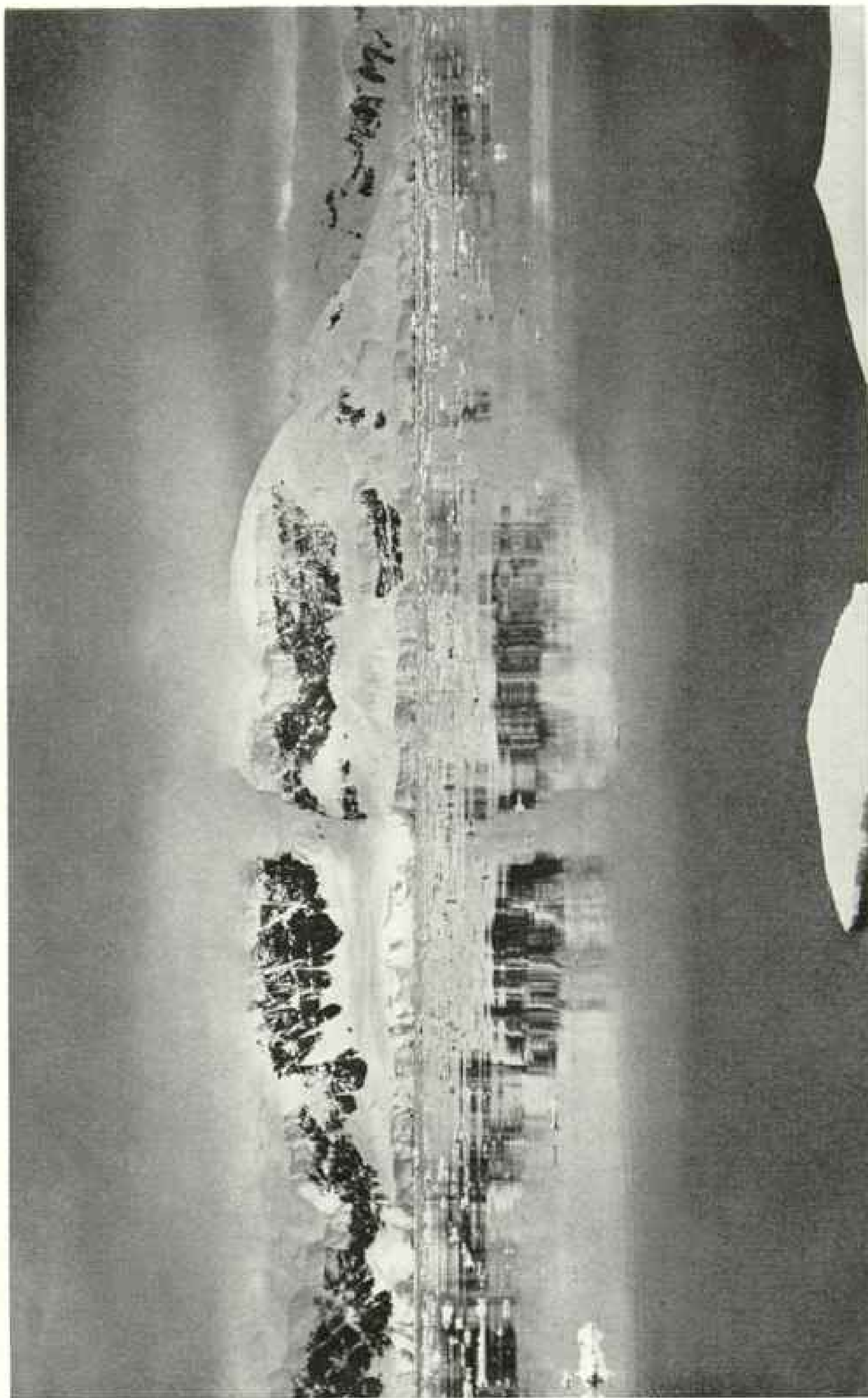
The photograph, taken at 8:05 Greenwich Civil Time, November 23, 1933, shows the ground party's last view of the *Polar Star*, as it roared down the snow field.



© Ellsworth Antarctic Expedition

READY FOR HER FLIGHT ACROSS ANTARCTICA, THE "POLAR STAR" RESTS ON SNOW-COVERED DUNDEE ISLAND

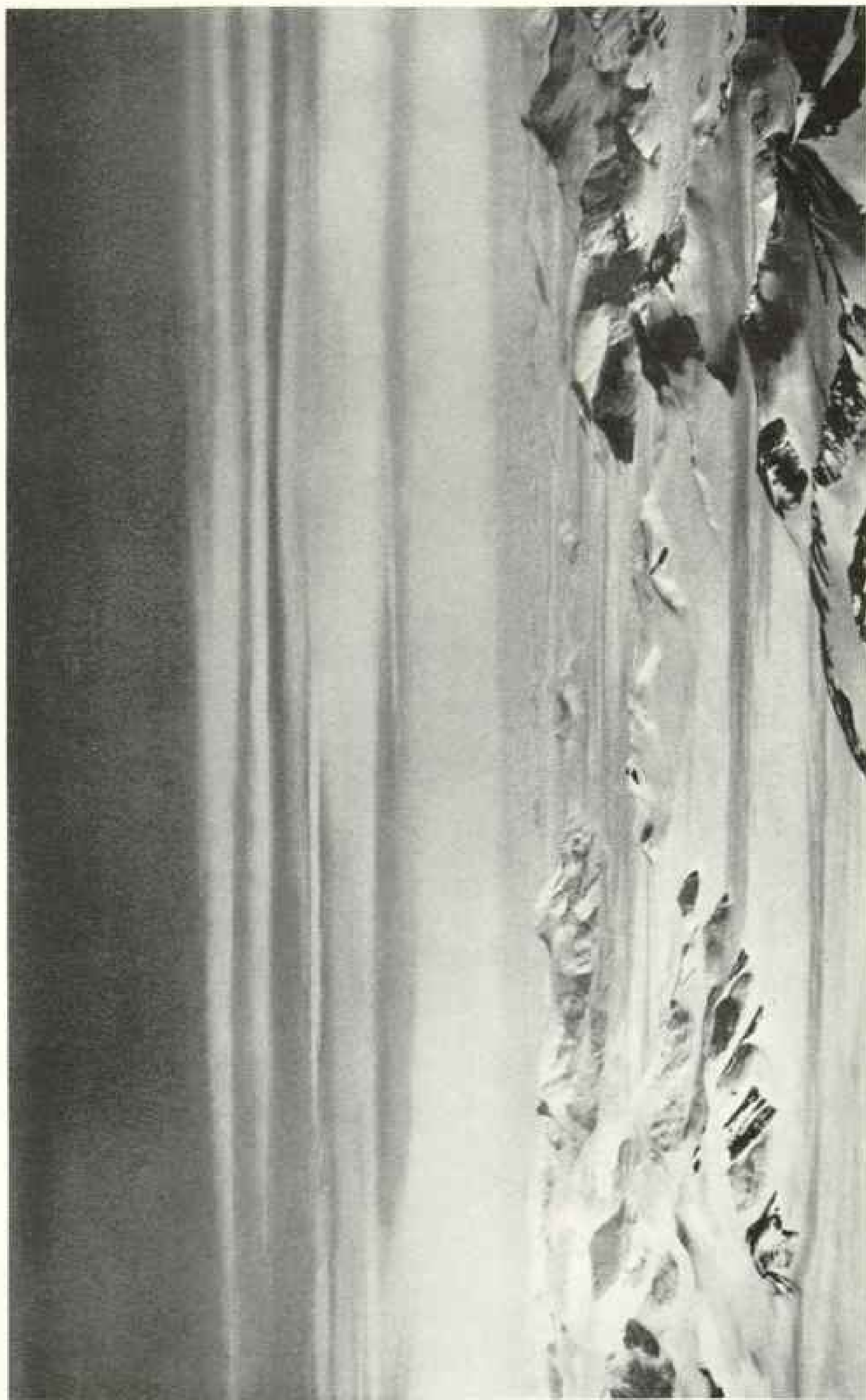
Below the wing is the canvas hood enclosing a fire pot for heating the engine (page 21). In the emergency tent mechanics warm themselves. Over the left wing the ship *Wyatt Earp*, moored to the ice face, seems dwarfed by the peak of Joinville Island.



© Ellsworth Antarctic Expedition

SOME OF THE WORLD'S FINEST SCENERY—BUT SELDOM A HUMAN EYE TO SEE IT!

Among the large and small islands of the Antarctic Archipelago, black rocks protrude from their mantles of snow and ice. The cliffs of ice facing the sea make it impossible to land a plane along most of this coast. The sheer ice walls shown here on the Bellingshausen Sea side are approximately 300 feet high.



C. Ellsworth Antarctic Expedition

THE FRINGES OF ETERNITY

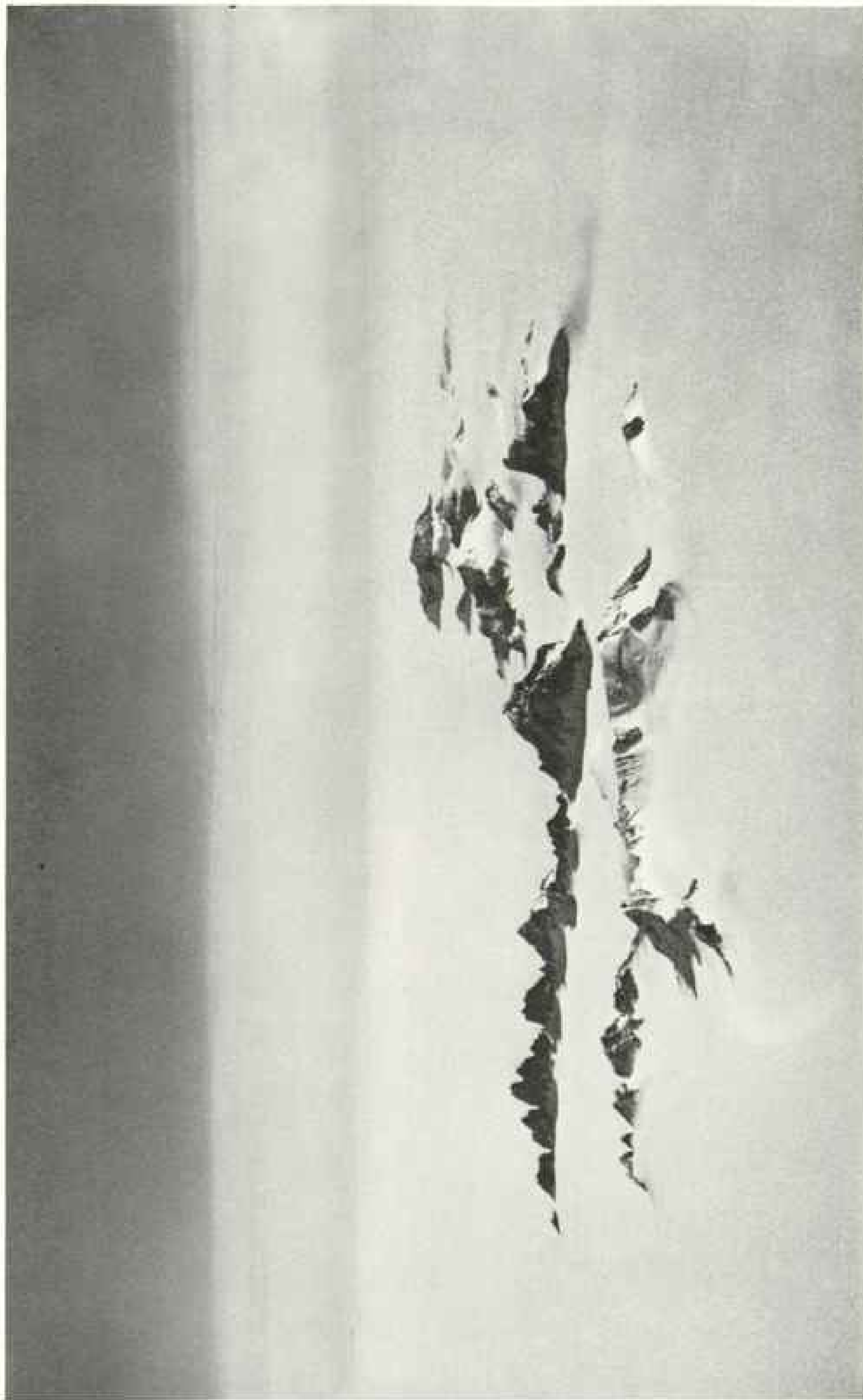
These peaks of the Eternity Range were photographed two and a half hours after the *Polar Star* crossed Stefansson Strait. Thirty-seven minutes later this great mountain range dwindled into isolated nunataks, which gave way to the level Antarctic plateau lying at an elevation of between 6,000 and 7,000 feet.



© Ellsworth Antarctic Expedition

MOUNTAINS NEVER SEEN BEFORE BY HUMAN EYE FLASHED INTO VIEW

The peaks rise 17,000 feet near the Heart Land coast, on the mainland of Antarctica. Ellsworth sighted them as he flew over Stefansson Strait to the continent and named them Eternity Range. He found them a striking contrast to the flat, low peaks of the Antarctic Archipelago, which he had followed from Dunder Island. From their appearance he believes them to be of sedimentary origin (page 8).



© Ellsworth Antarctic Expedition

"WE CAME AHEAD OF A SOLITARY LITTLE RANGE—I NAMED ITS CENTRAL PEAK MOUNT MARY LOUISE ULMER, FOR MY WIFE."

"Her unflinching help was a bulwark of support," says Lincoln Ellsworth (page 9). This group of mountains, christened Sentinel Range, was sighted about ten miles south of the line of flight when the explorers had been 11 hours in the air.



© Ellsworth A. Amundsen Expedition

ALMOST FREE! SEVERAL DAYS AFTER THE BLAZZARD, WITH MUCH OF THE SNOW SHOVELLED AWAY

A difficult task was clearing the flourlike snow from inside the tail of the plane. It had sifted and packed hard from the rear cockpit to the extreme end. It fell to Ellsworth, the slighter of the two men, to crawl in among the struts and bail out the fine grains with a pemmican mug (page 24).



© Ellsworth Antarctic Expedition

GOODBYE TO THE "WYATT EARP"—OFF FOR THE UNKNOWN!

Here the flyers look back at the little mother ship, fast in the ice, as they turn tail and head for the Bay of Whales, 2,400 miles away. From here on the plane skirted the coast of the Antarctic Archipelago for 600 miles and then climbed over the mountains to the Antarctic plateau.

Immediately after getting the altitude of the sun, we went inside the tent and started our primus stove, putting a pot of snow on to melt for water in which to boil oatmeal and chunks of bacon.

No sooner had we got the oatmeal to cooking than my stiffness from sitting so long in the cramped quarters of the plane manifested itself. To get in through the balloon entrance of the tent, it was necessary to crawl on hands and knees. One could not see what was to right or left of him. So I bumped into the primus stove, spilled our oatmeal, and we had to start preparing our meal all over again (p. 12).

We spread out our reindeer sleeping bags and between observations tried to sleep. In addition to the strain of 14 hours' flying, we experienced a feeling of tenseness because we did not know what lay ahead.

In the plane we had been wearing a suit of silk and wool underclothes next to the skin, over which was a camel's hair suit of underclothes, then an ordinary flannel shirt and a pair of ordinary trousers. The crease, by the way, never came out of Kenyon's trousers!

Outside the flannel shirt Kenyon wore a reindeer parka and I had on the Arctic squirrel parka given me by Amundsen. On our feet we wore two pairs of heavy woolen socks, over which were canvas knee boots with rubber soles. These we found excellent for our snowshoes; but the canvas became wet through and our feet were never dry.

WELCOME RELIEF FROM DAZZLING WHITE

I went out once to get exercise between observations, but the monotony of the terrible expanse of endless white got on my nerves, so I was glad to get back into the four walls of the tent. There are 24 hours of daylight in this region at this time of year and that, too, wears on the nerves.

The temperature here was 15 degrees below freezing.

During our 19 hours in this first camp we strung up the antenna wires on the bamboo sledge poles and put the trail set into operation, working it by hand. We kept on sending, although we got no response. Thinking we had the wrong wave length, we kept changing the length of the



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SNOWED IN BY AN ANTARCTIC BLIZZARD

No sooner had the flyers pitched their tent than a blizzard broke upon them. For three days they lay in their sleeping bags while the air temperature was 5 degrees below zero, Fahrenheit. A 45-mile gale threatened to carry away the tent, but the pegs, frozen firmly in the snow, held. During the flight across the plateau the *Polar Star* made four landings. This was at the third camp.



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AVIATION'S VERSION OF THE HOT WATER BOTTLE

The canvas warming hood, in place under the nose of the plane, was used for 45 minutes before each start to limber up the *Polar Star's* still "muscles." A fire pot was placed under the canvas. This photograph, also at the third camp, shows the snow shoveled from in front of the plane.



© Ellsworth Antarctic Expedition

"ELLSWORTH IS HERE," SIGNIFY THIS STREAMER AND TENT

It was planned before the flight that the *Wyatt Earp* should sail for the Bay of Whales as soon as the explorers took off from Dundee Island. When the radio failed and those on the ship did not know the fate of the flyers, they steamed first to Chile to take on a relief plane, then turned toward the Bay of Whales. As a signal of their arrival, the flyers erected this camp and the orange streamer at the mouth of the bay, six miles from Little America, where they lived in Admiral Byrd's deserted huts. Ellsworth left a note in the tent to inform the finder that he and Kenyon were safe.

antenna wires, but still no response. We assumed, being 5,400 feet above sea level, that there were no intervening mountain ranges to deter contact with the outer world. We always sent general calls besides trying to get contact with the *Wyatt Earp*.

We were surprised at the ease with which we could land or take off on the hard surface. It required not more than 50 yards to rise from the snow when we left this first camp on November 24. The next leg of the flight lasted a brief 30 minutes, and we came to ground because of low visibility ($79^{\circ} 30'$ S. latitude; $107^{\circ} 55'$ W. longitude). We again set up our tent and waited three days for good weather.

Midnight of the third day saw us flying again, but only for 50 minutes. The weather was so thick we could barely see to land. Evidently we were on the down grade to the Ross Shelf Ice, for the ground elevation here, at latitude $79^{\circ} 58'$ S. and longitude $114^{\circ} 15'$ W., was 6,200 feet.

No sooner had we pitched our tent than

a blizzard was upon us (p. 21). For three days we lay in our sleeping bags trying to keep warm. It was minus 5 degrees Fahrenheit and so cold I had to take my fur parka from beneath my bed and draw it over my feet and legs inside the sleeping bag.

I thought surely the tent would go with us inside it, as the floor cloth on which we lay was sewn to the sides of the tent. We were spared this unceremonious ejection only because the pegs holding the guy-ropes had frozen so firmly in position that even the 45-mile gale could not tear them out.

NEW DATA ON ANTARCTIC WINDS

When the blizzard abated we were able to cut snow blocks to erect a shelter to windward of our tent. No doubt it helped, but still the blasts of wind billowed in the tent on Kenyon's side and kept sliding him over almost on top of me as we tried to rest and sleep. Kenyon complained laughingly that the tent seemingly was always pitched so the billowing was on his side.



Photograph courtesy Discovery Committee Colonial Office

NEWS OF THIS MEETING AT LITTLE AMERICA WAS FLASHED AROUND THE WORLD

A landing party from *Discovery II* reaches Byrd's abandoned ice village and finds Ellsworth and Kenyon safe. Ellsworth (center) had been suffering from an infected foot caused by freezing and could not go, as Kenyon did, to the Barrier face to meet the visitors. "Have you anything to eat?" were almost the first words uttered by the hungry newcomers, unaccustomed to arduous exercise on shore, when they found the flyers (page 32).

During the whole mid-section of our flight—that is, from the time we left Eternity Range until we started on the down grade to the Ross Barrier—the prevailing winds blew from the east and southeast. Only twice did we have a north wind, and that lasted only for a few minutes. We never had a west wind.

Eight days—that is, until December 4—the storm held us prisoners in this cheerless camp. We accumulated grease and dirt, for we were never able to heat enough snow on the little cooking primus to wash with. We had to bring the gasoline generator for the radio into the tent to get it started. The exhaust soon blackened the tent and us, too.

Our only excursions outside during the blizzard were to use the wireless on our schedule three times daily and to fill our gallon bucket with snow for water in which to cook our morning meal of porridge and boiled bacon, and the evening meal of pemmican.

Our food ration was 34 ounces a man

each day, but we were not obliged to adhere to the allowance, as we ate only twice a day. Even then we were never very hungry.

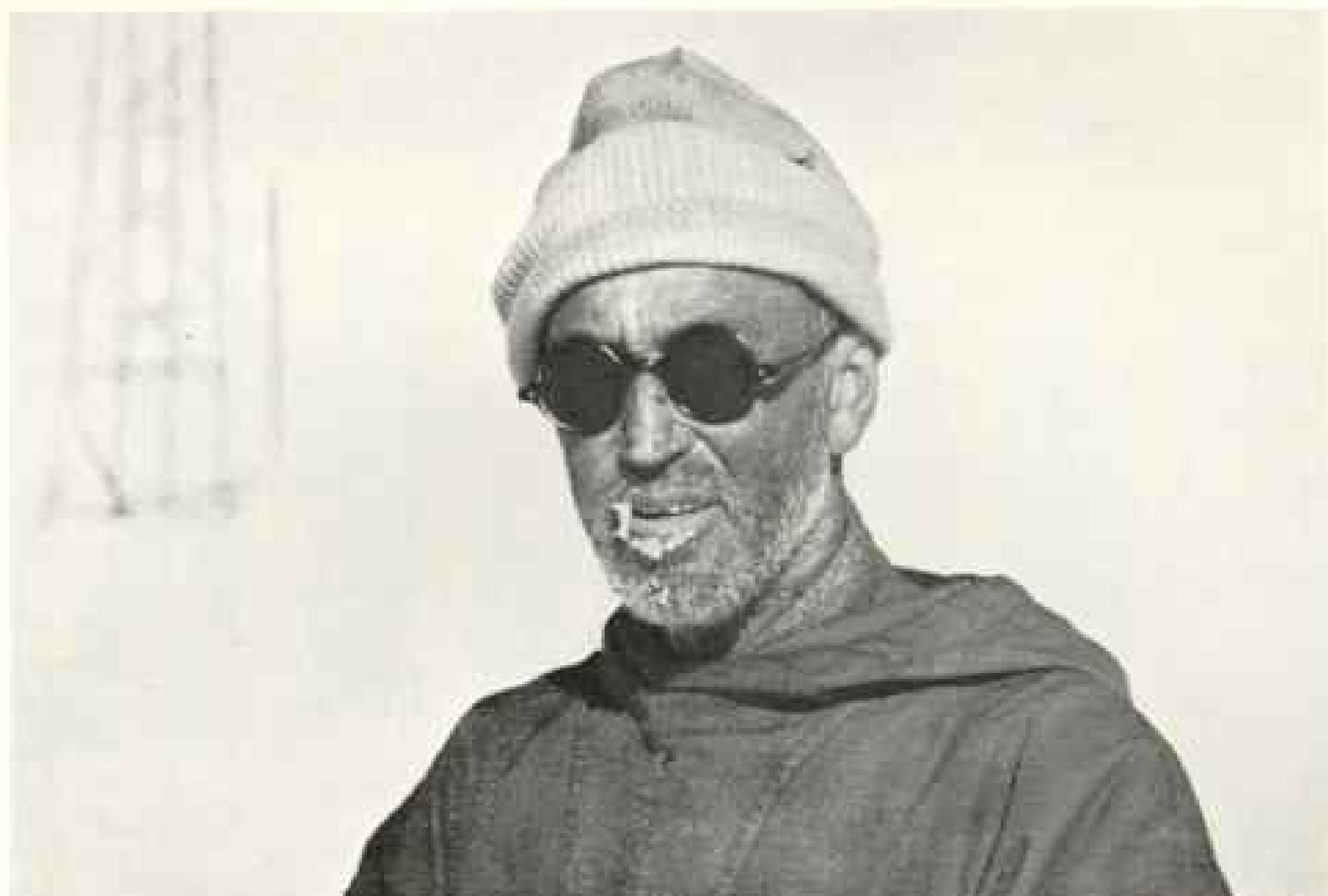
In the morning, we again had a mug of oatmeal with chunks of bacon boiled in it, milk, sugar, and oat biscuit with butter on the side. In the evening we had a mug of pemmican, oat biscuit and butter.

WHEN LIFE OR DEATH DEPENDS UPON AN AIRPLANE

I thrived on this simple diet, just as in 1925 with Amundsen I never grew tired of our menu of hot chocolate morning and night, and pemmican at noon. Intense interest and enthusiasm for the task have a strange influence upon one's mental attitude.

One evening, over a mug of pemmican, Kenyon voiced what was in my mind when he said, "Maybe this is all meant to try us out," and I remembered the beautiful promise in the old hymn:

"So long Thy power hath blest me,
Sure it still will lead me on."



© Ellsworth Antarctic Expedition

TWO OF ANTARCTICA'S RARE "GROWING THINGS"—BEARDS AND ICICLES.

Lincoln Ellsworth after two months without a shave. No washing was possible during this time, for the fuel supply was too scant to permit melting snow except for drinking and cooking. Dark glasses were worn to prevent snow blindness from the glare, which seemed worse on cloudy days than on sunny ones.

Catastrophe might be lurking just ahead should our frail man-made contrivance of metal and wood, lying inert and lifeless, deeply buried in the snowdrift beside our little tent, grow weary of its mission and set us adrift there where 630 miles separated us from our destination. True, the coast was only a few hundred to our north, but even so there might be a hundred miles of pack ice between it and open water.

There would be seals, and perhaps penguins. After that, what? Though one learns to accept disappointment in those regions, the thought of a month's man-haul on foot was anything but inviting.

All these things did come to mind one morning when we tried unsuccessfully to start the airplane motor after warming it for an hour. We were being buried deeper and deeper in the snow. The situation seemed bad. If we could just get out of that hole, nothing else seemed to matter.

Of all abominable jobs in Polar regions, next to man-haul, the worst is shoveling snow. It is dry, fine as flour, sifts into everything, and packs as hard as rock.

After the blizzard we discovered that the entire tail of our plane was one solid block of snow. Since I was more slender than Kenyon, it fell to my lot to crawl in among the control cables and struts to bail it out. With a bucket and pemmican mug, this job took one whole heart-breaking day (p. 19).

All the time in this camp we were beset by many troubles. The valve of the primus stove leaked air and constant pumping was necessary to keep the flame going.

Kenyon showed his ingenuity again when, from among the spare parts of the plane, he found a lead valve which we whittled down and, with the aid of a washer, fitted on the stove.

Then, too, the drift kept piling up around the plane and it seemed as if we would be buried.

Although the plane radio set had ceased to function when we were 1,300 miles from our destination, or opposite Charcot Island, our first rendezvous base previously agreed upon, we were not then particularly concerned because we were provided with three means of communication,



© Ellsworth Antarctic Expedition

BELIEVING HER OWNER "LOST," THE "WYATT EARP" FLIES SYMBOLS OF GRIEF

Because no word had come from Ellsworth and Kenyon, owing to failure of their radio, the party on the ship feared they had perished and flew flags at half-mast. Here the ship forces its way through the rough ice off King Edward VII Land, northeast of the Bay of Whales. Several days later it reached the bay and found the explorers safe.

In addition to the plane set powered by the motor during flight, we carried for auxiliary power, when not flying, a portable generator of 300 watts; we had also a hand-operated trail set complete in itself. It seemed unreasonable to suppose that all three means could fail. Nevertheless, owing to conditions still unexplained, they did fail in their primary purpose, which was to keep in touch with my ship.

Until the time we were forced to abandon the plane, 16 miles from the Bay of Whales, we were faithful to predetermined schedules for broadcasting. Twice each "night" and once every "morning" we tried to reach the *Wyatt Earp*. After the exhausting task of turning a frozen hand crank for 10-minute intervals, while standing in a biting wind with the temperature minus five, all we ever heard from the ship was the sentence, "We can't hear you."

AFTER 4 DAYS IN "BLIZZARD CAMP"

The defect was not in our receiver, for three times we got time signals from the powerful Buenos Aires station—a fortu-

nate reception which enabled me to keep track of my chronometer error.

We decided that we must get out of that hole, irrespective of the weather ahead, so after eight days in the "blizzard camp" we put the canvas hood over the motor, and placed the fire pot inside for 45 minutes, as we always did before starting. Then we cranked the engine. After a couple of weak turns the propeller would stop with a choke.

Kenyon knew better than I what was wrong, and after connecting the antenna wire from the stronger radio battery to the starter he had the propeller going in no time. With the plane unpacked of everything we pulled out of the drift.

Then we loaded up again and took off immediately into a sky which was anything but promising. This was the most trying moment of the entire flight.

We had not been flying long before the horizon became clear and the sky took on a beautiful golden glow.

After three hours and 55 minutes we came down to make another observation and to check our fuel.



© Ellsworth Antarctic Expedition

THE ANTARCTIC EXPLORER'S ICE BOX

Carcasses of pork and beef are hung in the shrouds, where the cold air keeps them constantly frozen. The meat hangs so high that spray rarely reaches it. In rough seas it is a ticklish job getting these porkers down.

We had used up a great deal of gas climbing over the Eternity Range and in making three take-offs. Also there was the added distance, for we later found that instead of 2,100 miles, the completed flight was really 2,300 miles.

What a picture! The snow sparkled like jewels. There was no wind. Once more it was good to be alive; we had left the high plateau and were only 125 miles from the Bay of Whales. We were on the Ross Ice Shelf at last, 980 feet above sea level, at latitude $79^{\circ} 15'$ south, longitude $153^{\circ} 16'$ west.

We had flown over the previously unexplored area. We were on the territory explored by Byrd, and all we wanted now was to get to our destination.

THE GOAL OF THREE YEARS' ENDEAVOR

Restless and anxious to be off again, we slept very little that daylight night. At 5:38 the next morning we took the air, and at 9:50 we reached the north end of Roosevelt Island. We were actually 16 miles south of the Bay of Whales, but we did not know this at the time.

From the air we saw the ice-free waters of the Ross Sea—the goal of my three years of endeavor.

At 10:30 the *Polar Star* slackened her speed and, like a weary bird, came gently

to the snow, her 466 gallons of gasoline completely exhausted.

We dug two-foot trenches for the skis, weighted them down with snow, and then pitched our tent. We knew we were not far from the Bay of Whales, and, standing on the wing of the plane and looking ahead, Kenyon saw what he believed to be Little America. It appeared to be not more than four miles away.

In reality, what we thought was Little America four miles away was an old pressure ridge, and what Kenyon thought to be the windmill generator coated with ice



Photograph courtesy Discovery Committee Colonial Office

LITTLE AMERICA, 1936: A JUMBLE OF MASTS AND POLES ON A FIELD OF SNOW.

Taken upon the arrival of the party from the *Discovery II*, this picture gives an idea of how the village looked when Ellsworth and Kenyon came upon it after trudging from their abandoned plane. Under the snow is a labyrinth of rooms and passages constructed by Admiral Byrd's expeditions. Projecting stovepipes made it possible to find the underground rooms.



© Ellsworth Antarctic Expedition

THE "KEY TO THE CITY" AT LITTLE AMERICA WAS A SHOVEL.

Here is the shaft, leading to the old radio shack, dug in the snow by Ellsworth and Kenyon. In this building, lined with bunks, they kept house for a month (see page 31).



© Ellsworth Antarctic Expedition

MEN FROM THE "WYATT EARP" HELP TO DIG OUT THE "POLAR STAR" FROM ITS BED OF SNOW (PAGE 14)



© Ellsworth Antarctic Expedition

FUEL EXHAUSTED, MAN-MUSCLE BECOMES MOTIVE POWER ON THE LAST HARD TREK TO LITTLE AMERICA

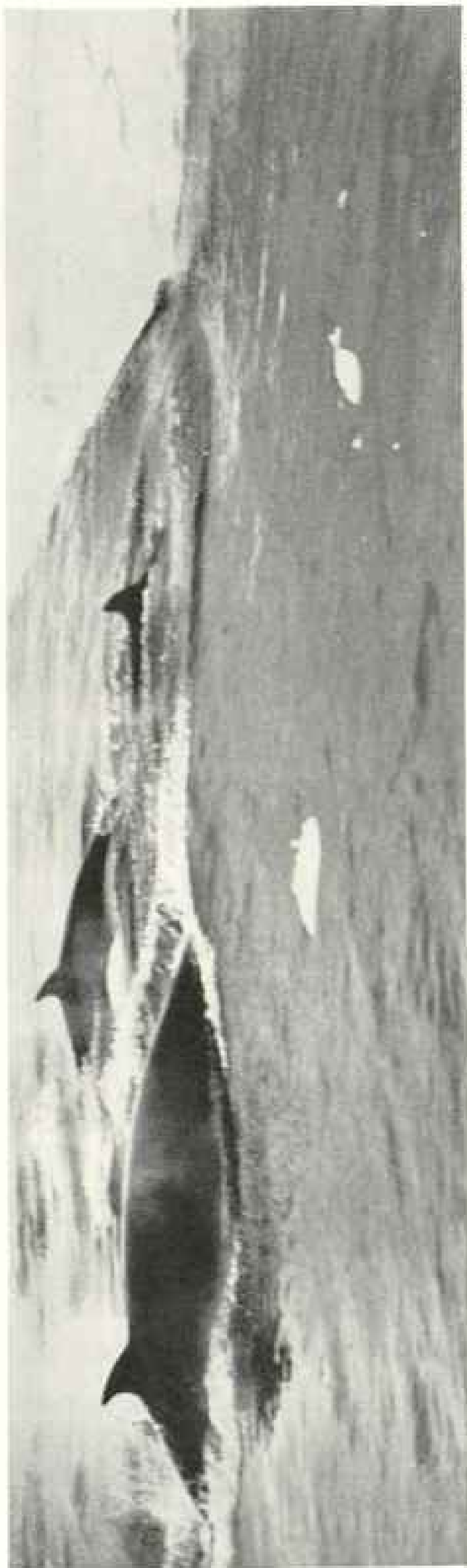
Sixteen miles short of the goal, the last drop of gasoline was used and the *Polar Star* settled on the ice. With sledge pack and the *Polar Star* (shown here) and Kenyon set out for the rigorous man-haul over the rough, snow-covered ice. They wear snowshoes.



© Ellsworth Antarctic Expedition

DWARFED BY THE IMMENSITY OF THE BARRIER, THE "WYATT EARP" TIES UP TO THE WORLD'S SOUTHERNMOST AIRPORT

Their work done, the relief plane and the *Polar Star* line up at the edge of the Barrier, ready to be shown of their wings and hoisted aboard. Ellsworth's famous airplane now is preserved in the U. S. National Museum, at Washington, D. C.



© Ellsworth Antarctic Expedition

THE BAY OF WHALES IS RIGHTLY NAMED! A SCHOOL OF FINBACKS SPORTS AND SPOUTS

This cleft in the Ross Ice Barrier is a happy hunting ground for whales because the water is rich in plankton, minute sea life on which the creatures feed.



© Ellsworth Antarctic Expedition

THE BLUE ENSIGN FLUTTERS A WELCOME TO THE EXPEDITION'S FLOATING HOME

The *Wyatt Earp* arrives at the Bay of Whales after her 5,100-mile voyage from Dundee Island, by way of Chile. The picture was taken from the Royal Research Ship *Discovery II*, exploring ship of the Discovery Committee of London, which arrived three days earlier and found Ellsworth and Hollick-Kenyon at Little America (see page 32).

was an old ice cake turned on end and standing above the pressure ridge. We had stowed our tent and sextant with other things beside the plane. So after having traveled 15 miles—which it was, instead of four—we left our sledge and tramped back to the plane to get our tent and sextant. We had taken on the sledge only three weeks' supply of food.

We made this 30-mile journey in one sledging, resting but an hour at the plane, and it was the only time in the whole journey that we really sweated. This was a lesson never to leave our tent behind!

That was December 9. Each of us had on a suit of camel's hair underwear, a flannel shirt, and light trousers, over which was worn a "windbreaker"—that is, a parka and pants of balloon silk. Kenyon wore two pairs of heavy socks and over them rubber-soled, high canvas boots reaching to the knees. I had the same, but unwisely introduced a pair of moose-hide Indian moccasins between the heavy socks and the canvas boots. Moisture caused the moccasins to shrink and stiffen, and the result was that I froze a foot.

Before starting the flight, we had debated the choice of skis or snowshoes. After loading the skis, we took them out and substituted three-foot snowshoes. It was well we did, for drawing a sledge over the slippery surface of the sastrugi would have been impossible for us on skis.

MAROONED BY A FOG

Our search for Little America was complicated by the advent of a fog which lasted for five days and made it impossible for us to see more than 100 feet ahead. Thus we had to travel entirely by compass and estimated distance.

Our system was to pull 15 minutes and then rest four minutes. A day's work consisted of six hours.

In other words, we made 10 miles a day. In addition, my frozen foot held up our progress.

One late afternoon we could discern through the mist ahead the crest of a ridge and thought it odd on that flat shelf-ice surface. We hastened our march to get a better view, and perhaps see the Ross Sea in the distance. We heard what we imag-



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HOMeward BOUND, THE "DISCOVERY II" LEAVES THE BAY OF WHALES

Mr. Ellsworth, on board, first visited Australia, where for 12 days he was the honored guest of the Australian Government; then he crossed the Pacific by liner to Los Angeles. The *Wyatt Earp*, moored to the edge of the bay ice, remains behind while the crew recover the marooned *Polar Star* from the Shelf Ice (pages 28 and 34).

ined to be the wind against the other side of this ridge.

We mounted the ridge and looked straight down into the Ross Sea! We were standing on the edge of the Ice Barrier. Two hundred feet down lay the sea. What we thought to be the wind was the lapping of the waves against the ice.

We retraced our steps and camped that night a mile back, for after attaining our goal, we did not feel like being dumped into the sea. The Bay of Whales, 16 miles long and 5 miles wide, is a pretty small dot on a map of Antarctica, and Little America, which lies at the head of the bay, is even smaller. It was really remarkable that we found either at the end of a 2,300-mile flight.

We remained in camp two days and, on the 15th, followed the edge of the Bay of Whales to Little America, reaching it just 22 days after leaving Dundee Island.

One does not see Little America until he tops the crest of the ridge, which is itself not observable from any distance, for the topographical features all become merged into one white expanse.

Once on the crest, there lies Little America at one's feet in a saucerlike depression. It was breath-taking to come suddenly upon something black in the limitless expanse of white.

I looked down upon a jumble of poles and masts, and was reminded of the oil fields of California. Poles and towers were to be seen, but where were the houses?

None was in sight, but closer inspection showed the tops of a dozen or more stovepipes sticking out of an undisturbed snow surface (page 27). It looked just as if some gigantic plant had taken root there and was forcing stubby shoots upward. We were certainly glad after a 15-mile haul that day, December 15, to find anything indicative of a house.

Digging around, we found a skylight, pried it open, and by means of loops knotted in our sledge rope—a trick used to get out of a crevasse which I had learned in Switzerland—we climbed down to find ourselves in Byrd's radio shack (page 27).

We quickly decided to make it our home. There were two rooms; one had a stove in the middle and a double tier of bunks lin-

ing the wall. Both were partly filled with snow that had sifted in.

How good it seemed after 22 days to find ourselves enclosed by four walls, in a place where we could sleep to our hearts' content, undistressed by the perpetual daylight glare from the snow which had so disturbed our rest since leaving the *Wyatt Earp*!

Next day we went on a foraging expedition: found two sacks of coal and half a drum of fuel for our primus stove, which we used for cooking; also a sack of hard-tack and a can of bully beef partly buried in the snow.

LITTLE AMERICA OFFERS SILENT HOSPITALITY

We dug a shaft and made steps in the side of it so that we could get in and out of the door of the shack without having to enter through the skylight. We found other skylights and were able to assemble an enjoyable assortment of odds and ends—such as flour, jams, and sauces.

Then we settled down to await the arrival of the *Wyatt Earp*, whenever that might be.

One morning about two weeks later when I awoke, Kenyon already was at the stove cooking oatmeal. "I hope they won't bother us for at least another week," he said.

We certainly were grateful to Byrd for the sustenance we found at Little America, because our own supplies would not have held out longer than three weeks. With the additional supplies we found there, we could have lived three months. Besides, there were many seals on the bay ice.

We were short of coal and fuel for our primus stove. When we were found we were on the last sack of coal, and only a quarter of a drum of fuel for our primus remained of what we had found in Little America.

I recalled Byrd's willingness to help us out with radio weather reports the year previous when he sent us two daily over a period of two months.

I have repeatedly been asked since returning why we did not use the radio equipment left at Little America. There was no radio equipment of any kind left there.

To live there, our daily routine was as follows: Supper around 9 p. m.; in our sleeping bags until 3 or 4 p. m. the following day; a light meal, possibly oatmeal with raisins and tea; clean up cabin; maybe

wash up dishes, depending upon how clean they were left from the previous meal; melt snow for the evening meal.

Then I would walk six miles to the mouth of the Bay of Whales to look out to sea for the *Wyatt Earp*; return home generally to find Kenyon had opened the skylight of another cabin and found another sack of coal, or more Worcestershire sauce, or marmalade, cans of tobacco, or magazines.

January 15 will forever remain memorable in the minds of Kenyon and me. It was 10 p. m. I was awakened from a sound sleep to see Kenyon standing over me with a note in his hand.

"Read it," he said, nonchalantly. "It's probably from Wilkins."

"Wilkins!" I excitedly replied. "Is he here?"

"No," he said, "but it has just dropped."

Kenyon had heard the roar of a motor overhead, although our dugout home was 15 feet beneath the surface of the snow. He had crawled up the shaft leading to the surface above in time to see a parachute descending through the enshrouding fog which had enveloped us for two weeks.

We opened the parcel delivered by parachute and in amazement spread its contents out on the table—packages of chocolate, raisins, and a can of very sweet, highly concentrated orange syrup, which we promptly drank undiluted. It almost made us ill.

AN INVITATION DROPS FROM THE SKIES

This note was from Captain Hill of the Royal Research ship *Discovery II*, and requested us to march until we met some of his men whom he was sending ashore.

Within ten days after the failure of our radio a relief expedition had been set in motion at the suggestion of the Prime Minister of the Commonwealth of Australia, a suggestion which was promptly seconded by the Governments of the United Kingdom and New Zealand. The *Discovery II*, then carrying out whaling investigations in the south, was summoned post-haste to Melbourne to be loaded with supplies for an exhaustive search by both land and air if this should prove necessary.

Carrying two airplanes, flyers of the Royal Australian Air Force, sledges, and extra rations for long marches over the ice, the *Discovery II* left Melbourne for Dunedin and the Bay of Whales just one month from the day we started our flight.



© Ellsworth Antarctic Expedition

THE OWNER COMES ABOARD!

After two months on the Antarctic plateaus and at Little America, Lincoln Ellsworth and Hollick-Kenyon board the *Wyatt Earp* at Bay of Whales. Overhead is the plane flown from Kansas City to Magallanes, Chile, and then brought south in case it should be necessary to search for the flyers.

How glad we were to hear their planes and to greet the first humans we had seen in eight weeks can well be imagined!

I shall always feel grateful both to the Research Committee of London and to the Australian Government for their earnest and generous efforts on our behalf.

As I was now laid up with an infected foot, because of freezing it, and was not feeling so well, Kenyon started off alone to meet our visitors. I could sleep no more that "night," so cooked myself a big meal and, after waiting until noon, started out on snowshoes to learn what was up. A mile from camp I saw through the fog, which magnifies frightfully in those regions, what appeared to be a whole army marching toward me; in reality there were six men (page 23).

About the first thing they asked me after our greetings was, "Have you any food?"

Naturally they were very hungry from

their unaccustomed exercise, so we turned back to Little America. After they had cleaned up all the food in the shack, the sledge was packed and we started for the ship, *Discovery II*, where I was received with open arms.

The doctor found that my foot had gone septic and that I was running a temperature of 102. After I had a hot bath, my first in three months, Commander Hill told me of events leading up to his arrival and gave me the news that my ship had been delayed by the pack ice in the Ross Sea.

Three days later we received a wireless from the *Wyatt Earp* saying she was approaching the bay.

And soon there she was, staunch little ship, looming big in the fog that enshrouded her after her 5,100-mile voyage from Dundee Island to pick us up. And how happy I was to see again the comrades I had learned to love so well during three years' voyaging!



© Ellsworth Antarctic Expedition

FLAGS THAT WERE FLOWN ACROSS THE LAST CONTINENT TO BE EXPLORED

The Stars and Stripes and the four banners of organizations with which Ellsworth has been closely associated were set up for this photograph on Dundee Island shortly before the start of the trans-Antarctic flight. The leader wears a squirrel-skin parka given him by Roald Amundsen.

While my party on the *Wyatt Earp* was loading the *Polar Star*, I went on the *Discovery II* to Australia, where I was for 12 days the guest of the Government. Never have I experienced more delightful hospitality than from those kind people.

NOT "LOST" OR "RESCUED"

Many Antarctic problems remain to be solved; yet our reconnaissance flight has shown the airplane to be a practical means for their solution. When two men alone can cross the continent, land at will on terrain well suited to the purpose, and take off again—which we did four times during the journey—the way is opened to complete exploration of that vast continent.

We saw no crevasses except in the area flown over just before reaching Roosevelt Island. Doubtless airplanes of the future will carry dogs and other necessary equipment for the establishment of bases from which to operate ground and aerial surveys. By these means the whole continent may be charted.

Of course, luck favored us; another year conditions might be as unfavorable as

they were during the two preceding years.

We approximated a great circle course, and, after flying 1,550 miles from Dundee Island to where we first came down, we were only 45 miles off our plotted course. We checked our compass with celestial observations at each landing;

Everything went exactly as we had planned and hoped, with two exceptions—our radio communications broke down and our gas, owing to three unexpected drains on it, gave out just 16 miles short of our goal. Of course, there was the possibility of crossing on a single flight; but I had no illusions about this. One of the most important features of my plans for the past three years had been to land on the snow in case of bad weather and wait for the return of good flying conditions.

Because our radio signals failed to reach the outside world, we were said, popularly, to be "lost." But, of course, this was not true. At no time was there the slightest doubt in our minds as to our location.

Again, because nothing had been heard from us, we were said to be "rescued." But our very comfortable stay at Little Amer-



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HEAVY GOING IN THE TURBULENT WATERS THAT GUARD ANTARCTICA

Where the Pacific, the Atlantic, and the Indian Oceans meet the Antarctic Continent are found the roughest seas in the world. The *Wyatt Earp* here plows her way through enormous waves south of New Zealand. Three trips to the Antarctic were made by the Ellsworth Expedition. The first year it touched at the Bay of Whales. Next, bad weather prevented a flight from Deception and Snow Hill Islands. The third, and successful, venture was made from Dunder Island.

ica and the shifting to that point of the *Wyatt Earp* to pick us up, also had been planned for three years.

THE RESULTS OF THE FLIGHT

The lofty mountain ranges and the high plateaus discovered on our flight probably are but units of a great mountain system that traverses Antarctica. The highlands of the Antarctic Archipelago must be regarded as the continuation of the South American Andes; and may they not link up with the mountains of South Victoria Land, on the Ross Sea, of which the Queen Maud Range is but a connecting link in this great chain that forms the backbone of Antarctica? If this be true, then a sea-level channel between the Weddell Sea and the Ross Sea cannot exist.

Our one regret was not to have been able to follow the trend of the ranges we saw and learn something of the rocks that compose them, for probably the greatest

unsolved problem regarding the earth's structure is the connection of the two sides of Antarctica—between the Weddell and the Ross Seas.

Although our flight of discovery is over, there are still vast untrod areas at this end of the earth, regions of heights and depths and cold, still touched with the mystery and romance of the unknown. Great is their lure!

Moreover, they are all parts of our heritage and it is man's duty to explore them. Seventy-five per cent of Antarctica's five million square miles remains unexplored and open to scientific research.

After six polar expeditions my enthusiasm has not dimmed.

The love of great adventure is not an acquired taste—it is in the blood. Will I be tempted again? Who can tell?

"Who has known heights and depths shall not again know peace, for he who has trodden stars seeks peace no more."



ELLSWORTH AWARDED THE HUBBARD MEDAL

AT the White House in Washington, D. C., at noon of April 15, President Roosevelt, on behalf of the National Geographic Society, presented Lincoln Ellsworth with The Society's Hubbard Gold Medal. The President said:

"Lincoln Ellsworth, it is always pleasant to have a part in the recognition of achievement and this occasion is one of greater pleasure to me because it is a reminder that the world still holds high adventure for those who have the spirit to seek it. There was real romance in that Antarctic flight of yours which carried you over a trackless area upon which human eyes never before had gazed, and I am particularly happy to welcome back home an old friend.

"And now that venture in discovery, as well as your flights over the Arctic—all of which enlarged the sum of human knowledge—are to be rewarded by the National Geographic Society. It gives me special pleasure in behalf of that organization, which was founded for 'the increase and diffusion of geographic knowledge', to hand to you the Hubbard Medal for 'Heroic and Extraordinary Achievements in Arctic and Antarctic Exploration from 1925 to 1936.'"

Mr. Ellsworth replied:

"Mr. President, I thank you for presenting to me the Hubbard Gold Medal of the National Geographic Society and for the kind things you have said. May I add that the most important incident of my trip across Antarctica was the raising of the Stars and Stripes in that territory of 350,000 square miles, the last unclaimed land on earth."

In Constitution Hall on the afternoon and evening of April 15 Mr. Ellsworth addressed two distinguished gatherings of members and guests of the National Geographic Society, describing his historic flight across the Antarctic Continent and showing lantern slides of photographs made on his three Antarctic expeditions.

Introducing Mr. Ellsworth, Dr. Gilbert Grosvenor, President of The Society, briefly summarized his many explorations:

"With great happiness we have gathered to welcome safely home a member of our Society, Lincoln Ellsworth, who has added another fruitful journey to a long record of outstanding feats of exploration.

"Son of a distinguished and generous captain of industry, who offered to help him travel in luxury, Lincoln Ellsworth preferred to lead a life of extreme physical

hardship to toughen his body and enlarge his experience for adventurous research in far-away places.

"After leaving Yale University, he worked as an axman on the first survey party of the Grand Trunk Pacific to explore a new route for a railway across Canada. Promoted to transit-man and engineer, for five years he conducted surveys in the roughest country of western Canada.

"For a year he prospected for gold in Alberta and Alaska. He took part in the last great round-up of wild buffalo for the nucleus of the immense herd the Canadian Government now owns.

"For three years he was field assistant of the U. S. Biological Survey, studying and collecting in the Rocky Mountain Range from Yukon into Mexico.

"He served in the Ambulance Service in France, and after the United States entered the war, became an aviator.

"He made a geological cross section of the Andes from the Pacific Ocean to the headwaters of the Amazon. He discovered a bed of fossil algae at the end of an 800-mile canoe trip in Labrador, and later was the first to discover the same rare fossils in Death Valley, California, one of the most prospected regions in the world.

"Lincoln Ellsworth was co-leader with Amundsen and navigator of the first expedition to explore the polar regions by aircraft. He made possible this important survey of 120,000 square miles of previously unknown area by financing the expedition. He rescued the engineer and mechanic from drowning when they fell through the ice after the two planes alighted a few miles from the North Pole. For this gallant deed, which Amundsen declared saved the lives of the six men in the party, the Norwegian Congress voted him its highest award, the gold medal for lifesaving.

"Again he was co-leader, and the generous financial backer, of the Amundsen-Ellsworth-Nobile Transpolar Flight in the airship *Norge* from Spitsbergen across the North Pole to Alaska. This exploration uncovered the largest remaining blind spot in the Northern Hemisphere and proved that no continental mass of land lies between the North Pole and Alaska.

"Thus Lincoln Ellsworth was co-leader and patron of the first expedition to cross the Arctic Ocean, and now returns as the successful leader of the first expedition to cross the Antarctic Continent."

BOSTON THROUGH MIDWEST EYES

BY FREDERICK SIMPICH

STUDY Boston from the high tower of the Customhouse. It looks down on that cobweb maze of narrow, crooked streets which marks the "city limits" of bygone days, when cows grazed on the Common and clipper ships traded with China and Bombay.

In the shadow of modern structures squat many old-style shops and "countinghouses," already weather-beaten when John Hancock was Governor. To Boston these are more than obsolete architecture; they are symbols of her busy, audacious youth when she built and sailed our first merchant fleet.

Modern Boston sprawls over more than 1,000 square miles and counts some 2,300,000 people in her metropolitan district. Much of that is in the pattern of other American cities. But the old Boston, so like parts of ancient London, is unique in the United States.

Come down from the Tower now and see how certain of these streets are devoted to a particular enterprise. This one smells of hides and leather; along that one you see only the gilded signs of shoe manufacturers. One section smells of fish, another of wool, and here is a wharf fragrant with bananas.

Turn up the hill toward the venerable Transcript, with its columns of genealogy, and you smell newsprint, fresh ink, roasting coffee, and second-hand books stacked in the open air—any book from Gray's "Elegy" to "Anthony Adverse."

Even the odd wording of signboards harks back to earlier days. "Victualers License," "Spa," "Protection Department," not fire department, and street-car signs in quaint, stilted English.

Old trades cling to old places. The Old Oyster House, live lobsters wriggling in its window tanks, stands just as it was a hundred years ago.

Before a window at 30 Court Street crowds watch a wrinkled artist carve pipes. At 87, wearing no glasses, he works as skillfully as when he began, seventy years ago. Monk, Viking, and Indian heads, skulls, lions, dogs—he makes them all.

Give him your picture and he will cut its likeness on a meerschaum bowl (p. 77). For a Kentucky horseman he carved the image of that rider's favorite mount; he

even carved the "Battle of Bunker Hill" with 50 brier figures on one big pipe!

Five workmen in pipe stores hereabouts have a total service of more than 200 years. "A man is on trial until he has been here 25 years" is a favorite joke in one shop.

Quietly another old sculptor works, making "ancient" idols, relics of the Stone Age, even a "petrified man" for a circus in Australia!

BOSTON'S POWER FELT AFAR

In sharp contrast rise that colossus, the United Shoe Machinery Corporation, and the United Fruit, whose white fleet plies from here to the Spanish Main.

Turn back and walk through the cathedral-like First National Bank and look at its compelling murals, with their dramatic themes of merchant adventures by land and sea; or study the fascinating exhibit of historic ships' models in the State Street Trust Company (page 59).

Then talk with men whose families for generations have helped shape Boston's destiny, and you begin to sense what significant events, affecting all America, are packed in her 300 years of history.

Boston cash and engineering skill built the Michigan Central, the Atchison, the Burlington route, and other railways. Chicago stockyards, to a large degree, were built by men from Boston. She founded the great copper-mining industry in our West; she was the early home of many corporations, famous now in the annals of finance, foreign trade, construction, and manufacturing.

It was Boston brains and money that started the great telegraph and telephone systems that now girdle the globe. Miraculously, almost, she turned the jungles of Central America and the Caribbean isles into vast banana plantations, and built up the greatest fruit industry the world knows.

From Boston, from all New England, went groups of thrifty, energetic men to share in the conquest of the West. To Kansas, especially, many colonists were sent by the Massachusetts Emigrant Aid Company to circumvent the rise of another slave State under the Kansas-Nebraska Act. On the march they sang



Photograph by Luis Marten

SYMBOLIC OF FISHING'S EARLY VALUE TO THE COMMONWEALTH, THE "SACRED COD" HAS BEEN HUNG IN THE STATEHOUSE FOR GENERATIONS

On Wednesday, March 17, 1784, Mr. John Rowe "moved the House that leave might be given to hang up the representation of a Cod Fish." This effigy, made of pine and often repainted, now hangs opposite the Speaker's chair (page 48).

Whittier's song of "The Kansas Emigrants":

"We cross the prairie as of old
The pilgrims crossed the sea,
To make the West, as they the East,
The homestead of the free."

Lawrence, Kansas, is named for an old Boston family, and many a budding Midwest factory town drew its first artisans from that national training school for skilled mechanics which is New England.

Descendants of these pioneers form part of the army of 2,000,000 visitors, more or less, who flock back to Boston each season and swarm out to the historic towns about it. They want to see the old places where their ancestors lived, and spots famous in the annals of early days: Bunker Hill Monument; Faneuil Hall; the site of the Boston Tea Party; Old North Church; Paul Revere's house (page 43); the tomb of Mother Goose; the site of the Boston Massacre (page 75); the sacred Codfish in the Statehouse; and near-by Plymouth Rock, Concord, and Lexington, and the Witch House at Salem.

Today Boston prints more books than when she was preëminently a "literary center." Manuscripts pour in to her editors. Novels, carloads of dictionaries, and schoolbooks in Spanish and English, Sanskrit and Eskimo, are shipped from here, often to markets as remote as Baghdad.

Her Golden Age of letters, when Emerson, Hawthorne, Longfellow, Whittier, Holmes, and Lowell used to frequent the Old Corner Book Store, passed with the rise of New York as a market for manuscripts. But curious visitors still seek out Emerson's old home at Concord; they prowl through the country house of Louisa M. Alcott—admission 25 cents—and drop a tear for "Little Women." For another 25 cents they see the "House of Seven Gables" at Salem.

In American letters Dana's "Two Years Before the Mast," Melville's "Moby Dick" or "Typee," and the brilliant historical work of Prescott, Parkman, Fiske, and Bancroft must long endure, as will other names, from Edward Everett Hale, author of "The Man Without a Country," and



Photograph by B. Anthony Stewart

BROWSING AMONG BOOKS IS AN OUTDOOR SPORT AT THIS "SERVE YOURSELF" SHOP

Customers select volumes from the well-stocked shelves on the sidewalk and pay for them downstairs in the basement store. This establishment is noted for its many books on heraldry and genealogy. The tracing of American family histories is a flourishing enterprise in Boston (page 80).

Julia Ward Howe, who wrote "The Battle Hymn of the Republic," to Thoreau and John Boyle O'Reilly.

From Boston still comes the Atlantic Monthly, though the long-beloved Youth's Companion is merged now with The American Boy, and the New England Magazine is no more. But it is the stupendous output of textbooks which astonishes.

You can imagine the volume when you stop to think that between 25 and 30 million American children alone are enrolled in schools; that they must have some 70,000,000 books when schools open each September, and that Boston is one of the chief textbook-producing centers in the world.

SCHOOLBOOKS BY THE MILLION

"There are many schoolbooks," said an official of Houghton Mifflin Company, "whose sales make that of a popular novel look diminutive. They are not handled in dozens of boxes, but in carloads of 40,000 pounds each.

"While some of our novels, 'Uncle Tom's Cabin' and 'Rebecca of Sunnybrook Farm,'

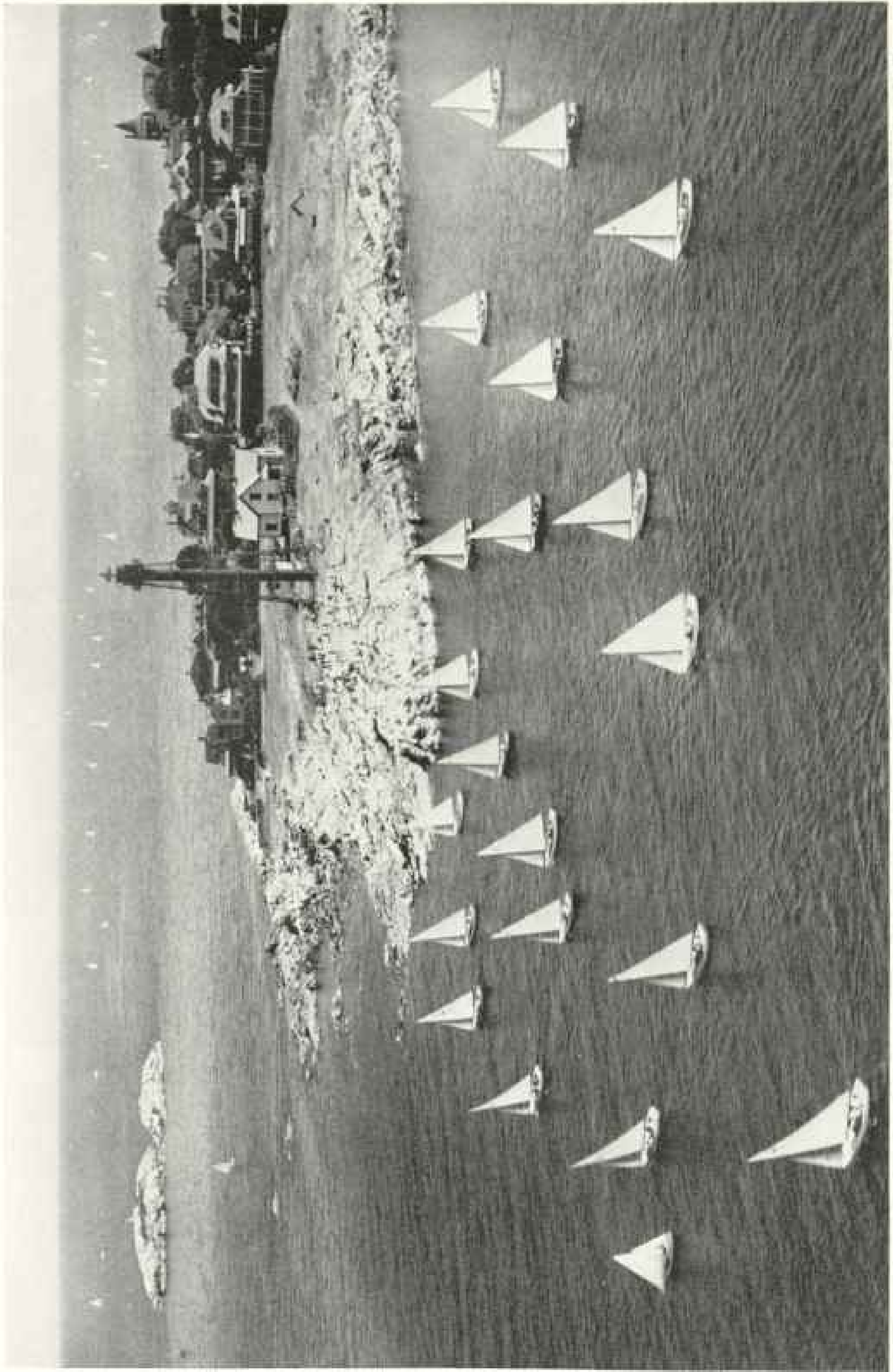
for example, have sold more than half a million each, our little school pamphlets such as 'Evangeline' and 'The Courtship of Miles Standish' have sold at the rate of a million a year.

"The task of getting sufficient schoolbooks ready to meet the sudden demand every September, when orders come in at the last minute by wire, means that publishers usually begin printing these books as long as ten months ahead."

"Where do books made in Boston go?" I asked the editor of Ginn and Company.

"Everywhere, I should say, that English is used in schools. More than that; in translation, they go to scores of foreign lands. Recently orders came from Baghdad for thousands of our Craig's 'Pathways in Science.' Arabic translations of Breasted's 'Ancient Times' and a number of our other books are used in the schools of Iraq. Not long ago we granted the Government of Iraq permission to translate Caldwell and Curtis' 'Introduction to Science' into Arabic.

"You know that the British Isles are a citadel of the classics. We feel gratified,



Photograph by T. P. Hartley

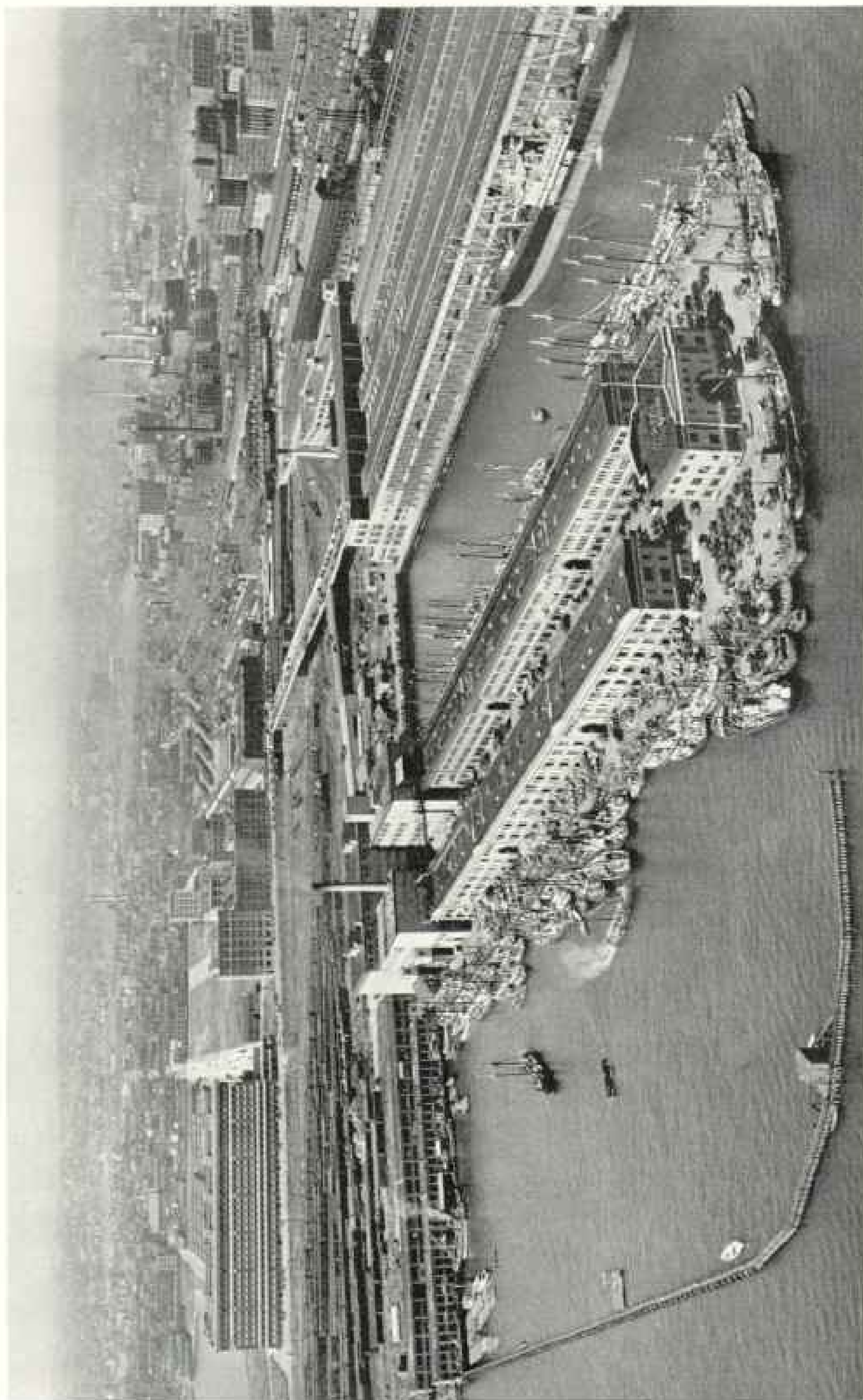
SKIMMING ROUND MARBLEHEAD NECK IN A RACE FROM A HARBOR START, LITTLE INDIAN-CLASS BOATS RESEMBLE TOY MODELS IN A POND. Larger craft, which started to the left of the rocky islet, are also competing offshore. Hundreds of yachts crowd Marblehead during Race Week in August.



Photograph by T. F. Hartley

NEARLY THREE MILES BELOW, BOSTON AND NEIGHBORING TOWNS RESEMBLE SCATTERED PIECES OF A GIANT'S JIGSAW PUZZLE

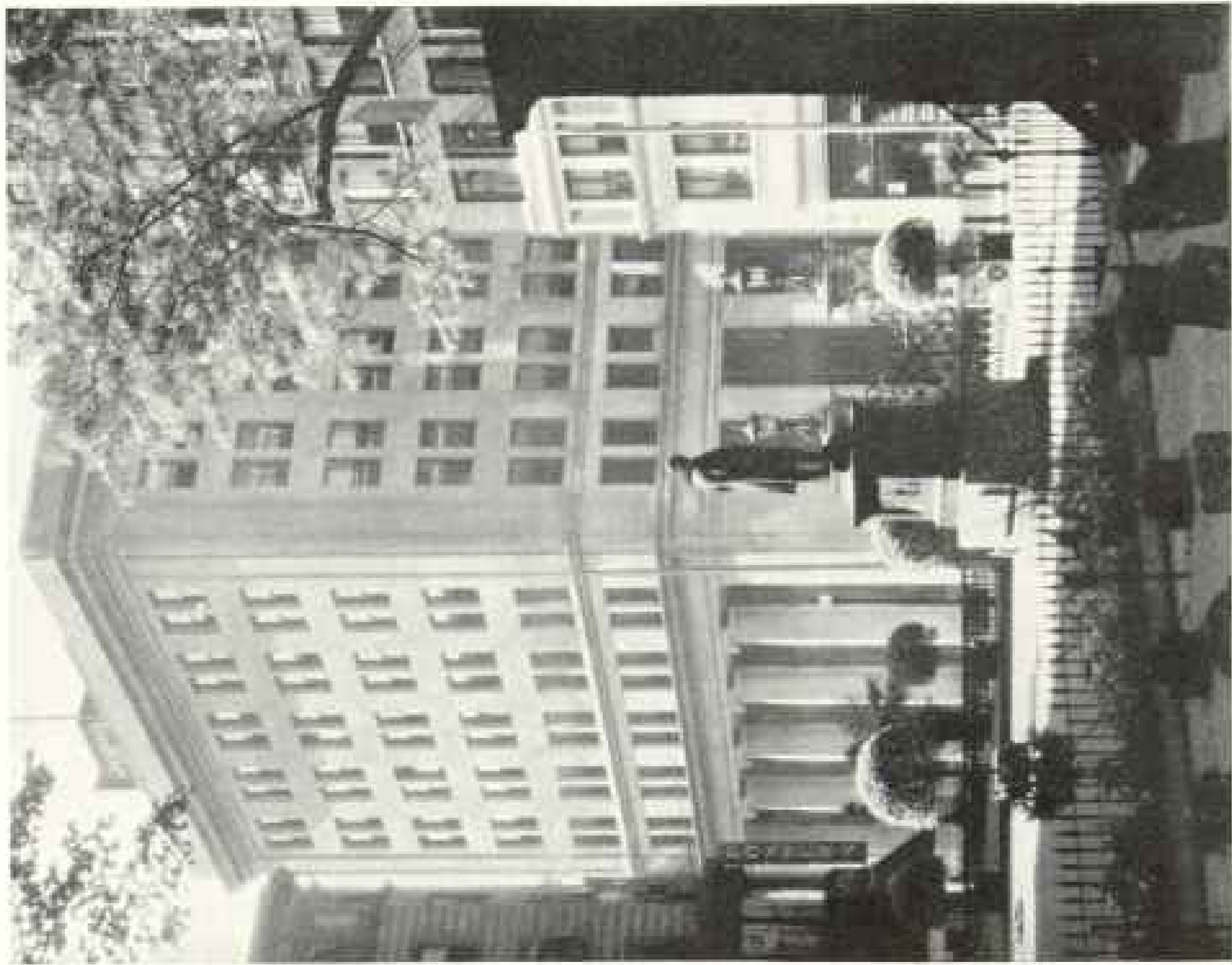
Boston Common is the large bare patch, lower right. Just above is the downtown district. In Charlestown, left, Bunker Hill Monument is seen in its square park. A tip of Cambridge lies in the center foreground. Across the harbor are: East Boston, center; Winthrop, upper center; Revere Beach, upper left (pages 57 and 61).



Photograph by Fairchild Aerial Surveys

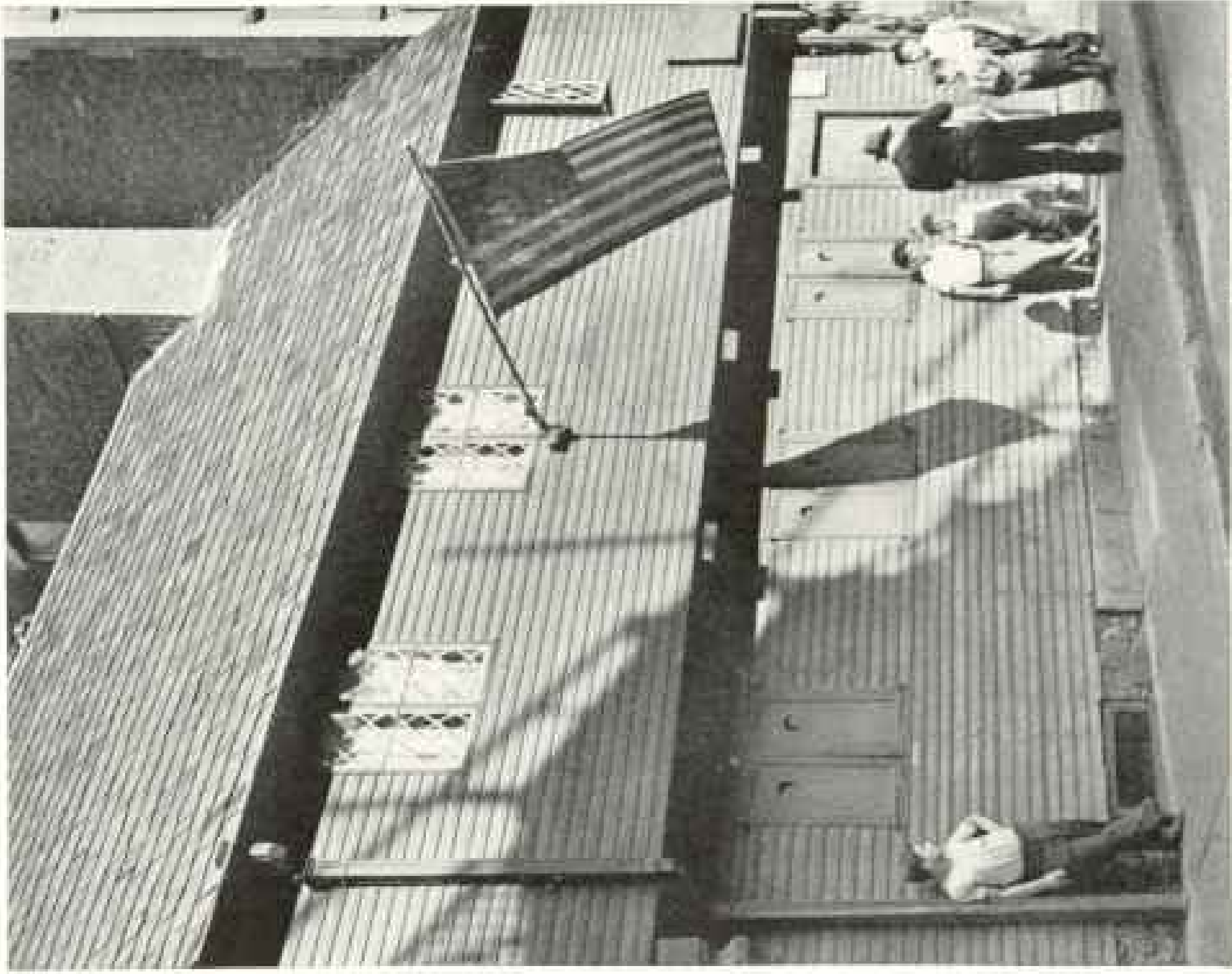
BOSTON FISH PIER IS CROWDED EVERY MORNING WHEN THE TRAWLER FLEET DOCKS TO UNLOAD ITS CATCH.

Fish auctions are held in the large hall on the pier's end. Buyers' cars are parked about. All over the busy dock swarm men in rubber boots, pushing their colored fish carts. Inside the court trucks load up, distributing fresh fish far and near (Color Plate XIII, and page 48).



Photograph by Arthur C. Haskell
**IN THE FIVE CENTS SAVINGS BANK PEOPLE FROM EVERY CIVILIZED
 LAND HAVE ACCOUNTS**

Signature cards form an autograph album of more than 890,000 names. The statue is of Benjamin Franklin. In the foreground is King's Chapel Burying Ground, where Governor Winthrop and other early Bostonians are interred.



Photograph by Lays Marden
**"LISTEN, MY CHILDREN, AND YOU SHALL HEAR OF THE MIDNIGHT
 RIDE OF PAUL REVERE"**

At Revere's house Italian boys entertain visitors with Longfellow's poem. Here the versatile Revolutionary War patriot worked at his trade of silversmith, engraved copper plates, and pioneered in the manufacture of false teeth.

therefore, that our series, 'Latin for To-day' is now in wide use in Scotland and England. These volumes are the authorized books in New Zealand and at least one of the States of Australia, besides being much used in South Africa.

"Latin America is today using carloads of textbooks made within a mile of where we sit. They are Spanish readers, geographies, arithmetics, hygiene books, algebras, geometries, and others.

"In Ottawa, I saw a wall map with tiny flags that marked the sites of Indian schools; many were up within the Arctic Circle. All these schools use our books. This summer we had to hurry one new book through for publication early in August so we might get it to these schools before ice closed navigation to the Far North."

Because the editor was an old friend of Philippine days we talked long at Ginn's. It was nearly sundown when I left, the best time for that "walk abroad" through Little Italy (Color Plate XV).

In swarming Salem and Hanover Streets, all sights, smells, and sounds are as purely Italian as Naples itself. Mandolin strains of "Santa Lucia" and "Funiculi-Funicula" come from crowded spaghetti restaurants. Here are little theaters with Italian "talkies," and Italian signs adorn all the shops, banks, newspapers, and steamer ticket offices.

Heavy odors of garlic, sour wine, and black tobacco hang in the air, and show windows are set with goat's cheese, sausages, and rows of dark bottles with brightly-colored labels.

At a pushcart, chattering men eat raw clams sprinkled with lemon juice, a penny each, while getting their shoes shined. With a loud honk of horns, a wedding party circles about the quarter, stuffed white doves tied on the motor hoods, and white ribbons waving from the cars.

From upper windows fat wives look down, smiling, waving; and on lines stretched across alleys and courts flaps the family washing. Furtively, one eye out for "cops," boys match pennies and shoot craps.

What a swarm of street urchins besieged us at Paul Revere's house! At Old North Church it was the same. For a penny they mimic the lecture of the sight-seeing bus guides, tell you all about the church, even recite "Paul Revere's Ride." But if

you interrupt one of these six-year-old elocutionists in the midst of his recital, he must go back to the first line, starting afresh!

In the older sections of town you meet more Irish than Anglo-Saxons, with more than 5,000 Sullivans and Murphys alone in the telephone directory. Here are about 100,000 Jews, and almost as many Italians.

Along "Emerson's Walk" through the shady Common you hear older people speaking in foreign tongues, but their children use English. Greek and Italian boys on scooters chase the pigeons now, or duck each other in that Frog Pond where once the ducking stool dipped the scolds.

THE VITALITY OF BOSTON

Such racial changes are plainly reflected in political and religious life. But they rob the city of no commercial vigor. Stalwart Brahmans, though many have quit Beacon Hill and Commonwealth Avenue for Brookline, Winchester, and other suburbs, still guide Boston with their inherited mercantile sense and long intercourse with what is good. Their trade and financial genius help her, though overshadowed in mere size by New York and Philadelphia, to maintain her high place as a prosperous Atlantic seaport.

Geographically, here is the trade and population center of rich, industrial New England. A few minutes' ride from Faneuil Hall are more than 5,700 factories and over 25,000 stores of one kind or another.

Boston does not flaunt these distinctions; yet seek and you find she has America's largest drydock; the world's greatest fish-freezing and storage plant. Here is a center of America's paper, wool, textbook, and cotton-manufacturing industries, and the second port in America in volume of ocean-borne passenger traffic.

Her deep-channeled harbor, whose modern piers connect with rails and highways, is one of the most accessible on the Atlantic seaboard; it has 40 miles of berthing space and deep water to accommodate the largest vessels.

When "Boston ships" traded hardware for California hides before the days of '49, the shoe and leather industry of New England began. Today, a large share of all hides used in American leather and shoe factories is bought and sold inside one square mile in old Boston, where even in the mid-

dle of the street you catch the acrid whiff of newly tanned leather.

In Bombay Englishmen once pointed out to me "the old American icehouse." It dated from the period, beginning in 1805, when Boston skippers took ice cargoes for sale in Jamaica, Cuba, Brazil, and India. Now high-grade electrical machines, which include refrigerators, rank among Boston exports.

Boston's pioneer place in the import and processing of tropical things is still hers. She and her neighbors make now more than a third of all America's rubber shoes; the trade name of one cocoa made here has been a household word for generations. Jute, burlap, goatskins, fleeces, bales of cotton, sisal, fruit, sugar, coffee, all pass this way.

Ask how long skilled workers have served in the same plants; hear how many generations of a given family have worked at the same trades, and you begin to account for the vitality of Boston industry. Here is pride in good work, inherited knowledge, genius for craftsmanship.

BOSTON COVERS AMERICA WITH BANANAS

John Hancock probably never saw a banana. At the Philadelphia Centennial Exhibition, in 1876, curious crowds gazed in wonder at a bunch of them. Now every-



Photograph by Luis Marden

"THIS PILE IS FROM OHIO; THE ONE BEHIND, OREGON"

More wool is marketed in Boston than anywhere else in the Western Hemisphere. Some families here have been in this trade for many generations. Through storerooms like this experts can walk and tell by a glance where certain wool came from—the United States, Argentina, or Canada. So much wool is handled in Summer Street that even the open air often smells of it (p. 78).

body, from Quoddy Light to Golden Gate, from Key West to Alaska, knows their smell and taste (Color Plate XII).

Boston's United Fruit Company makes the banana, once a rarity wrapped in tin-foil, today a staple American food.

Yet its greatest feat is not in distribution but production.

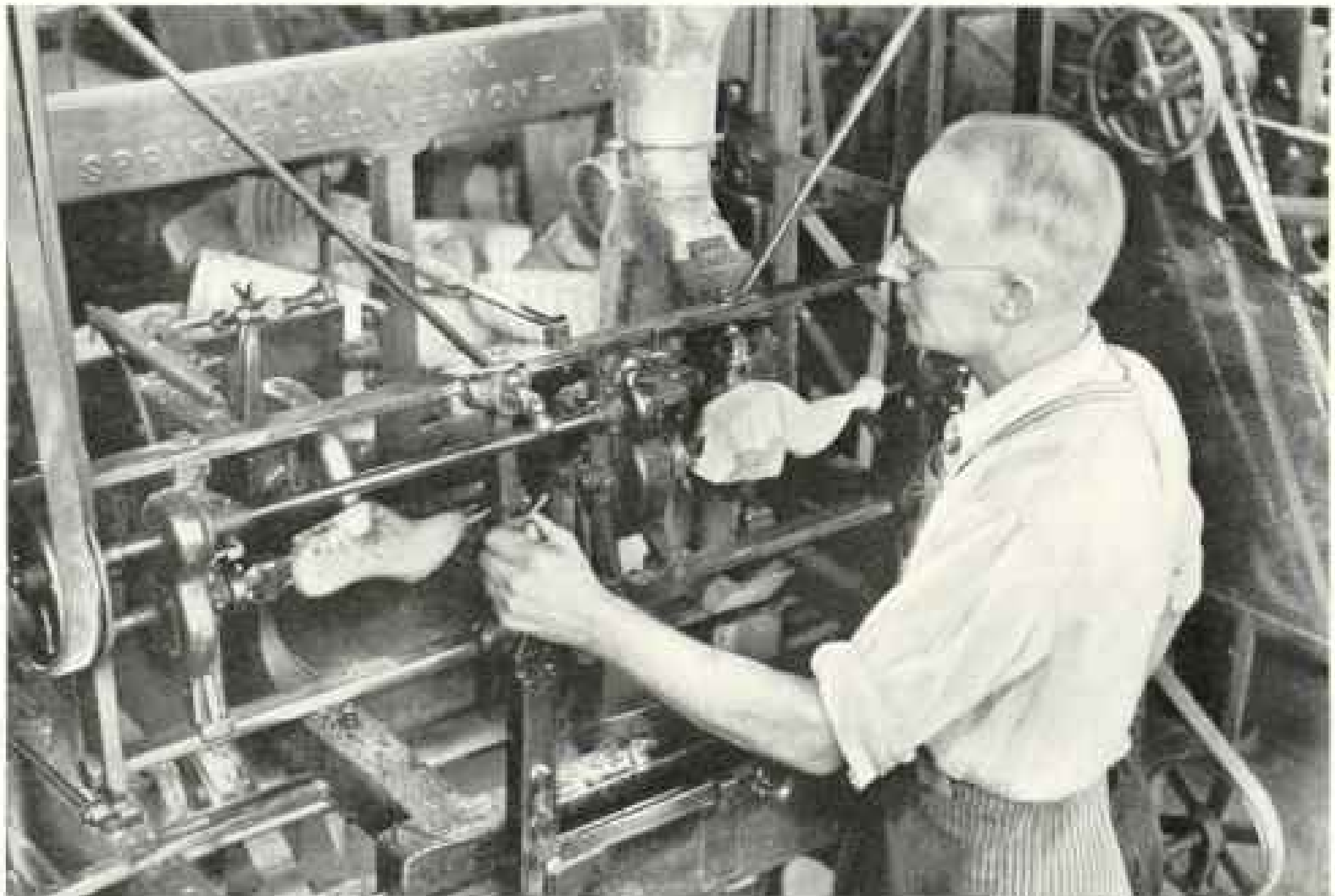
About its success in turning jungle into rich plantations and its conquest of tropical disease, piles of fat books are written. All that is far from Boston, yet it was a Boston man, Andrew W. Preston, who



Photograph courtesy M. I. T.

ON THE DOWN STROKE, WING FEATHERS TAKE THIS POSITION TO HELP THE BIRD GAIN ALTITUDE

This remarkable high-speed photograph was taken by scientists of the Massachusetts Institute of Technology just after the mourning dove started to fly. Its feathers overlap to prevent air passing through its wings on the down stroke; on the up stroke, they rotate slightly, to let air through and reduce resistance.



Photograph by Lois Marden

EXACT COPIES OF ANY MODEL ARE SWIFTLY CUT BY THIS WOOD-TURNING MACHINE

Operating in the colossal factory of the United Shoe Machinery Corporation at Beverly, near Boston, the machine is now copying a shoemaker's last. At left is the model, at right the crude block. It can also reproduce doll heads, decoy ducks, golf club heads—any simple form in wood (77).



Photograph by B. Anthony Stewart

VISITORS EXPLORE THE WORLD INSIDE THIS BIG HOLLOW GLOBE AT THE NEW
CHRISTIAN SCIENCE PUBLISHING HOUSE

Glowing with color, a map of the earth's surface is depicted on concave glass sections held by a bronze framework 30 feet in diameter. Standing on the "mapparium's" crystal bridge, one sees our planet from pole to pole, with none of the distortions of area and distance that occur on a flat map.

conceived these incomparable tasks. When he began, long ago, the world banana crop barely equaled what New York alone now eats in a few weeks!

To get bananas the company had to raise them; so it became a vast agricultural concern. Jungle areas cleared and planted total thousands of square miles.

When Minor C. Keith, of United Fruit, started his railroad in Costa Rica from Puerto Limón to San José, a 19-year job that cost more than 4,000 lives from fever, there was but little rail in all Central America. Now the company owns and operates its tracks, trucks, and aerial tramways in a dozen tropic regions. It has built towns, piers, radio stations, hotels, harbors, hospitals; stores, schools, churches, theaters, playgrounds; shops, warehouses, markets; water, light, and power plants, and workers' homes by the thousands.

Besides growing bananas, it raises meat, vegetables, and other foods for its armies of workers, and operates sugar plantations, mills, and refineries; grows coconuts, cocoa, and other tropical products; and annually carries some 40,000 passengers on its 97 ships from Boston, New York, Baltimore, New Orleans, and San Francisco to 25 different ports between Habana and Cartagena, Colombia.

You think of all this when you sit in its Boston offices and watch engineers, munching bananas, draw plans for new drainage works in Panama, or experts testing soils for still more plantations in Colombia.

FISHING IS BOSTON'S OLDEST BUSINESS

Though Boston, remote from grainfields and ranches, must go far for bread and meat, she also covers much of America with fish, as well as bananas.

"But what profit might arise?" That was King James' query when Pilgrims asked him, in 1618, to permit them to sail for the New World.

"Fishing," they replied.

"So, God save my soul!" he exclaimed. "'Tis an honest trade. 'Twas the Apostles' own calling."

There's a reason why the Sacred Codfish is an emblem of Massachusetts; why its effigy hangs now in the Statehouse, and has hung, in one assembly hall or another, for more than 200 years. It saved the early settlers from starving; preserved with salt from England, it became their first export, their first source of revenue (p. 38).

Boston, like Gloucester, catches many other kinds now, from lobster to mackerel, and helps feed the whole United States. And cod is no longer the favorite; haddock is more in demand. "Come for a trip in my trawler," a skipper said.

Heading for the Stellwagen Bank, the dingdong echo of our radio depth-finder warned us that we were over the fishing grounds, and the big conical net was let go.

Wooden wheels, set on its lower lip, let it roll easily over the ocean floor; big wooden gates at each end, opening outward, kept it stretched wide open, so that it scooped up everything that swam or crawled, from "sea eggs" to squid.

"Last time we got a halibut as big as a horse," said a fisherman. "He weighed nearly 900 pounds."

"And once we found a gold-mounted fountain pen in a big cod's stomach," said another. "The skipper of the *Illinois* uses it now to keep his log."

Coins, spoons, buttons, even pieces of jewelry have been found in fish taken off the New England coast; apparently they seize such bright objects as may fall from passing ships.

With such suggestive names as *Kingfisher*, *Penguin*, and *Cormorant*, these trawlers and scores of other boats come back to unload at the huge Boston Fish Pier, which handles fish by the trainload (Color Plate XIII, and page 42).

"Green," or unfrozen, fish is shipped as far west as Mississippi; frozen fish, really fresh fish preserved by freezing which will keep in perfect condition a year or more, reaches the Pacific coast, while salted and dried codfish, or "bacalao," is consumed as far away as southern Europe, the Caribbean, and the coast of Brazil.

Dawn brings the auction in a big "pit" at the pier's end. Signs on the walls say all bidding must be in English; bids are called in English, but debates rage with confusion of tongues.

Then this big, busy fish pier echoes with excitement. Men in rubber boots, wearing caps with long visors like duck bills, throw fish into rope baskets that swing them to the docks. Others run hither and yon, pushing bright-colored carts filled with fish, followed by sniffing, hard-faced wharf cats.

These Boston people love the sea. For generations they sailed it to make a living. Now many sail for fun, yet with

THE HUB CITY, CRADLE OF AMERICAN LIBERTY



WITH ITS GILDED, MOSQUELIKE DOME, THE STATEHOUSE DOMINATES BOSTON

In a literal sense the Capitol is the "hub" of the city. Residents of Beacon Hill, which it crowns, are within walking distance of department stores, theaters, symphony hall, railway stations, even the gangplanks of ocean-going steamships.



© National Geographic Society

Enslay Photographs by Luis Marden

ON LAZY SWAN BOATS DREAMERS DRIFT ON TINY PUBLIC GARDEN PONDS

Washington's Tidal Basin and lakes in other cities have their swan boats; but they are driven by motors. Here man power and bicycle pedals, hidden in the swan, propel the silent craft.



Finlay Photograph by Lois Marden

THE "CONSTITUTION'S" WHEEL REPLACES ONE SHOT AWAY BY THE "JAVA" IN 1812. Known familiarly as "Old Ironsides," this 44-gun frigate was one of six ordered by Congress in 1794 because of the Algerian piracies. She took part in three bombardments off Tripoli.



© National Geographic Society

Finlay Photograph by B. Anthony Stewart

"OLD IRONSIDES," OFTEN REBUILT, RESTS NOW AT CHARLESTOWN NAVY YARD AFTER A RECENT TOUR OF ATLANTIC AND PACIFIC PORTS

This old ship's fights with the *Guerrière*, the *Java*, the *Cyane*, and the *Leviath* are famous in early annals of the American Navy. Condemned as unseaworthy in 1830, she was saved by public demand after Holmes published his poem, "Old Ironsides."

THE HUB CITY, CRADLE OF AMERICAN LIBERTY



© National Geographic Society

Finlay Photograph by B. Anthony Stewart

JOCKEYS WATCH THEIR WEIGHT IN THEIR DRESSING ROOM AT SUFFOLK DOWNS

Recent legislation in Massachusetts permits pari mutuel betting at horse and dog races. Huge crowds flock to this new course at South Boston.



© National Geographic Society

Finlay Photograph by Lois Marden

SAMOSET, ALGONQUIN WOODEN INDIAN CHIEF, OFFERS CUSTOMERS
A GOOD CIGAR ON MILK STREET, BOSTON

Carl Larsen, who once made ships' figureheads, carved this friendly Indian from live oak which had been seasoned in mud and water storage. Boiled linseed oil is periodically poured down a hole on top the Indian's head to keep the wood from cracking.



PARK GARDENERS FASHIONED THIS CITY SEAL ON THE LAWN OF COPLEY SQUARE

Formed from colored shrubs set in a green grass background, the inscription reads: "As to our fathers so may God be to us. Given by the Government of the City, A. D. 1822." In the center, "Boston, founded A. D. 1630."



© National Geographic Society

Finlay Photographs by Luis Marden

HISTORIC LIBERTY TREE FLAG IS CAREFULLY GUARDED BY THE BOSTON SOCIETY

The donor's letter says: "Presented by John C. Fernald. In August, 1767, a flagpole was erected, extending upward through the (Liberty) tree From the pole, a flag was flown to call the Sons of Liberty together . . . This is that flag."

THE HUB CITY. CRADLE OF AMERICAN LIBERTY



A MILLION-DOLLAR SMILE FREE WITH EVERY 10 CENTS' WORTH OF FRUIT.

Italian boys tend their fragrant pushcarts, and mark down their prices as evening shadows fall. In and near Faneuil Hall and at adjacent Quincy Market, a spacious structure 535 feet long, Boston buys much of its food.



© National Geographic Society

Finlay Photographs by Luis Marden

DRUMS! DRUMS! FOR BRASS BANDS, DRUM CORPS, AND SMALL BOYS EVERYWHERE

For generations kinsmen of the man at the left have made drums, played them, and taught drummers serving in the Revolution, the War-between-the-States, and in the World War. Assembling an instrument in a Boston drum factory.



GIRLS IN EMERALD ISLE COSTUME STAGE FOLK DANCES ON THE COMMON

In Boston, noted for its many racial groups, the sons and daughters of Ireland are numerous. Early American families still cling to Beacon Hill and Back Bay, especially for winter residence.



© National Geographic Society

Finlay Photographs by Luis Marden

DANCING A MINUET, A REENACTMENT OF THE SPINNING BEE OF 1753

In 1634 this Common was set apart as a cow pasture and training ground. For generations it has been the scene of many exciting events in city and national history. Now, with its open-air oratory and concerts, its nursemaids, and noisy small boys, it is the Hyde Park (London) of Boston.

THE HUB CITY, CRADLE OF AMERICAN LIBERTY



BOWLING IN BROOKLINE AT "THE COUNTRY CLUB"—FIRST TO BE FOUNDED IN AMERICA. More than half a century ago, when this club was founded for outdoor athletics, golf was little played, squash was hardly known in the United States, and tennis was in its infancy.



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Finlay Photographs by Luis Marsden

SPINNING AND WEAVING EXHIBITS RETURN AGAIN AFTER NEARLY 200 YEARS

Boston papers of 1753 tell how interest in these arts was stimulated when in that year 300 young women brought their wheels to the Common and showed a huge crowd how to spin wool (Plate VIII). Containing about 50 acres of tree-shaded lawns, Boston Common lies in the heart of the city.



TWO HUNDRED WOMEN—AND THE LONE MAN—KNITTED THIS WOOLEN FLAG IN ONE DAY. Here three contestants pin the finished squares on a board to form the Stars and Stripes. In August, 1935, Boston staged an old-fashioned wool-working exhibit on the Common.



© National Geographic Society

Finlay Photographs by Luis Marden

BOSTON YOUNG LADIES MAKE THEIR NEEDLES FLY TO WIN THE KNITTING TROPHY

Even man competes in the background with the busy women, two of whom have nearly finished their sections that will form parts of a stripe in the flag above. Women's organizations founded spinning schools in Boston after 1720. Free wheels were supplied by the city. After one competition excited swains; becoming jealous, rioted over the spinning prowess of their dames.

all the skill and grim intent of adventurous clipper days.

Be asked to sail in Yacht Club races, especially if all your racing experience has been on the deck of a mustang, and you hear a new language. On the first day of "soft spots" in the air, of tacking, luffing, crossing of bows and sterns, and shutting off of the rival's wind, sailing seems a sport not only of odd speech but of mysterious motions (page 40).

Then, all at once, you begin to sense these tricks of jockeying with boats. Here is horse racing, but on water! Instead of crowding the other, riding in to the rail to slow him down, you shut off his breeze power. Ship lines are only bridle reins; stiff breezes are spurs, and letting out a spinnaker is merely giving your nag her head.

Fair play and good sportsmanship are ingrained. Inherited English ways and proximity of Harvard, with its generations of clean sport, have fostered this love for games (page 79).

Gymnasiums came early, where circus acrobats and strong men used to be invited to "show off" for the boys. That colorful character in prize-ring history, John L. Sullivan, was born in Boston. Cricket, hockey, boxing, rowing, swimming, high bicycles, and ball players in full beards, Boston fostered them all; yet permitted no league baseball games on Sunday till 1929!

Special "snow trains" leave now, taking winter crowds with skis, sleds, and toboggans, at the first news of heavy snows in the White Mountains. Born of the old East Indian battledore and shuttlecock, and introduced into England about a century ago by returning Army officers, the game of badminton is now also much played about Boston.

New among Boston sports is midget motor-car racing. She has a special Tom Thumb track, an oddly formed figure with seven turns. To it, on race days, tiny speed cars are hauled on trucks, for rough-and-tumble contests (page 60).

Instead of arresting people now who swim on Sundays, the city of Revere and the State jointly support a vast pleasure resort at Revere Beach. Here you can rent a locker and a bathing suit for 10 cents (page 61). After one Sunday's sport the city laundered more than 100,000 bathing suits!

The public playground, the Common, was once a cruel, mirthless place where men were whipped at posts and taunted in the stocks; where pirates and Quakers were hanged, and trenches dug for British soldiers killed at Bunker Hill.

CHILDREN FROLIC AND IDLE MEN SLEEP WHERE PIRATES USED TO HANG

Great trees shade the Common now, and on city-built playgrounds boys and girls of mingled races romp through their games (Color Plates VI-VIII). Along wide walks where Union soldiers marched off to war singing "John Brown's Body," first sung into popularity by the 12th Massachusetts Regiment, I saw Labor Day crowds gathering to hear speeches.

A band again played "America" within earshot of Park Street Church, where that hymn was first publicly sung (Plate XIV). Then a versatile Congressman put on the bandmaster's cap and led the band himself, while news cameramen shot him in many poses; election was coming.

Some rods apart from the official speakers' stand, the usual "agin-the-Government" dissenters harangued their little groups; a few listeners agreed, some grinned, and some scowled (page 82).

"If you don't like this country, get out!" some voices shouted.

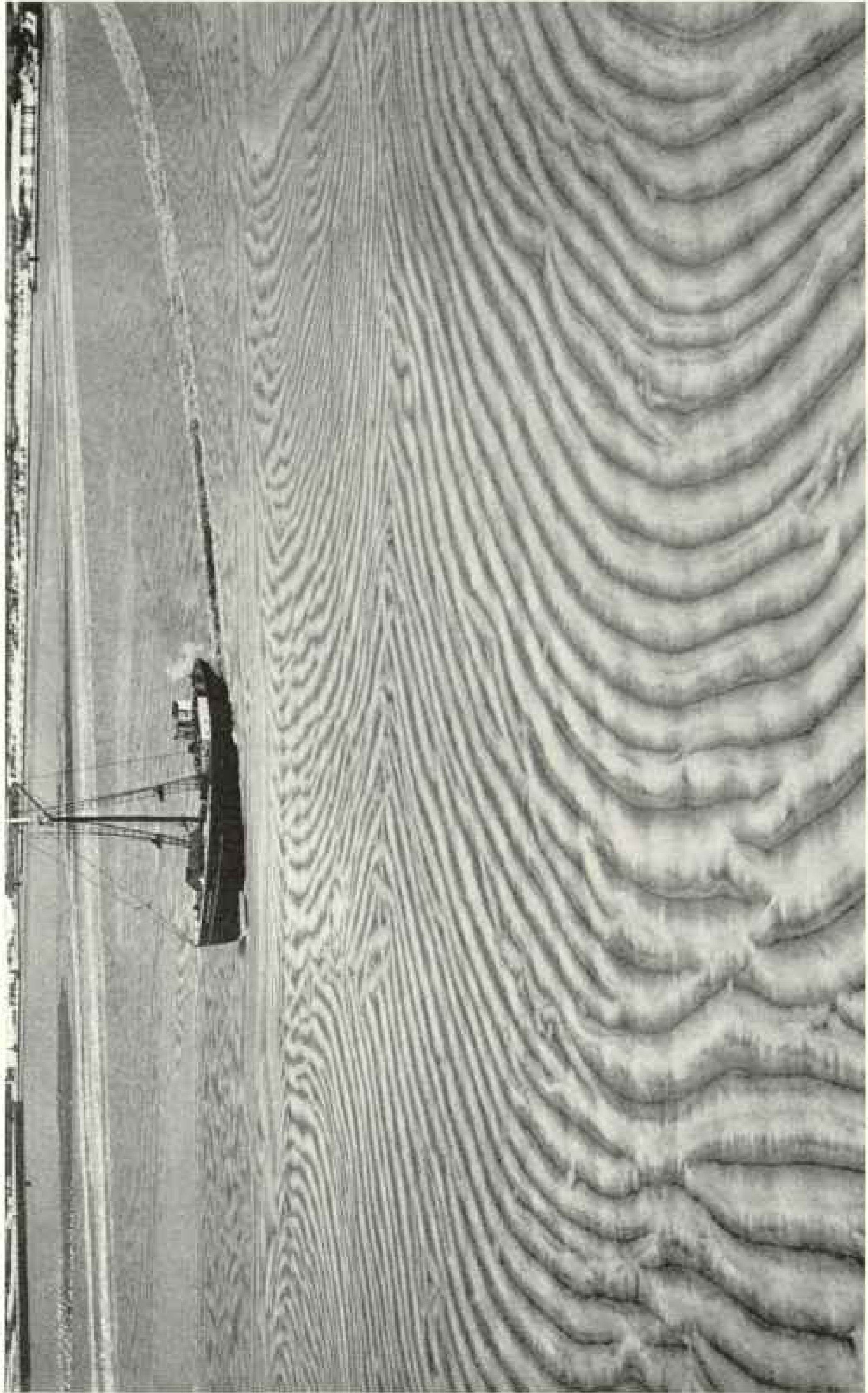
"That's right," others echoed; and strolled off to watch the ball games.

Next day, after dawn, I walked again across the Common. In all directions men sprawled on the grass; there they had slept.

One near me opened an old suitcase to change his shirt. Then he reached for a discarded newspaper and read the headlines: "Labor Day Crowd Bets \$1,787,261 on Races", "Total Bet During Meet Just Closed More than \$12,000,000." Idly he scanned these lines, then crushed the paper and tossed it away.

Later that day, at the Essex Institute in near-by Salem, I thought again of those idle men on the Common. To look at the Museum's symbols of busy, thrifty pioneer life is to be impressed, profoundly, with the changes less than three centuries have brought.

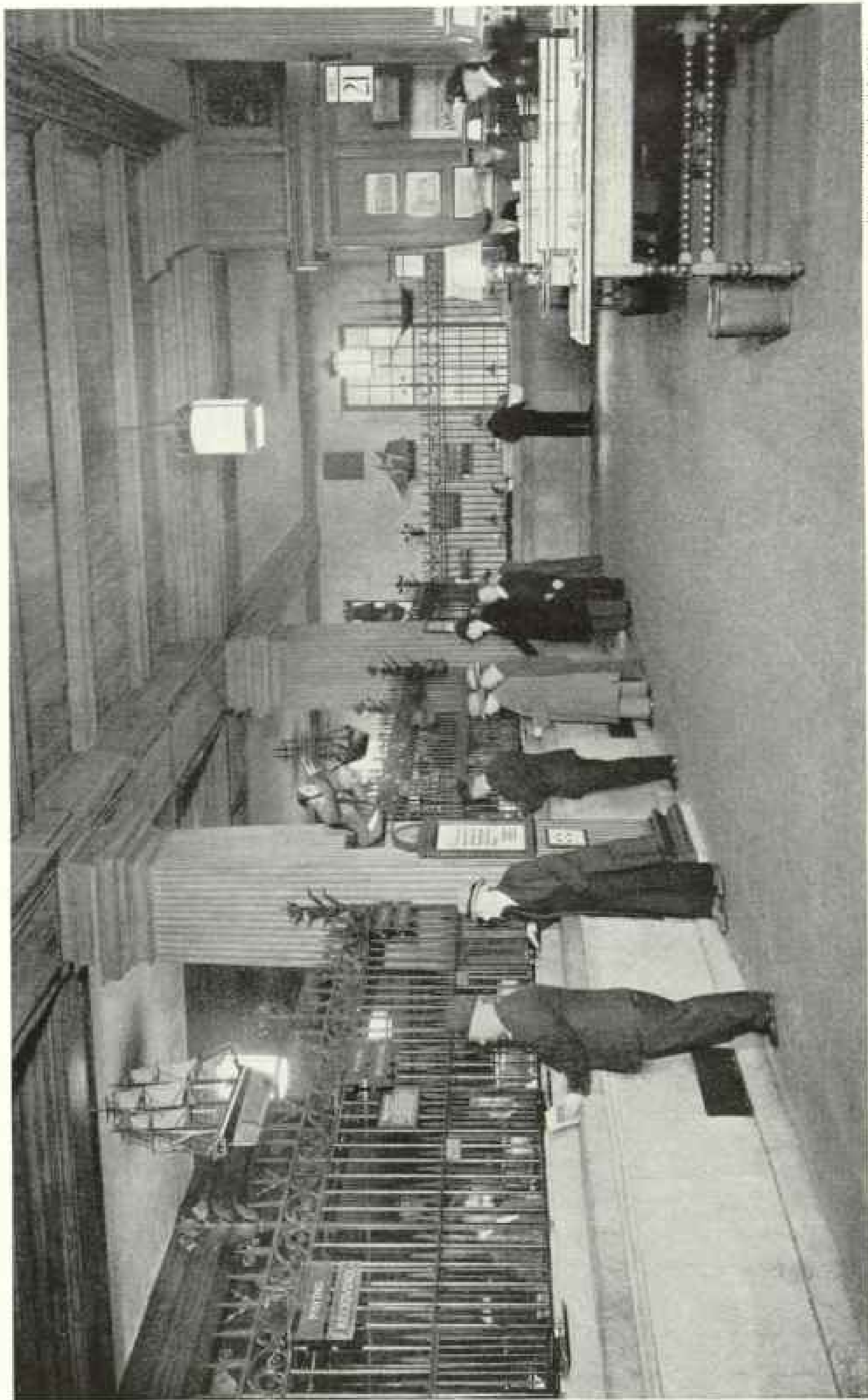
All these crude, hand-made tools, implements, utensils, vehicles, clothing, furniture, and toys prove how diligently *all* the early settlers had to work for life's needs and comforts. More things were



Photograph by Lindie R. Jones

ZEBRA-LIKE PATTERNS ETCHED ON CHARLES RIVER BASIN BY WAYWARD WINTER'S CAPRICE.

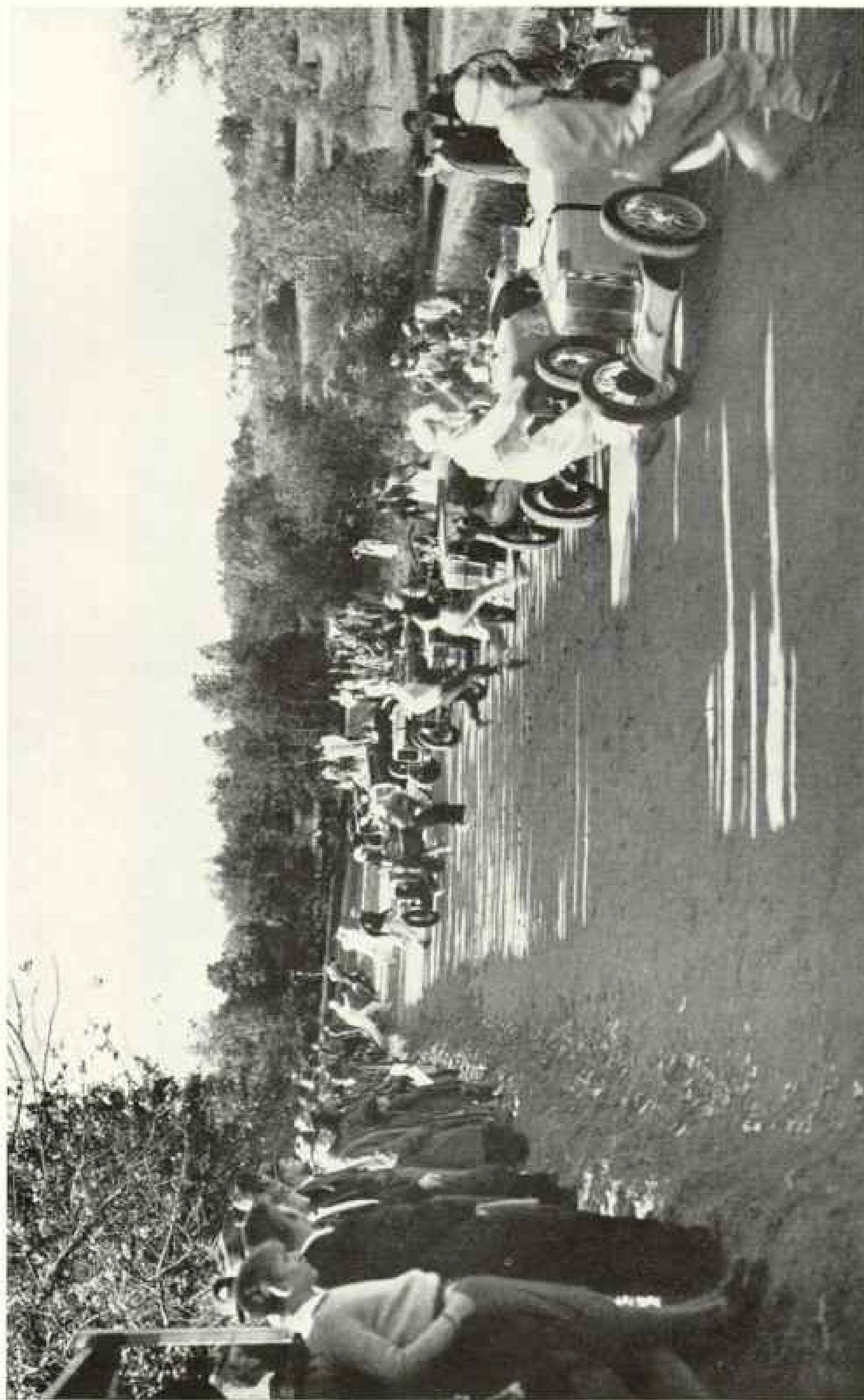
This unusual wavelike ice, not often observed on the Charles, was photographed February 23, 1929. The ice-breaking boat was used by the State to keep barge lanes open to the locks. The surface is smooth, but has a ruffled appearance when seen from above.



Photograph by Paul J. Weber

FAMED NEW ENGLAND VESSELS LIVE IN MINIATURE AT THE STATE STREET TRUST COMPANY'S MAIN OFFICE

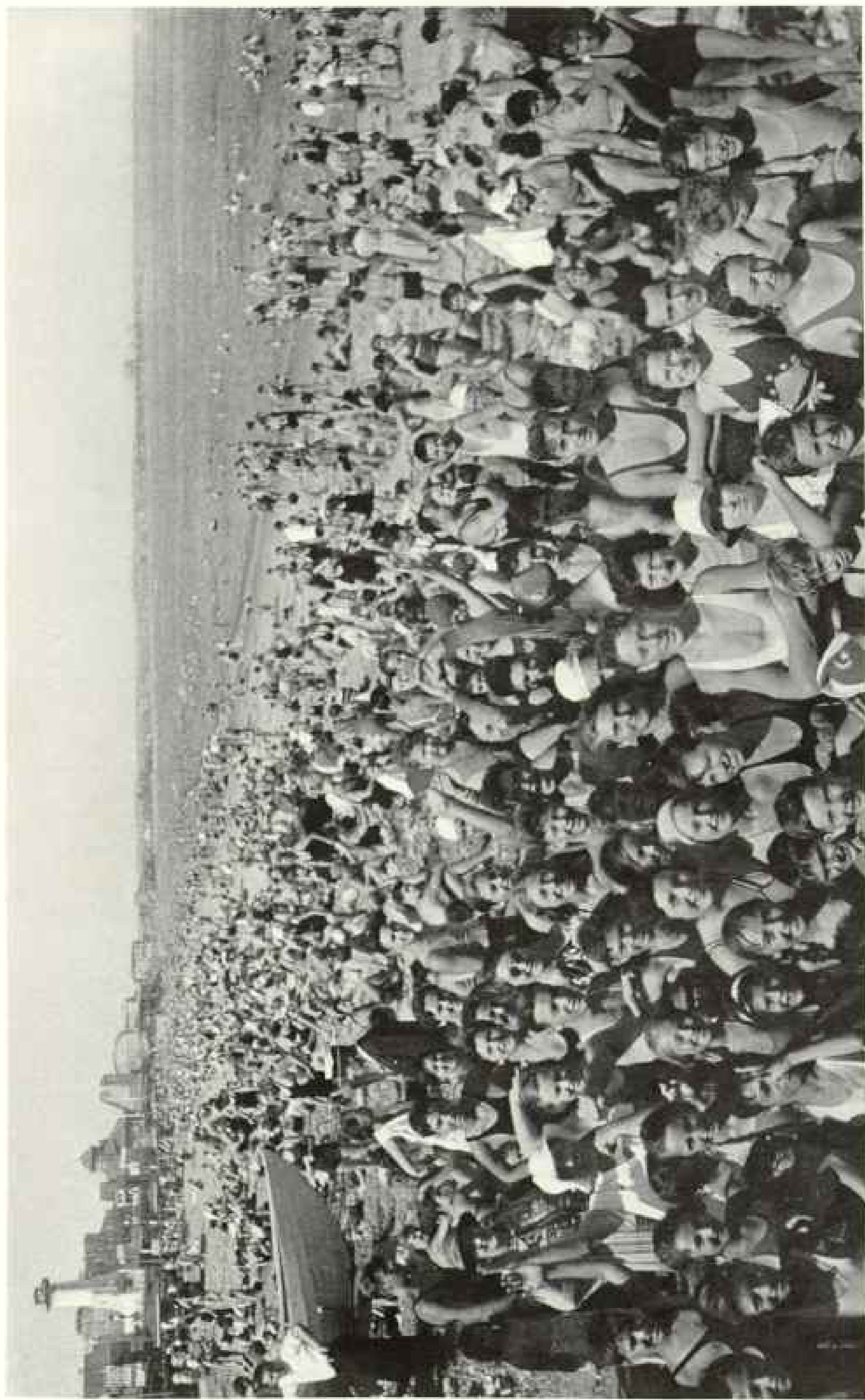
A model of the whaler *Esperanza* hangs above the teller's cage, left. On the nearest column is a curious figurehead from the ship *Abraham Lincoln*, which was sunk off the coast of England. Lighting fixtures on the customers' desks are old whale oil lamps adapted for electricity, their shades decorated with reproductions of noted ships. Even the inkwells are original pewter ones from old English countinghouses. Flagstones for the floor and counter were obtained at Hingham, Massachusetts, near quarries which supplied granite for many of Boston's historic buildings. "Cages" are made of hand-forged wrought iron of early Colonial design.



Photograph by Harris W. Reynolds

"THEY'RE OFF!" IN THIS ROAD RACE THAT BEGINS WITH A SPRINT AS DRIVERS DASH TO THEIR MIDGET CARS

The starter has waved his flag. Contestants, who were lined up across the roadway, scramble into their machines, motors jilling. One driver leaps belatedly from the sidelines, while another has his car already under way. Starting positions are determined on a handicap basis, smaller cars being placed near the head of the line. This race is run on a "circuit" of winding roads on a private estate at Wayland, near Boston (page 57).



Photograph by H. Anthony Stewart

SWARMS OF HAPPY BATHERS CROWD REVERE BEACH, BOSTON'S CONEY ISLAND

Bathing suits are rented to the public by the city of Revere and the State, which jointly maintain this huge resort. After one busy Sunday, the city hauled more than 100,000 suits—in a locality where Sunday sport was once a crime (page 57). A boulevard and promenades, with roller coasters and other amusements, extend for about two miles along this wide beach on Massachusetts Bay.



Photograph by Richard W. Sears

AT BOSTON IN 1876 ALEXANDER GRAHAM BELL SENT THE FIRST MESSAGE
BY TELEPHONE

"Mr. Watson, come here, I want you." With these now historic words, Dr. Bell summoned his assistant by telephone in this building on March 10, 1876. Here, forty years later, on March 13, 1916, the inventor of the telephone and Mrs. Bell attend the unveiling of a memorial tablet commemorating the momentous invention achieved in this building on Exeter Place. Second president of the National Geographic Society, Dr. Bell was a trustee of The Society until his death in 1922 (page 76 and Plate XI).

wanted than there were hands to make them. From this necessity came inventions; shoe machinery, the cotton gin, mechanical wool combers, all New England's complex factory life.

For busloads who daily visit these historic shrines about Boston, here is visual, fascinating evidence of how their ancestors lived and fought, by land and sea.

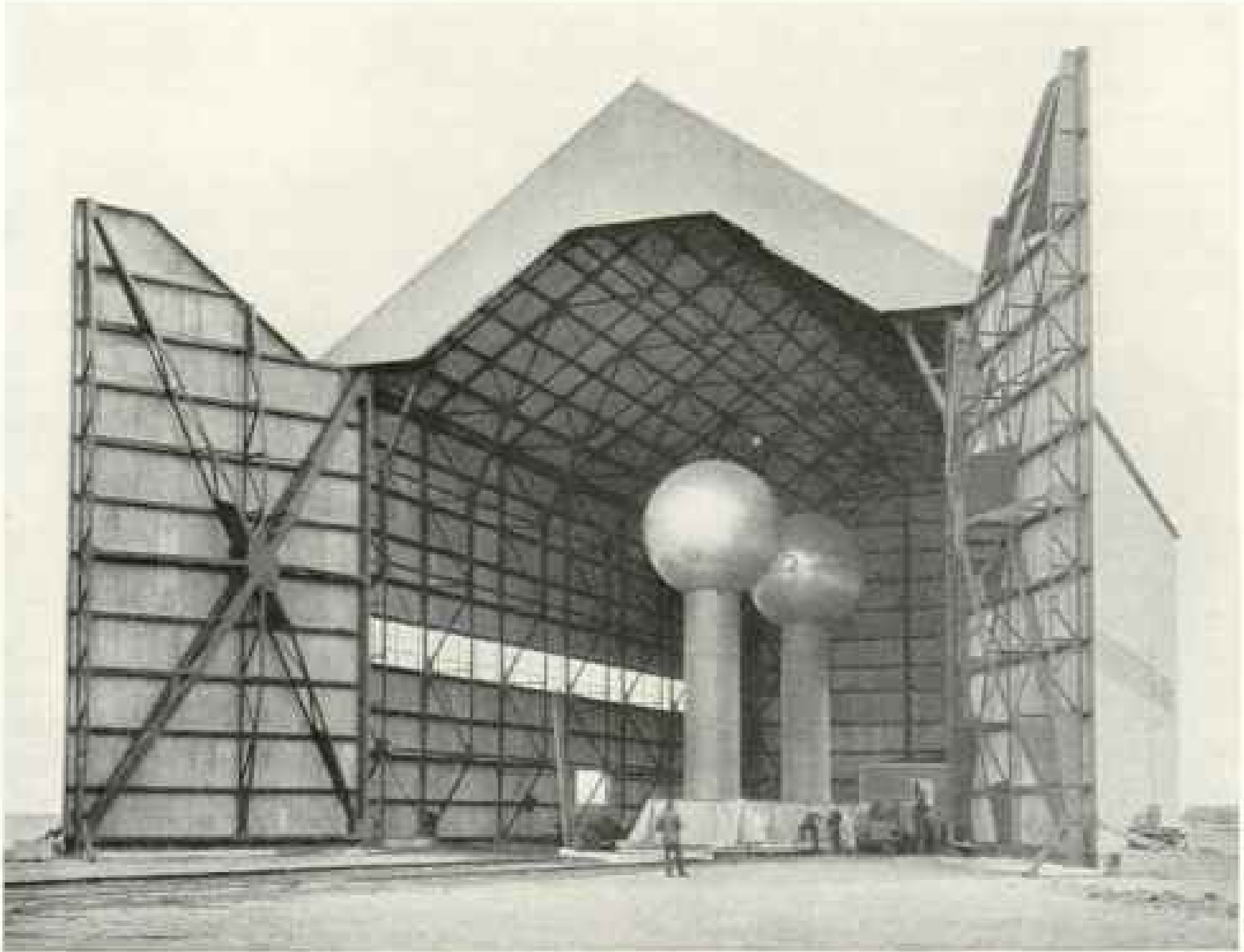
How pirates were outwitted, whales killed, wars waged, privateers launched, trade carried on with China, and how New England became mistress of the seas are all graphically shown in the matchless sea-faring exhibits of Peabody Museum, also at Salem.

Here, too, is the visual story of life in the Far East, a century or more ago, as these Yankee skippers found it. Besides its amazing show of ship models, pictures of historic clippers, and crude paintings of

Canton and Shanghai homes of exiled Boston and Salem traders of long ago, to this museum have been added rare life-sized ethnological groups, collections of oriental art and handcraft, boats, weapons, dishes, jewelry, and wearing apparel.

How profitless a walk out to Salem's "Gallows Hill," where a few "witches" were hanged, compared with a silent, vivid hour, imagination at play, among these wonders of bygone ways and days!

Follow the route of Paul Revere's ride, if you will, and see Lexington, Concord, and that bridge where patriots fired "the shot heard round the world." But never with the Boston Sunday crowds! The road becomes a river then, a thick sluggish stream of crowded busses, family flivvers, "foreign" cars with Iowa or Utah license tags, motorcycles, and fat girls in shorts walking, reducing.



Photograph courtesy Massachusetts Institute of Technology

ATTEMPTING A POWERFUL ATTACK ON THE ATOM, M. I. T. BUILT THIS DIRECT CURRENT ELECTROSTATIC GENERATOR

Using voltages up to 10,000,000, electrical "bullets" flying 100,000 times faster than the swiftest rifle bullets will be fired at atoms to smash their cores, or nuclei, in which vast energy is believed to be locked up. Could this power be released, it is estimated that the atomic energy in a single lump of coal might drive a steamship across the Atlantic. If they can learn how the cores of atoms are put together, scientists will be nearer to solving the secret of how the universe is constructed, for everything is composed of atoms, from human beings to the distant stars. This generator is housed in an airship dock. The giant spherical terminals are 15 feet in diameter and the units are 45 feet high, weighing 16 tons each.

Slowly, often in second gear, the big parade moves past the Minute Man Cafe, past an advertising effigy of Paul Revere on a galloping wooden horse; through blue smoke, the smell of hot rubber, hot oil, hot dogs, and coffee, mixed with gasoline and whiffs of roadside onion stew, fruit stands, and cheap perfume.

Beside me in the bus was a Texan. "Paul could never have made it on a day like this," he growled.

BOSTON REVIVES AN ANCIENT ART

For more than a century after the Pilgrims landed, many New England settlers had not even seen a windowpane. They weren't imported, for wide use, until about 1829.

Yet, some 800 years earlier, most elabo-

rate windows of stained glass for cathedral use were made in the Old World.

Today, in Boston, this art has been revived. Medieval craftsmen who made the famous cathedral windows at Chartres, Le Mans, or Canterbury, centuries ago, would feel quite at home in these Boston shops. One of them, could he return, might walk into a Boston studio and go right to work, for methods are changed but little.

Boston makes windows not only for churches and chapels all over America; she even sends them abroad, to the American Memorial Cemetery Chapel at Belleau Wood, France, and to the American Church in Paris.

All themes for windows are not ecclesiastical. Legend, romance, or even science are drawn on for secular themes that may

range from Tom Sawyer to Sir Galahad, as for windows in the playroom of a Cincinnati hospital; or from Euclid, "Father of Geometry," to Charles Darwin, the evolutionist, as in the chapel rose windows made for Colorado College.

For the Cathedral of St. John the Divine, in New York, one great window made here tells the History of Healing. The figures shown begin with ancient Imhotep, the early Egyptian doctor; then comes Hippocrates, and Avicenna, the Arabian physician. Pasteur, Lister, Florence Nightingale, and Edith Cavell are also shown. So is the Boston dentist, William T. G. Morton, who demonstrated the use of ether as escape from pain during surgery.

Larger medallions in this window show Christ miraculously healing the lepers, the blind and the halt, the raising of Lazarus, and the casting out of devils.

To make these often huge, heavy, and costly windows, artists first draw designs on small scale, after which the cartoon, or full-size drawing is made (Plate XVI).

From this a paper plan is copied and cut into pattern pieces, like a jigsaw puzzle; these patterns are followed exactly in cutting the bits of various-colored glass, whose correct arrangement forms the design, and which are held together by grooved strips of lead.

Workmen hundreds of years ago used almost these same methods, and knew perfectly the color values of stained glass, which, as some one said, can make the inside of a cathedral seem like a lonely forest at twilight.

Windows of the chapel at Princeton University are great epics of literature—"Paradise Lost," "The Divine Comedy," "Pilgrim's Progress," all as recorded in colored glass by a Boston artist.

MAKING A SILK PURSE FROM A SOW'S EAR

From this centuries-old art Boston takes a long stride to the magic of modern chemical science.

"We got 100 sow ears from a Chicago packer," said a chemist in the Arthur D. Little laboratories, "and made a silk purse. Here it is. No, it isn't very good silk, or very strong, but it *is* silk (Plate IX).

"How did we do it? Well, briefly, by finding out just how the silkworm does it. He emits a viscous liquid which, on reaching the air, turns into silk thread. That liquid, we found, was much like glue.

So we took glue from a sow's ear, and sought to make it act just like the silkworm's fluid. The rest was straight laboratory work.

"We never intended, of course, to make silk from sows' ears to sell; we were only playing! There is more wood and cotton fiber at hand for making artificial silk than there are pigs' ears."

How to build better cedar chests, chests more discouraging to moths which now destroy each year more than \$200,000,000 worth of our woolen clothes and rugs, was another riddle handed to the chemists. Solving it, they raised swarms of moths to study their diets, breathing habits, and reactions to poisons.

Mercury vapor, for example, though fatal to other forms of life, was found to stimulate moths, making them larger and more vigorous. But adequate vapor of cedar oil, as exuded from cedar wood, was found to kill the moth by harm to its skin and breathing machine.

Another odd task here has to do with smells.

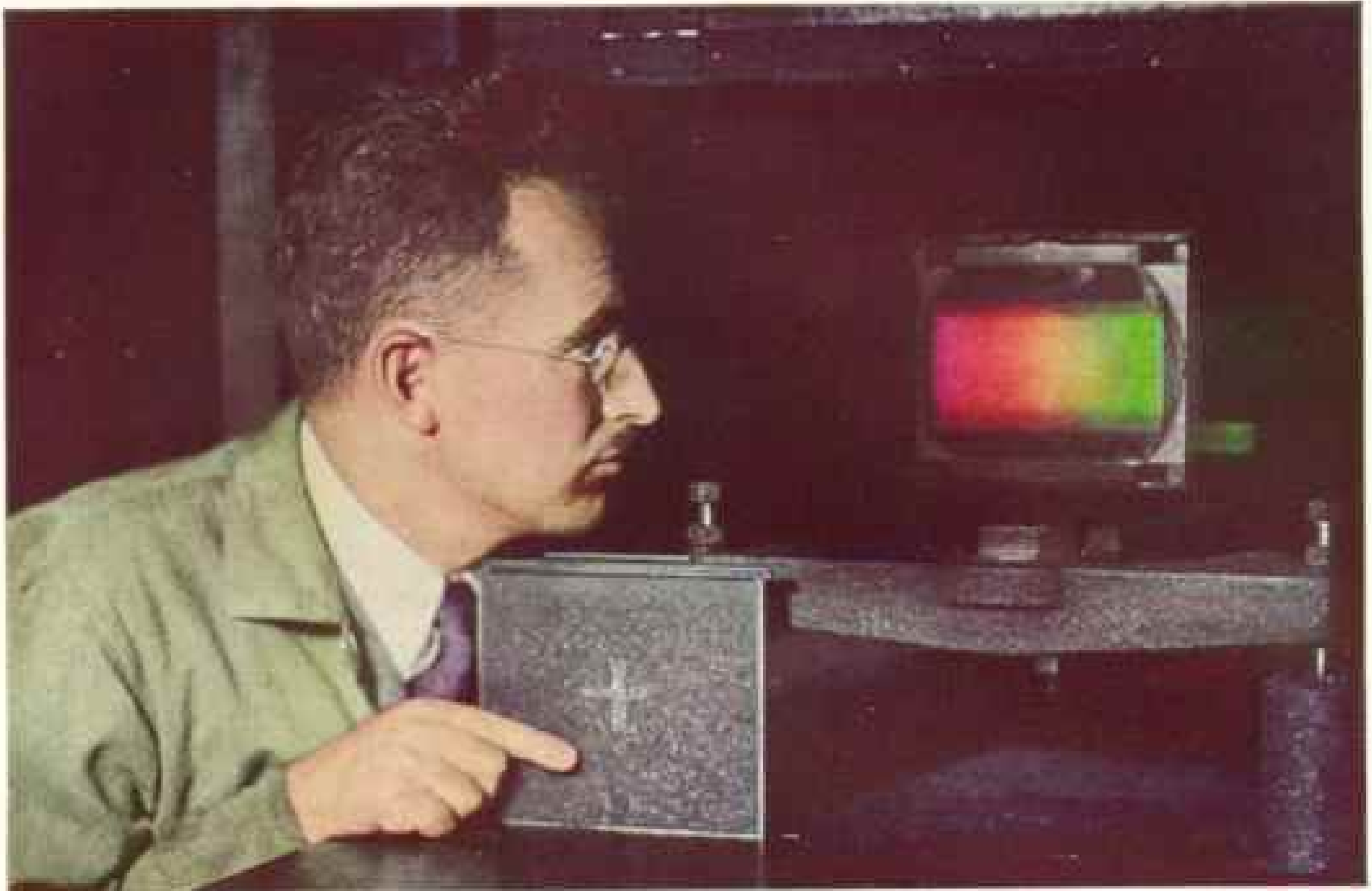
If you make glue, soap, or linoleum, or tan leather, run a fertilizer factory, or use a bookbinder's paste whose odor makes your workmen sick and drives customers away, these chemists will suppress it for you. Not only that, they can trade you a pleasant smell for that unwanted stench.

In working silk into stockings, for example, oil is added to make the silk more easily handled. Later this gets rancid. One hosiery maker, to overcome this, mildly perfumed the stockings. Then, by actual tests, kept secret from sales girls, it was found the scented stockings outsold the others by 34 per cent!

In the same way chemistry now supplies pleasing odors to cosmetics, soaps, and pharmaceuticals, as well as to manufactured foods and beverages. Without our sense of smell, these chemists say, apples, celery, and onions would all taste much alike.

Fragrant, acid, burnt, and caprylic (goaty) are the four basic smells which the human nose can detect. With these come infinite combinations, of which a well-trained "smell expert" may identify upwards of 60 before his nose gets tired. (When such nasal nerve fatigue overtakes a perfumer, he sniffs some gum camphor to reawaken his olfactory senses.)

An ingenious chart shows the character



A BEAM OF LIGHT, BROKEN UP BY A SPECTROGRAPH, MAKES THIS ARTIFICIAL RAINBOW. Its face highly polished and lined with microscopic grooves, the mirror spreads a band of light, in which students at Massachusetts Institute of Technology distinguish more than 15,000 kinds of red and blue. On photographic plates, the mirror will register the unseen infra-red and ultra-violet light rays.



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Finlay Photographs by Luis Marden

"YOU CAN'T MAKE A SILK PURSE FROM A SOW'S EAR"—BUT LOOK AT THIS!

Challenging that proverb, scientists in the Arthur D. Little laboratories ordered sows' ears from Chicago packers, compared their chemical structure with silkworm excretions—and so finally made this silk purse from a sow's ear.



© National Geographic Society

Finlay Photograph by H. Anthony Stewart

BEFORE: DUNSTER HOUSE, A HARVARD UNIVERSITY DORMITORY, SUMMER STUDENTS SCULL ON THE CHARLES RIVER

This year, 1936, marks the 300th anniversary of the United States' oldest institution of higher learning, founded by John Harvard. He was one of 35 graduates of Emmanuel College, Cambridge University in England, and came to Massachusetts in the Puritan migration. Earlier teachers were often paid in grain and wampum; once a goat was used as part of the pay due the president, but the goat died!



© National Geographic Society

THE ODD-LOOKING OBJECT IS A MODEL OF THE FIRST TELEPHONE
 Compare the wooden instrument with the dial hand set. At Boston in 1876 Alexander Graham Bell, long a President of the National Geographic Society, invented the telephone. New England saw the origin and development of the first local and long-distance service.



Finlay Photographs by Louis Mardich

"EVERY GEOGRAPHIC SINCE 1905" SAYS THE SIGN

This dealer keeps a list of copies on hand, classified by the year and country. From Emerson's day, Boston writers have frequented these second-hand bookshops along Cornhill. From far and near customers come or write for any book, from Gray's "Elegy" to "Mittiny on the Beauty."



ASTONISHING IS THE PRODIGIOUS GROWTH OF THE BANANA TRADE

As recently as the Philadelphia Centennial bananas were a rare tropical fruit, sold only here and there as an oddity, wrapped in tin foil. Now, with its vast plantations and "big white fleet," the United Fruit Company performs miracles of production and distribution.



© National Geographic Society

Finlay Photographs by Luis Marden

AS FROM SOME COLOSSAL CORNUCOPIA, FRUITS AND VEGETABLES
POUR INTO BOSTON'S "PETTICOAT LANE"

What with tropic fruits coming by steamer, Pacific coast products via the Panama Canal, and field and orchard crops by train and truck, Boston finds fruits "in season" the year round.

THE HUB CITY, CRADLE OF AMERICAN LIBERTY



TRAWLERS UNLOAD A GIANT HALIBUT AT BOSTON'S INCOMPARABLE FISH-PIER

Often in winter, these little ships come in from the Banks sheathed in coats of frozen spray. In the background rises Customhouse Tower. The man at the left, in boots, uses his pitchfork for tossing fish into pushcarts. Noisy early-morning fish auctions are held in a big hall on the pier.



© National Geographic Society

Finlay Photographs by Luis Marden

HERE IS APPETIZING EVIDENCE THAT BOSTON STILL ENJOYS ITS
TRADITIONAL TASTE FOR BAKED BEANS

This ambrosial food factory in near-by Melrose also bakes the brown bread, every Saturday, that goes so well with beans at Sunday breakfast.



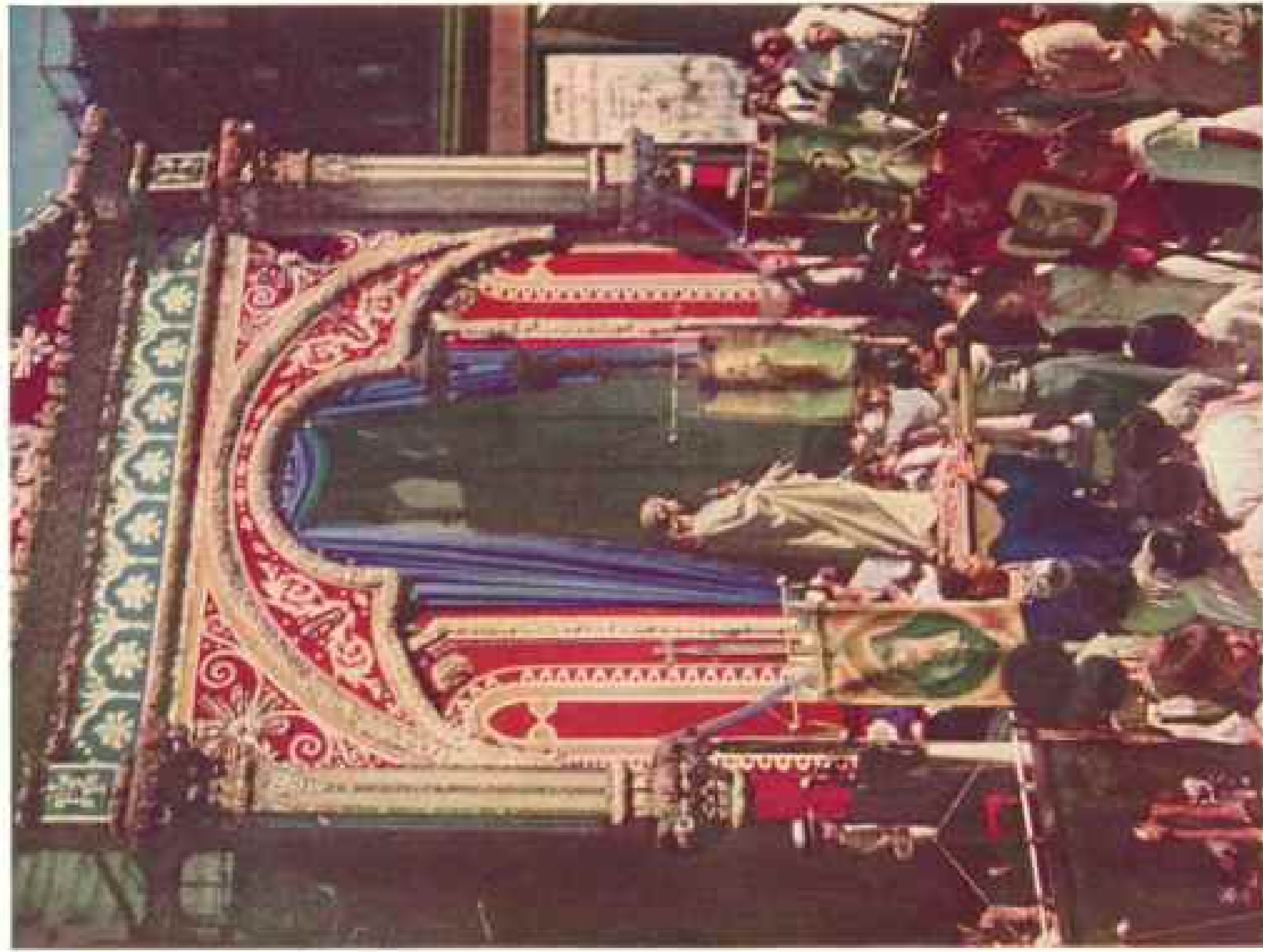
© National Geographic Society
 Friday Photograph by Luis Maróten
 NOT PATRIOTIC SPEECHES BUT PUSHCART VENDERS' FERVENT
 CRIES NOW AROUSE ECHOES AROUND FANEUIL HALL.

Fat green cucumbers, crisp and warty, are sold by Signor Passanisi! In the background rises the Customhouse Tower, Boston's only sky-scraper, which on clear days is a landmark for sailors far out to sea.



Friday Photograph by H. Anthony Stewart
 IN PARK STREET CHURCH THE NATIONAL HYMN, "AMERICA,"
 WAS FIRST SUNG, JULY 4, 1832

Samuel Francis Smith wrote the song. Busy Tremont Street, with churches and burying grounds flanking modern hotels and stores, is one of Boston's many reminders of London.



© National Geographic Society

SHRINES ARE OFTEN ERECTED IN BOSTON'S "LITTLE ITALY"

Fishermen are prominent in these celebrations, when images of the saints are borne on men's shoulders through the streets. Spectators often rush up and pin dollar bills to ribbons that hang from the shrines.



Finlay Photographs by Louis Marden

OFFICERS OF THE "ANCIENT AND HONORABLE ARTILLERY COMPANY"

Faneuil Hall's first floor now is a public market. Upper rooms house the historic Company, named for the London organization. Here statesmen have made many speeches enshrined in American history.



Finlay Photograph by B. Anthony Stewart

ODD BOOTS AND SHOES FROM OLD TIMES AND FAR PLACES IN A BOSTON MUSEUM

The queer, feathery shoe (lower center) is worn by Australian aborigines to hide their footprints from enemies. The high boots are jack boots of the 16th century. Turkish sandals, right; Chinese mandarin slippers, left.



© National Geographic Society

Finlay Photograph by Luis Marden

AN ARTIST IN CONNICK'S STUDIO FINISHES A STAINED-GLASS WINDOW FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK

Tacked to the wall at the right is the full-size black-and-white "cartoon" from which the finished window is patterned. Medallions, left, depict the "White Rabbit" and "Alice in Wonderland."

and source of various smells. When a certain smell is desired for use in a trade or industry, the chemist knows just where or how to get it.

In Boston today sulphuric, nitric, hydrochloric, and acetic acids, as well as alum, ammonia, salts, and other chemicals, are made for paper and textile mills, tanneries, etc. One chemical concern makes shoe polishes which sell all over the world; others furnish chemicals for factories making steam hose, bowling balls, and rubber rolls.

In the field of pharmaceutical chemistry, Boston has the great plant of the United Drug Company, now known as "Drug, Inc.," and other factories whose products are much exported.

Here the quick freezing of food was first accomplished; here are made sugar-of-milk, cod-liver oil, and disinfectants, and here is one of the world's largest soap factories.

THE HARVARD TRICENTENARY

In September of this year Harvard University will celebrate the tricentenary of its founding, when, on September 8, 1636, the Massachusetts Bay Colony appropriated £400 toward a college which should educate "English and Indian youth in knowledge and Godliness" (Plate X).

America's first college lecture on electricity was given at Harvard in 1746 by Professor John Winthrop.

Harvard's Blue Hill Weather Observatory was founded in 1884. Here the first recording instrument was raised by a kite. Samuel P. Langley and Orville Wright came to study these kite findings. At the St. Louis World's Fair in 1904, the Harvard Observatory initiated in America the use of weather-sounding balloons.

For more than fifty years Harvard has been noted for its study of the heavens; it has made more than 400,000 celestial photographs, and has led in work on star clusters, star brightness, Magellanic Clouds, and the galactic system.

In chemistry, Harvard laboratories determined the atomic weights of more than half of all known elements; led in the manufacture of organic compounds; developed the methods and apparatus, now in use the world over, for precise work in chemical analysis, calorimetry, and electrochemistry.

X-rays, acoustics, spectra, radio waves, high pressures, cosmic rays, radioactivity and thermodynamics have been subjects of

major research at Harvard, to the advancement of science.

In geology and volcanology Harvard has made field studies in six continents and the islands of three oceans.

PIONEERS IN RESEARCH

Early American development in many phases of science is attributed to Harvard men: Agassiz in zoology and geology; Gray in American flora; Goodale and Farlow in botany; Cooke and Gibbs in chemistry; Wyman in anatomy; Whitney and Shaler in geology; Peirce in mathematics; Jackson in paleontology; Sabine in physics; Pickering in astronomy; James and Münsterberg in psychology.

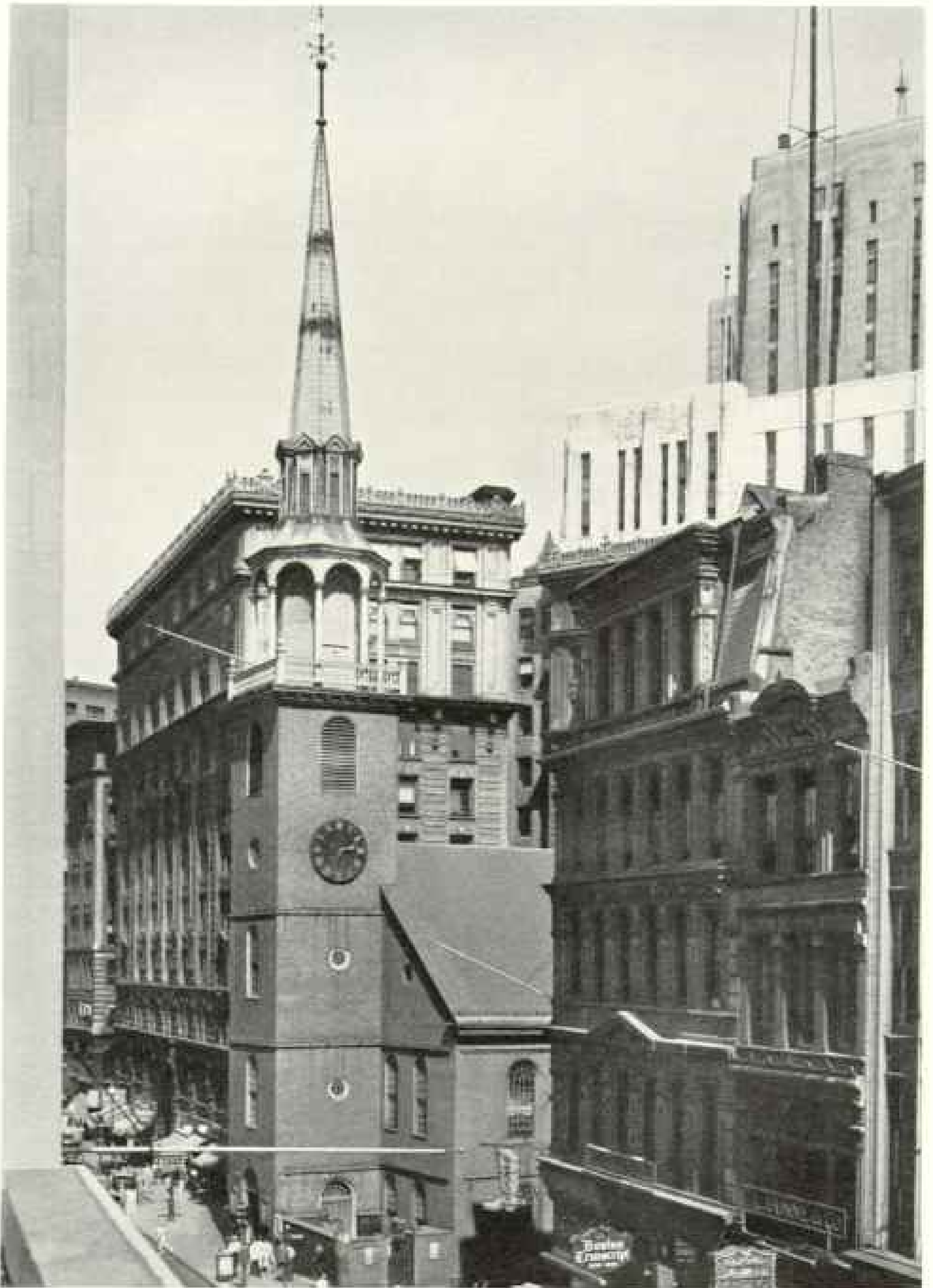
Anthropology in America owes much of its growth to Harvard, which has carried on field research throughout the world, notably, in earlier days, in Central America and New Mexico.

The Gray Herbarium, founded in 1864, has 850,000 sheets of specimens of plants and ferns, most nearly complete of any collection. The Harvard forest of 2,100 acres is our oldest scientifically managed forest research tract. For more than a century Harvard's botanic garden has been a living museum of plant forms. Harvard's Arnold Arboretum, founded in 1872, contains about 5,000 kinds of trees, shrubs, and plants grown in the open air for research.

Asa Gray, of Harvard, America's greatest botanist, from the time he became a professor at Harvard in 1842, until his death in 1888, developed a system whereby surveying parties, pioneer observers, members of exploring expeditions, Army men at frontier posts, and others who went into the American pioneer country of that day sent him botanical specimens. Thereby Gray studied and named thousands of American plants.

Harvard's medical school men recognized and named appendicitis, devised the first baked dressings, suggested sterilization of milk for infants, determined the value of bacteriological examination of throat cases in diphtheria, devised serums and muscle-training treatment for infantile paralysis, and discovered the liver cure for pernicious anemia.

On the development of chemical engineering, Massachusetts Institute of Technology is having profound influence. Its chief aim is to train young men, with books and in laboratories, for industrial research.



Photograph by B. Anthony Stewart

OLD SOUTH MEETINGHOUSE IS A LANDMARK OF PRE-REVOLUTIONARY DAYS

Built in 1729, the brick church was used for patriotic gatherings as well as religious services. Its original hand-carved pews were designed to squeak, tradition says, so that no one could arrive in church unnoticed. Dwarfed by modern buildings, "Old South" has been restored and serves as a museum. Benjamin Franklin was born at noon on January 17, 1706, and his mother brought him to be baptized that same afternoon in a church on this site.



Photograph by B. Anthony Stewart

IN THE OLD STATEHOUSE BRITISH GOVERNORS HELD COUNCILS IN COLONIAL TIMES

On this site the first Town House was built in 1657. Here also stood the pillory, the stocks, and whipping post. Bostonians first heard the Declaration of Independence when it was read from the balcony under the clock. Royal symbols, the lion and unicorn, still ornament the facade. Exhibited inside are Franklin's old printing press, models of historic New England ships, and other relics of earlier days. The circle of cobblestones in the pavement marks the site of the Boston Massacre.



Photograph by Harris W. Reynolds

OVER THE HEDGE FOR A PERFECT TWO-POINT LANDING!

Hard-riding steeplechasers spur their mounts along the course at The Country Club in Brookline, near Boston, during the Eastern Horse Club Race Meeting of 1935 (Color Plate VII).

Constantly its instructors are being lured away by private industries.

From the Institute have also come many of the Nation's authorities in aeronautical engineering, including famous Army and Navy pilots, designers, and scientific research workers.

During the World War the great plants of our Chemical Warfare Service at Edgewood Arsenal were developed by a scientist from the Institute. To its laboratories, with their trained staffs and special apparatus, private industries may, under certain conditions, bring their problems. This plan aims at a closer relation between technical schools and business, a plan which Europeans have used successfully.

Pure water, milk control, food and drug analysis, sewage disposal, and many other problems of bacteriology vital to daily life have been among the grave tasks faced by the scientists of Harvard and Boston Tech.

THE BIRTH OF THE TELEGRAPH AND THE TELEPHONE

Born at Boston, near where Benjamin Franklin was born, Samuel F. B. Morse took electricity, till then but a scientific toy, and made it carry messages over wires.

Alexander Graham Bell, a generation later, while teaching here at schools for the deaf, gave his telephone to the world (page 62).

Here the first research laboratory of the American Bell Telephone Company was established. Boston remained the world center of telephone development until the American Company joined with the Western Electric Company to open a joint laboratory in New York.

More than a score of laboratories are busy in Boston today, investigating the problems which arise among the plants which own or patronize them. One of these early laboratories put the sulphite process, which helps turn wood into paper, on a sound manufacturing basis.

Here in Boston was developed the safety razor, now scattered so thoroughly over the world that its inventor's name and face are known to as many people as those of any mortal who ever lived!

In tanning hides and making shoes, chemistry and mechanical genius are so closely linked in New England that all the world looks to Boston now for shoemaking ideas. King Edward VII used to have his shoes made in Massachusetts, though now modern shoe machines, made abroad



Photograph by Luis Marden

A PIPE-MAKER CARVES A GROTESQUE HEAD ON BRIER OR MEERSCHAUM BOWL

He works in his shop window on Court Street, attracting sidewalk crowds. One Boston store employs a craftsman who has carved pipes for 70 years. In another establishment they say jokingly: "A man is on trial until he has been here 25 years" (page 37).

under American patents, are used to fashion shoes in England and many other foreign lands.

Until the Civil War all shoes were made by hand, and tools had changed but little since Pharaoh days. Now 154 different machines may be used in making a single shoe! It is true that before the Civil War a few machines, helpful in making shoes, like Howe's sewing machine, had been invented; but their use was restricted. Only when war came, with sudden demand for army shoes in prodigious quantities, did men turn to the new machines.

Man's genius in making metal fingers do the work of human hands is a fascinating story in the annals of invention, too long to tell here. Yet had not Massachusetts' brains and capital produced the modern shoe machines, it would require the steady work of all the men in one of our largest cities, even if they were trained shoemakers, to make by hand all the shoes our machines now turn out.

Since pioneer farm boys cut wooden pegs on winter nights, the modern shoemaking machine, born of infinite experiment, has grown up to serve the whole world. Its

development led to that colossal enterprise, the United Shoe Machinery Corporation, whose giant building towers over Boston. Out at Beverly is its factory, so vast that one walks six miles merely to pass through it.

Nothing at Beverly astonishes the visitor so much as the lathe on which lasts are turned. It can also make decoy ducks, golf clubs, gun stocks, ax helms, and wooden Indians (page 46).

Put any solid-wood model that is to be copied on one end of the lathe and set the sensitive wheels that guide the knives; put a rough block of wood on the other end of the shaft and turn on the power. Before your eyes, faster and more accurately than human hands could do it, the machine makes a perfect copy!

A MUSEUM OF HISTORIC SHOES

But it is the museum of some 2,000 old shoes in the main Boston building that most visitors wish to see (Plate XVI).

Here is an Egyptian sandal plaited from papyrus leaves long before Christ. Here are jousting boots worn by Henry IV of France as part of his armor, and postilion

boots worn in the days of Maria Theresa, so heavy that they were fixed in the stirrup and not worn when dismounted, but used merely to protect the right leg of the driver from the off horse.

Here are ceremonial clogs from Japan eight inches high, gaudy mandarin boots with thick soles made from layers of rice paper; highly ornamented Turkish slippers with long upturned toes; 16th-century jack boots from Boyne Castle in Ireland.

In this museum, in fact, is every conceivable kind of footwear the world over, even to the peculiar basketlike shoes worn by Australian bushmen, made from twisted hair cord and emu feathers so that no distinct footprints may remain by which an enemy might track the wearer. Everything, that is, except the seven-league boots of fiction, the winged sandals of Mercury, or that tiny slipper lost by Cinderella.

HERE IS THE BUSIEST WOOL MARKET IN THE WESTERN HEMISPHERE

Summer Street, Boston, is the heart of the greatest wool market in the Western World. In huge buildings here so much wool is stored that even the offices smell of it, pungently, like sheep corrals.

From here buyers go not only to our South and West, but to the wool centers of South America, Australia, New Zealand, and Tasmania. One buyer, just back from Patagonia, escorted me through a vast warehouse whose floors were piled with hundreds of tons of wool stacked solid, like lumber. He could tell by looking at a wool pile what country it came from. One stack was from Iceland (page 45).

"No," he said, "there is no fire risk; wool is hard to burn. But moths get at it if it is stored too long.

"America uses about twice as much wool as it raises; in fact, we grow less now than we did 30 years ago. About 25 per cent of all we grow comes now from Texas. That's not counting the mohair, or goat. In the last 20 years, the Texas wool clip has increased about 1,000 per cent.

"Dirt is the wool buyer's nightmare, for wool shrinks so much in scouring. Some wool from the red, sandy deserts of the Southwest will shrink as much as 72 per cent when washed. To scour 100 pounds of this dirty, greasy wool means you will have left only 28 pounds of clean wool. In buying from the grower we have to pay spot cash, and so we pay for the

dirt and grease; hence the buyer's judgment must be accurate, when he fixes the price, as to how much the wool will shrink."

Besides dirt, they often find strange things in bags and bales of wool: shears, pieces of chain, lunch buckets, rocks, put there to make it weigh more; pieces of clothing, notes, a watch, and on one occasion a black man's hand.

A buyer who knows the range that sheep run on can tell fairly well by the look and smell of the wool, even before he handles it, what the shrinkage will be. Mohair is a chief component of universally popular Palm Beach suits, coach seats, and imitation caracul fur. Dyed and sheared close, mohair has a luster like fur; many so-called "fur" coats are really made of goat hair.

The wool trade is one of the world's oldest. The Bible says God prospered Job, and gave him 14,000 sheep, enough to make 20,000 wool suits for men! Some one has reported that there are 689,000,000 sheep in the world and 637,000,000 people in countries where wool is worn.

A silver service buried in the ruins of Pompeii was clean after 1,800 years, because it was wrapped in wool.

Babylonians wove robes of wool; and in 55 B. C., when Julius Cæsar invaded England, he found people there weaving both wool and flax. Alfred the Great, in 871, set all the women of his household to spinning wool; whence the term "spinster."

Distaffs and spindles were used till about 1530, when a baker invented the one-thread spinning wheel.

As early as 1643 a "fulling mill" for treating wool was built near Rowley, in Massachusetts. This State has never lost that lead; to-day the world's largest woolen mill is at Lawrence.

At the mills you see them making three distinct kinds of goods: woolens, worsteds, and felts. In making woolens, the fibers are carded together, but no effort is made to lay them parallel.

In worsteds the wool is combed to get a fine, smooth fiber; these are laid straight and parallel, in the form of a "rope"; this rope, or "top," is then drawn into smaller and smaller diameter and finally spun into yarn. The yarn is so carefully drawn that a pound of fine Ohio wool can be made to reach 16 miles without breaking.

"You can spin anything that has two



Photograph by T. F. Hartley

FOOTBALL FANS JAM HARVARD STADIUM TO SEE A GAME WITH DARTMOUTH

Soldiers Field, Harvard's playground (left), adjoins the stadium. Beside the Charles River is the University Boat House, left, used by varsity crews. Across the water, on the other side of the bridge, is the Weld Boat House. The Graduate School of Business Administration occupies the imposing buildings to the right of the football field. Most of the university lies across the river, in Cambridge, which, though it reflects the spirit of Boston, is a separate municipality.

ends" is an old mill saying. A pound of finest Australian wool can be spun out to 22 miles! From such yarn come the finest serges, dress goods, and broadcloth.

Short fibers, combed out in making the ropes or tops, are called "noils." They are blended with longer wool to make woolens and felts. That woolly fuzz in your overcoat pocket is noils, wearing away.

Felt, says a tradition in the woolen mills,

got its name from an old French monk who once made a long pilgrimage. When his feet became sore, he clipped some wool from roadside sheep and put it in his sandals. Lo! a miracle! The bits of wool had become one solid mass. He had made felt, just as it is made to this day—that is, by heat, moisture, and pressure.

For blocks along Summer Street you smell wool and pass nothing but wool traders. "This wool colony should have

a mascot," I urged, "a lamb to gambol about your desks or follow you around the golf courses."

"Look," said a broker, "I have!" But his was stuffed and set in a glass case; and over the entrance to his office was a ram's head carved in stone.

Americans with ancestral lines lost in genealogical mists come to Boston for help; here they may learn, too, whether they have the right to assume a coat of arms.

Copying epitaphs from old tombstones, searching family Bibles, church, government, and other records for facts on marriages, births, military service, deaths, wills, etc., is a brisk local enterprise, employing many trained genealogists. One such advertises that he has "11,000 gravestone inscriptions from Middlesex County." Others announce "Lineage papers for patriotic societies prepared."

BOSTON'S FINEST PRODUCT: TRAINED MEN AND WOMEN

"Desire to join such societies as the Colonial Dames, Sons of the Revolution, and the D. A. R.," said one genealogist, "of course results in many clients for us."

In Wall Street, in Minneapolis flour mills, on Arizona cow ranches, in schools and libraries of the Northwest, you find men and women trained at Harvard, Boston Tech, Boston University, Simmons, Radcliffe, Wellesley, and the New England Conservatory of Music, as well as many other near-by seats of learning. All make New England peculiarly a national source of culture, with wide-spread effect on manners, ethics, and character.

To a degree seldom appreciated, these graduates, scattered over the Union, tend to reduce sectionalism and promote understanding among the States.

Twitting Boston on its book learning is an idle all-American weakness.

As so often sketched by newspaper artists, the Boston small boy is a spindle-shanked lad of intellectual mien and oversized owlish spectacles.

There is Sousa's quip that he never could understand the Einstein theory until a Boston policeman explained it to him. And that anecdote of two Beacon Hill hackmen who blocked traffic while they argued whether the influence of Ibsen was permanent or evanescent!

To such flippancy Boston is indifferent; she may have other ideas of what is funny.

Anyway, busy for 300 years with her own thoughts, Boston (as the traditional "state of mind") is preëminently the philosopher among American cities.

Puritans founded America's first free public school here, in 1635; it survives, as the Public Latin School. The next year, at Newtowne, now Cambridge, across the Charles River from Boston, Harvard College was born. Here American higher education began.

Today Boston's metropolitan area includes more than 200 universities, colleges, normal, technical, music, art, and private schools of various kinds, besides the public schools.

Finding "something to read" is easy; 156 different libraries are available to the public, in addition to college, university, and special libraries.

The Athenaeum, owned by its members, is known as the world's first gentleman's library; it is the world's largest library whose shelves are all open to readers, and among its treasures is the biography of an English outlaw, bound in his own skin!

The Public Library at Copley Square, famous for its Abbey paintings of "The Holy Grail," has 34 branches. From it more than 5,000,000 books circulate each year; whole armies crowd the public reading rooms, while yet another army busily writes and prints the city's 128 daily and other papers, in many sizes and languages.

With such adventures in culture come also the museums; that great palace, the Museum of Fine Arts; the spectacular Isabella Stewart Gardner Museum; the Fogg Art Museum at Harvard—these and others.

For those having eyes it is futile to *write* about museums. How useless, for example, merely to catalogue the Japanese exhibit at the Museum of Fine Arts! Or how futile to write words about that simple spray of blooming mountain laurel made of glass, in Harvard Museum!

Since time began, no art has rivaled these miraculous glass flowers of Blaschka, the German. Look at his unique, so-different form of artistic achievement, and you agree that art is never a finished product: that, to its creator, it is an activity always progressing.

Yet buildings in which museums are housed, like other public edifices in Boston, reflect the architecture of other times and places. Only the astonishing forms of such structures as the United Shoe



Photograph by B. Anthony Stewart

"SNOW TRAINS" TAKE WINTER SPORTS FANS FROM BOSTON TO THE WHITE MOUNTAINS

With skis, skates, and sleds, week-end crowds leave at the first news of heavy snows. Some start early Sunday morning for such places as North Conway and Intervale, the train being sidetracked while college boys, schoolgirls, and others enjoy the fun. Ski enthusiasts even come from New York to join these excursions. More than 24,000 people rode the Boston and Maine Railroad's "Snow Trains" from January 1 to March 8, 1936.



Photograph by Lilla Marden

"... AS I WAS SAYING, WHEN SO RUDELY INTERRUPTED ..."

Self-anointed Ciceros on Boston Common tackle any theme from the Single Tax to Infant Baptism. Speech is free, and so are listeners—free to laugh, heckle, and contradict (page 57).

Machinery building reveal American conceptions; they recall a German saying that our finest architectural feat is seen in western grain elevators.

NOBODY ASKED, "HOW DO YOU LIKE BOSTON?"

Boston's career as an American city began on that exciting day in March, 1776, when General Howe evacuated with his British troops and sailed for Halifax. When General Washington entered next day, all he could find for lunch was a piece of salted beef!

Life was strict and simple. Governor John Hancock himself once paid a fine for taking a buggy ride on Sunday. Men and boys were punished for swimming on Sunday. In the *Centinel* a wag wrote:

"In superstition's days, 'tis said,
Hens laid two eggs on Monday,
Because a hen would lose her head
That laid an egg on Sunday.

Now our wise rulers and the law
Say none shall wash on Sunday;
So Boston folks must dirty go,
And wash them twice on Monday."

"Stage plays" were illegal. Drama lovers, circumventing this, advertised plays as

"moral lectures," and once staged "Macbeth" as "A Dialogue on the Horrid Crime of Murder."

To smoke on the street was a penal offense until 1880, although a "smokers' circle" was set aside on the Common.

All that was long ago. Time's changes in the city's physical and racial structure have of course brought corresponding changes in customs, behavior, and thought. Stubbornly, however, the spirit of the Anglo-Saxon founders still survives. Like its old families, Boston itself is simple, dignified, reserved.

"How do you like Boston?"

During a long visit nobody asks you that. Simple hospitality, effective aid in your quest for facts, these you do meet; also, a caution that leans to understatement rather than guesses, and never to exaggeration. Yet opinion, after evidence is all in, is your own responsibility; no one seeks to influence that. Should you err, Boston will not be disturbed. Age has mellowed her, and eventful history records the true story of those achievements which make her, to one born in the Middle West, America's most interesting city.

HOW WARWICK WAS PHOTOGRAPHED IN COLOR

BY MAYNARD OWEN WILLIAMS

PERHAPS the finest view of Warwick is free to all who pass. Across the Avon, not far above an earlier structure dominated by the towering walls, is the "new" bridge, only 146 years old. And from it, seen between and above the trees which overhang Shakespeare's river, there is a breath-taking view of the wide walls and tall towers of Warwick.

But who, seeing such a sight and knowing that visitors are privileged to roam the halls which kings and queens have trod since the days of Elizabeth, could resist the appeal of this fortress, armory, treasure house, art gallery, and home? So, with hushed expectancy, we walked through a rock corridor and approached old Warwick's inner gate.

Shrubs and trees mask the hardness of this hundred-yard defile, easier to defend than Thermopylae. There is no mistaking the fact that here one must come as a friend or not at all.

Farther on, the view widens to broad flower beds and lawns, but an enemy would—and many did—find this an inhospitable spot. Two tall towers dominate the scene and in them are loopholes so cunningly planned that a Bowman had but to sight down one to hit a foe in the gallery below. A loophole like that was almost like a gun barrel, trained on an enemy who could not but face its muzzle.

From Caesar's Tower, the defenders had an added advantage (Color Plate I). The solid rock on which it stands slopes outward at such an angle that no knight, even with ground-gripping spikes on his armored shoes, could scale its surface. But a stone dropped from the parapet some forty yards above could carom off the rock base at right angles and plow through half a dozen of the attacking force, putting unwonted creases in armored pants and flattening out pouter-pigeon breastplates.

Guy's Tower, built a century before Columbus discovered America, recalls the tales of the redoubtable Guy of Warwick.

"Some Guy!" an American exclaimed on being shown the hero's huge "punch bowl." It holds 120 gallons and was really the cooking-pot for the garrison. Today vines with bright berries warm the old rock of

the tower, which still has the fine finish of honest workmanship (Plate VI).

A stone arch has supplanted the old-time drawbridge, but few would care to storm the barbican, for behind the portcullis (Plate III) there are holes from which melted lead or blazing tar could be poured on the heads of would-be invaders. Disconcerting it must have been to have one's best suit of armor turned to a roasting pan in the twinkling of an eye and the twist of a foe-man's wrist high up on the castle walls!

HIS HOME IS HIS CASTLE

Inside the gateway, this martial castle becomes a peaceful country home, residence of the present Earl of Warwick. A sleek sports roadster stands before the door at which knights in armor once dismounted to clanging sounds like the Anvil Chorus. Within the frowning walls stretches a smiling courtyard, turfed with the smooth sod of Old England.

Once past the heavy palace door one plunges deep into time. Armor gleams on the walls of hall and passageway. Old masters, sweeping aside the present, introduce the days of white bosoms above voluminous trains, and of ruffs and laces worn by men with long hair—and a way with a sword.

In such a setting, one's everyday companions seem strange. A girl in shorts seemed like a visitor from Mars. Entering the chapel and standing before Perugino's painting of the Assumption, she covered her head with a scarf, giving her bobbed-haired modernity a touch of the Old World, and achieving poignant dignity.

Our host had a genius for conjuring up a living past amid Warwick's lasting relics. As he talked, imagination peopled the great hall and grounds with a noble company reaching back to the days of Alfred the Great. It was Alfred's heroic daughter, Ethelfleda, who built the early fortifications here to protect mid-England from the Danes.

It is useless to describe the treasures of Warwick. Here a picture is better than thousands of words (Color Plates IV, V, and VIII). In the state bedroom hang Brussels tapestries woven before the Jamestown colony was founded. Since they were made the

known world has tripled or quadrupled in extent, then has shrunk again before the marvels of modern communication. Yet those old tapestries keep their beauty and fit those walls far better than modern hangings could.

THE CASTLE IS SURRENDERED

Later, with the estate manager, I discussed plans for my pictures.

Once my identity was known the cooperation was whole-hearted, for three Countesses of Warwick are fellow members of the National Geographic Society. At 4 o'clock on Monday afternoon the last party of visitors would leave those stately halls. At 4:15 Warwick Castle would be mine.

As long as I cared to work that night, an electrician and helpers were to be at my disposal. Old silks and time-browned canvas, Florentine mosaic and waxen Venus, shining armor and canopied bed—all mine, for the National Geographic Magazine.

But photographing paintings in color is a studio job. A castle with small windows, dark decorations, and walls ten feet thick is not the place. Yet here I must capture with the color camera those tones which brought glory to Rubens and Van Dyck, Holbein the younger, and Sir Joshua Reynolds. The equestrian Charles occupies an entire end of the great dining room and towers almost to the lofty ceiling (Plate VIII). Enormous problems of lighting loomed.

All this I explained to the Earl of Warwick, whose kindness approached 100 per cent. The castle would be ready. I could have all the 100-volt current the former flour mill turned by the Avon could generate. If I wanted to tap the Leamington power line, of 220 volts, that would be arranged.

But much equipment and assistance remained to be gathered. And only a Sunday lay between me and the responsibility of having a castle on my hands. Back to London I went by train.

There a few minutes on the telephone convinced me that my worries might as well be postponed till Monday morning. Londoners have the enviable habit of escape over the week-end.

But Monday was fruitful from the first. The friend who has advised me about cameras for years was all helpfulness. So was the world-famous concern that makes my films. Packages of material began to ac-

cumulate in several places at once, with not a scrap of red tape in sight.

A friend with whom I had roamed the wind-swept slopes of the Scilly Islands had promised aid.

"I have just the man for you," she greeted me. "He has his lamps—all 100-volt, which is what you want—packed in his car, ready to start. You'll never do it with flashlights even if you shoot a hundred of them, and little lamps will spread white spots like leprosy over every painting you photograph."

Since this friend of a friend had everything we would need, I telephoned orders to have innumerable bulbs, reflectors, and tripods returned to stock, then dashed for the train. It had left.

One small traffic jam in London—which sadly prophesies that it will be at a standstill in another decade—had done it. But the guard whisked me onto another.

"Change at Oxford," he said, and his voice was positively cheerful, as if changing trains were a privilege.

CAMERAS AMID GHOSTS IN ARMOR

Back in Warwick, things moved fast. The taxi which I had sent to bring my "technical assistant" arrived at the same time as my tea. Lunch had been out of the question and leaving that piping hot tea untasted smacked of heroism, I felt.

"I have to catch the 11:36 back to town," said my friend, thus spiking any plan I had for an all-night ghost party of lights and shadows amid the knights in armor in Warwick's great hall.

The portcullis would be left up, the gate-man on duty. We plunged to work, but it was three hours before we completed the first exposure.

There in the night-dark castle we seemed strange anachronisms. Across the mirror-smooth floors our light cables squirmed like serpents. The ghosts of centuries retreated from the glare of our lamps, only to slink into corners behind us and watch us work.

Some of the paintings I had chosen were high on the walls. But a portrait must be photographed from a point opposite its center. Henry VIII, taken from too low down, becomes all stomach and no head.

In the color process I used, wide-angle lenses will not do because light jumps from a red square to a yellow one, putting jaundice on a nose which some monarch was at great pains to color with good red wine.

WARWICK CASTLE, STAGE FOR OLD ENGLAND'S PAGEANTRY



© National Geographic Society

Finlay Photograph by Maynard Owen Williams

"FAIRKEST MONUMENT OF ANCIENT AND CHIVALROUS SPLENDOR,"
SIR WALTER SCOTT CALLED WARWICK CASTLE

English peers for nearly six centuries have dwelt in this feudal stronghold on the Avon, about eight miles from Shakespeare's Stratford. Caesar's Tower, with narrow loopholes for bowmen, commanded the river. Missiles dropped onto the sloping base bounced on heads of attackers, who were also deluged with blazing pitch and molten lead from the turret. The water wheel once operated a mill; now it turns a generator supplying the castle's electricity.



CHEERY VINE-CLAD COTTAGES HOUSE THE EARL OF WARWICK'S RETAINERS

The backyard gardens of these homes front on the Avon across from the castle and the ancient town of Warwick. Quiet villages, old manor houses, shady lanes, and meadows characterize the Midland county of Warwickshire, once called "the core and center of the English world."



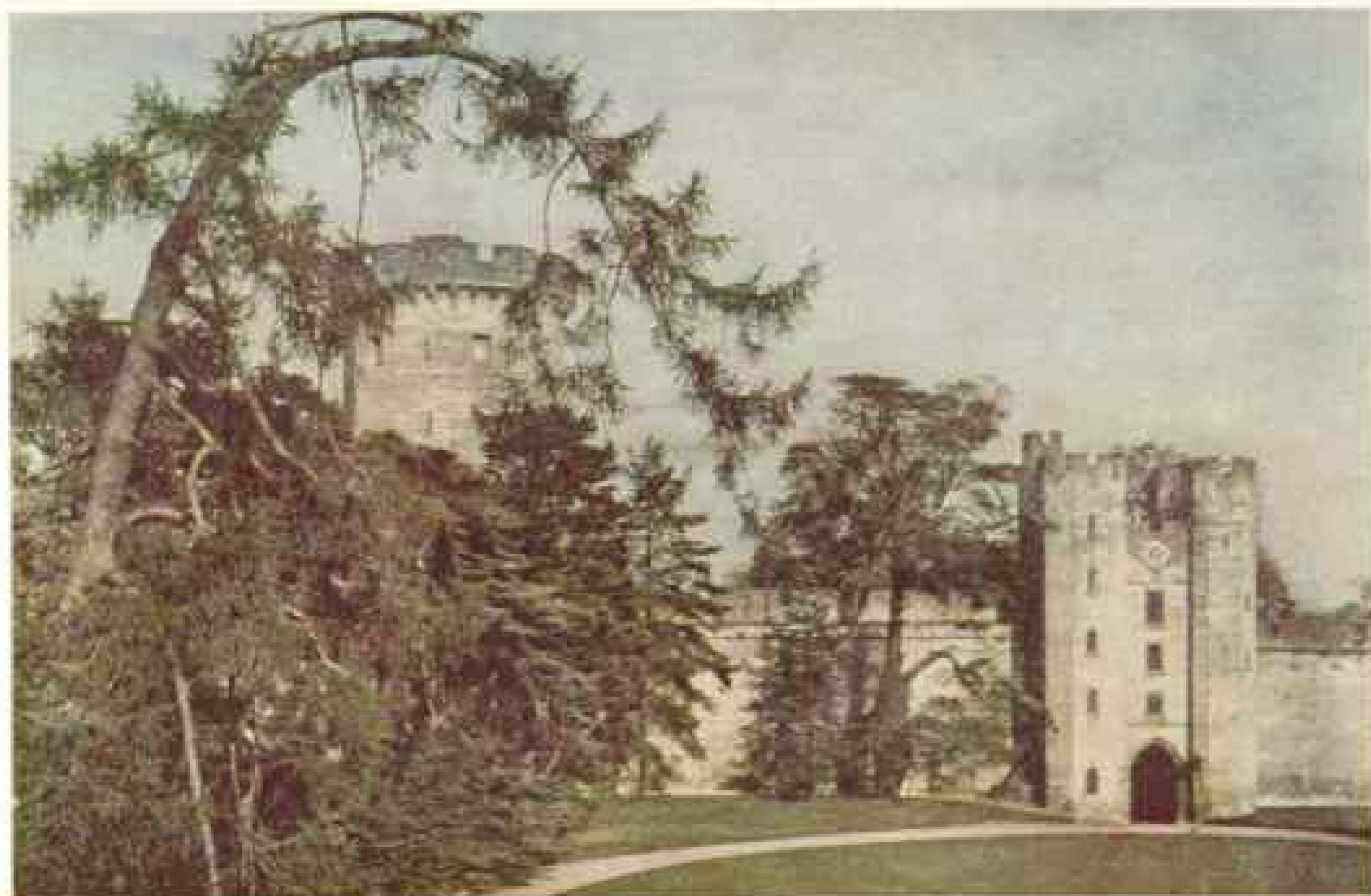
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Finlay Photographs by Maynard Owen Williams

LARGE DORMERED DWELLINGS ARE FOR OFFICIALS OF THE ESTATE

The present Earl's staff is modest compared with that of a 15th-century predecessor; Warwick the "Kingmaker," whose horde of retainers consumed six oxen at breakfast.

WARWICK CASTLE, STAGE FOR OLD ENGLAND'S PAGEANTRY



ENGLAND'S GREAT HAVE PASSED THROUGH THE NARROW PORTAL TO THIS INNER COURT

During Queen Elizabeth's visit, country people came "to see the dance in the Court of the Castle, Her Majesty beholding them out of her chamber-window." The mansion is to the right of the gate, whose portcullis dropped behind The Society's photographer when he left late at night.



© National Geographic Society

Friday Photographs by Maynard Owen Williams

PEACOCKS ROAM THE GARDENS, WHERE CLIPPED HEDGES ASSUME ODD SHAPES

The castle is occupied by the Earl's family, but parts of it are open to visitors. It is "a national glory as well as a personal possession," wrote the Countess of Warwick.



© National Geographic Society

"FINE PORTRAITS ARE WHAT I PARTICULARLY DESIRE"
 Thus wrote George Greville, Earl of Warwick, in 1779. Rubens' picture of St. Ignatius of Loyola is in the green drawing room.



Finlay Photographs by Maynard Owen Williams

HENRY VIII, BY HOLBEIN, HANGS IN THE CASTLE BOUDOIR
 The much-married monarch is portrayed in jewels, ermines, and lace cuffs by his court painter, one of the old masters.



© National Geographic Society

A DIFFERENT HENRY VIII IS THIS WIDE-EYED BOY,
PAINTED LONG AFTER THE KING'S DEATH

Sir Anthony Van Dyck and his assistants imagined Henry as he might have looked before acquiring gross features and vast girth. In photographing this and other "old masters" at Warwick Castle, The Society's photographer utilized electric light generated by the old grain mill on the Avon (Plate I).



Finlay Photographs by Maynard Owen Williams

NOBLE BROTHERS POSE IN PINK SATIN AND LACE
FOR A PORTRAIT BY VAN DYCK

George, Duke of Buckingham, left, and Lord Francis Villiers were brought up with the children of unlucky King Charles I. The younger brother was killed in his teens during England's Great Rebellion, but the Duke lived to be a statesman, poet, dramatist, and popular leader of fashion in Charles II's reign.



Photograph by Maynard Owen Williams
BRIGHT BERRIES BEDECK A GRIM WALL, TEN FEET THICK

The vine clings near the base of Guy's Tower, Ethelfleda, daughter of Alfred the Great, built a wooden fort at Warwick about 1,000 years ago as defense against Danish invaders.



© National Geographic Society

TIME HAS DEALT KINDLY WITH WARWICK

Few other medieval fortresses have survived with so little outward change as this castle. The boy Shakespeare probably grazed across the Avon towards such parapets and mullioned windows.

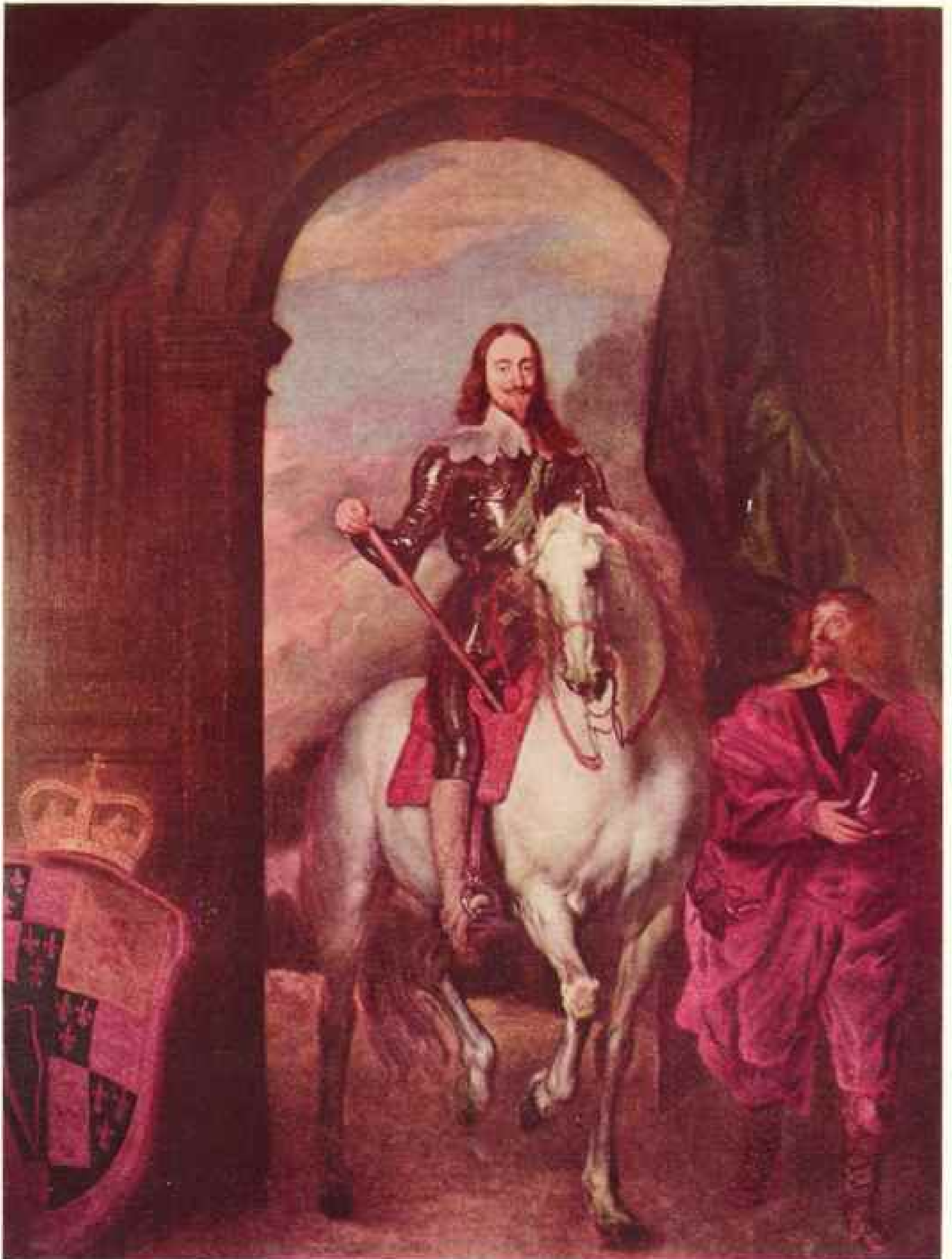


© National Geographic Society

Finlay Photograph by Margaret Owen Williams

HERE KINGS AND BARONS PLAYED STAB ROLES IN ENGLISH HISTORY

The scene from this meadow across the Avon was not always so peaceful. William the Conqueror used it as headquarters during his campaign in England. Here Warwick the "Kingmaker" imprisoned Edward IV, whom he later deposed. Caesar's Tower, right, believed to be the oldest part of the castle, is 147 feet high and is based on solid rock, preventing underground attack.



© National Geographic Society

Finlay Photograph by Maynard Owen Williams

IN THE GREAT DINING ROOM IS VAN DYCK'S EQUESTRIAN PORTRAIT OF CHARLES I

It seems strange to find this picture in Warwick Castle, for the fortress became an anti-Royalist stronghold when its owner joined the Parliamentary forces against the hapless King. Here Charles wears the light armor and broad lace collar of his time, while an equerry bears the royal helmet. Dr. Williams relates how he took this color plate of the huge painting: "To get our cameras high enough, we had to construct on the state dining table a pyramid of stools, sawhorses, and tripods worthy of a circus balancing act."

The distance of my camera was fixed and it seemed as if, in every spot where I had to set my tripod, there was a priceless mosaic table, brought from far-away Italy in the days of crude transport and since preserved through blood and fire for centuries.

I felt like some rank intruder from a world that is yet to be amid the proud treasures of the past.

Some of Warwick's finest paintings were away on loan during my visit, but there were enough left to have kept me busy for weeks.

The picture of the two sons of George Villiers, Duke of Buckingham, appealed to me because it was from Warwick that scheming Richard III wrote to the Governor of the Tower of London ordering the death of his two small nephews, sons of Edward IV. These boys in their innocence and splendor of garb made me think of the "little princes of the Tower," and, besides, this painting by Van Dyck had a challenging range of colors (Plate V).

In the boudoir at the far end of the state apartments I selected two paintings of Henry VIII—Van Dyck's, showing him as a half-timid child, and Holbein's, which pictures bluff King Hal as every inch a king, albeit a king with whom the gentle George V, who called himself "a very ordinary fellow," would have had little in common (Color Plates IV and V).

While my camera was at work making the long exposures, I tiptoed back and forth, conferring with the ever-helpful electrician as to where we could plug in the lights for the next picture, or trying to restore some order to the chaos our work had caused.

The painting of Ignatius of Loyola is outstanding, even in so rich a collection as that at Warwick. Rubens here combines the rich trappings of ecclesiastical dignity with the spirituality of the man. The founder of the Order of Jesuits stands before us in a portrait notable for its force and rich coloring (Plate IV).

PHOTOGRAPHERS TURN ACROBATS

After a late snack with the seventh Earl of Warwick, we tackled the painting which taxed our knowledge and equipment most—the huge equestrian portrait of Charles I (Plate VIII). Providing the canvas for pictures of such heroic size must have influenced the textile statistics of Van Dyck's day.

To get the camera high enough, we had to construct on the state dining table a pyramid of stools, sawhorses, and tripods worthy of a circus balancing act. Then, as we focused the camera, our heads brushed the highly destructible chandelier—hundreds of pounds of it. "Heavy, heavy hangs over thy head," was its recurrent warning. Nor, try as we would, could we get our floodlights in such a position that a glare in some part of the painting would not kill the color.

If you look closely at the sides of that great painting you will see how the electric light generated from Warwick's old grain mill, still turned by the quiet Avon, has put a sheen over the coloring.

At eleven o'clock the shutter closed on the last exposure, and we hurriedly collected our equipment from its hiding places under furniture gathered from half of Europe or from the feet of lordly forms created by Flemish or English artists.

Down corridors bristling with armament we carried our bulky reflectors and cameras. While a knight on horseback looked on dispassionately, my companion wondered when his taxi would arrive.

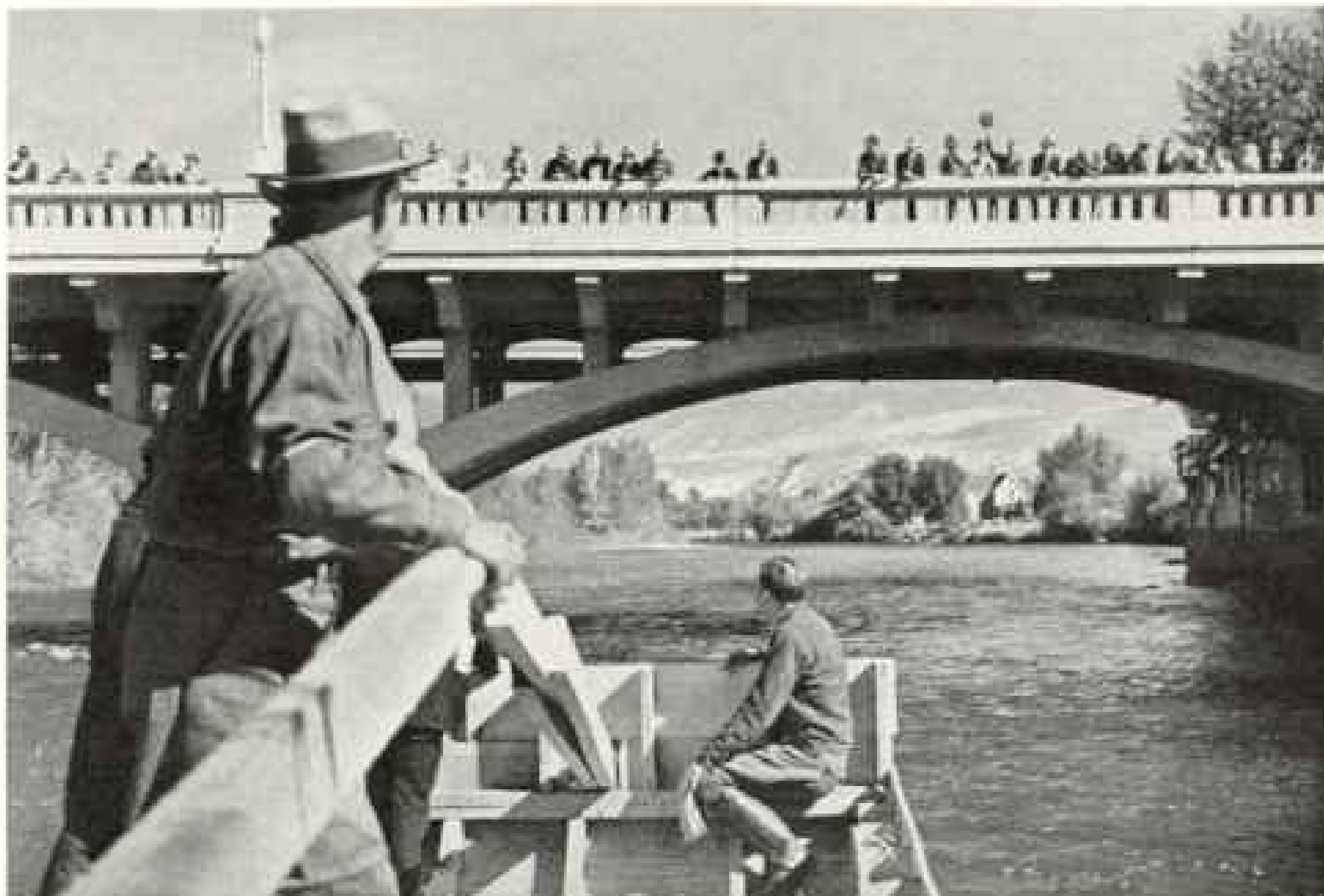
We had ordered the car for 11:15. And as we slammed the automobile door after our anachronistic labors, it was just that. Even the portcullis might have been worked by a time clock, for, as we left the hospitable castle behind, the grating dropped, as if closing the adventure forever.

I had still to make color views of Warwick's exterior, and of the gardens where peacocks strut (Plate III). But that, in the sunshine, would be comparatively easy.

That night, after seeing my friend off on the train, I returned to my hotel, empty of stomach and light of heart. It was midnight and the ten bells of Warwick's St. Mary's softly began a new tune. Just before we had taken the castle by storm, the chimes had been playing "Home, Sweet Home." Now they started a new day with "Jenny Lind."

When next St. Mary's bells played "Home, Sweet Home," I was *there*. For better or for worse I had accepted Warwick's challenge and my plates came home in my own hands, keeping their secret of success or failure till the National Geographic Society laboratories were reached.

Here they are, the result of a noble hospitality which still warms my heart.



A CROWD ON THE BRIDGE AT SALMON WATCHES THE START OF "THE WILDEST BOAT RIDE IN AMERICA"

Because of unusually low water all the party except the boatmen and cook disembarked below the new highway span and rejoined the scow at Ebenezer Bar, 56 miles farther downstream. The boat carried the scientists who were to investigate some of the most remarkable geologic formations in North America.



STEELHEAD FISHING WAS GOOD

The *National Geographic Society* waited here at Middle Fork while Shenon, Reed, and Williams made a side trip up the rugged stream. This junction of the Salmon River and its Middle Fork is a favorite center for fishermen and hunters.

DOWN IDAHO'S RIVER OF NO RETURN

BY PHILIP J. SHENON AND JOHN C. REED

LEADERS OF THE NATIONAL GEOGRAPHIC SOCIETY—U. S. GEOLOGICAL SURVEY SALMON RIVER EXPEDITION

With Illustrations from Photographs by Maynard Owen Williams

IN 1803 President Jefferson gave his blessing to an expedition led by Lewis and Clark, whose achievement is history. The leaders of the Nation's first overland expedition to the Pacific turned back only once—when they faced the precipitous walls and "white waters" of the Salmon River Canyon.

Thus the Salmon remained unconquered until about 40 years ago, when Captain Harry Guleke piloted a flat-bottomed scow through its thundering rapids to its mouth (page 98).

HOW GULEKE CONQUERED THE SALMON

Like Phoenician mariners, using islands as stepping stones to far-away shores, Guleke and Sanderland, his first mate, braved one rapid after another, learning the secrets of each before venturing farther into the unknown.

Boats were smashed on hidden rocks, and lives were lost, but one-way traffic on the Salmon had come to stay. The trip is still known as "the wildest boat ride in America."

Unlike Guleke, we, as geologists working in the high mountain country above the river for the United States Geological Survey, were challenged not by the rapids but by problems of scientific and economic interest, solution of which appeared to lie partly in the canyon that yawned below us.

How did the granite mass known as the Idaho Batholith invade the rocks surrounding it? (Page 105.) How far did the veins exposed on the plateau above extend into the canyon? Why did the Salmon River cut directly across the grain of the rocks, and why did some tributary streams flow scores of miles to pass again within four or five miles of their sources?

The National Geographic Society saw the value of an expedition through the canyon and sponsored our plans. Dr. Maynard Owen Williams, photographer and writer, of the NATIONAL GEOGRAPHIC MAGAZINE staff, was sent with the expedition.

Mr. Howard R. Flint, Regional Forest Inspector of the United States Forest Service, was assigned by that organization to study the plants and animals.

Dean A. W. Fahrenwald, metallurgist and educator, accompanied the expedition in his capacity as Director of the Idaho Bureau of Mines and Geology.

U. S. Representative D. Worth Clark, of Idaho, an enthusiast for the trip since it was first proposed, was made a member of the expedition because of his interest in the primitive areas of his native State.

The Salmon River rises amid rugged peaks of the Sawtooth Range, over 10,000 feet high. From this spectacular beginning the river flows through valley and canyon to its confluence with the Snake near where Oregon, Washington, and Idaho meet (map, page 105). In 390 miles it falls more than a vertical mile.

The Salmon River Canyon is one of the deepest and most rugged in North America. From rim to river its depth in several places exceeds 6,000 feet. This is more than that of the equally wide Grand Canyon of the Colorado, about 5,500 feet deep near Bright Angel Canyon, but less than that of the Snake River Canyon, which not far from He Devil peak is 7,900 feet deep.

MANY MET DEATH FROM "LEAD POISONING"

Except for occasional Indians, man played little part in the early history of the country. In 1861 gold was discovered near the canyon brink. Waves of prospectors from California and Oregon swept eastward, meeting a westward-advancing army from the Atlantic. Road agents and gamblers rubbed shoulders with miners and merchants. Before vigilante committees curbed crime, many met sudden death by "lead poisoning."

From mushroom mining camps at Florence, Elk City, Warren, Dixie, Leesburg, and Grantsville (now part of Leesburg) millions poured into the war-depleted treasury of President Lincoln.

Rich pockets sometimes yielded a hundred dollars to a shovelful. When the richest ground was skimmed, the impatient miners departed, leaving the "diggings" to Chinese, who flocked to the placers after helping to complete the Central Pacific Railroad (page 122).



FORESTS OF PAST AGES ARE BURIED IN THESE SHALE BEDS

An outcrop of the Latah formation along the North-South Highway near White Bird makes a "happy hunting ground" for paleobotanists. Fossil plants of many species are abundant here where the authors are prospecting for them.

In 1877, under the able leadership of Chief Joseph, the Nez Percé Indians went on the warpath, and participated in one of the most remarkable running fights on record. In 1878 the Bannock Indians killed a number of white settlers. In 1879 a group of renegade Sheepeater (Tukuarika) Indians, after fighting several hard battles in the upper Salmon River country, were finally captured.

So ended Idaho's Indian wars.

Civilization again pushed forward in a more or less circumspect manner. Occasionally the new citizen miner would hear the call of gold and rush off to some "big strike," but usually returned with little more than hands in his pockets. In 1898-9

rich gold lodes were discovered at Buffalo Hump and Thunder Mountain. Hundreds flocked to new diggings that soon petered out. A landslide wiped out Roosevelt, the only town at Thunder Mountain (p. 119). The panic of 1907 finished Buffalo Hump,

THE UNEMPLOYED TURN TO MINING

Now, along with other early-day camps, both districts are awakening because of better transportation and dearer gold. The Forest Service and C.C.C. are constructing much needed roads. The unemployed have turned to gold pan and rocker.

To our wild boat ride we added side trips to spots where history is repeating itself. First, with Allen Merritt, of Salmon,



Photograph by Washington National Guard

SOLDIER BAR LANDING FIELD TYPIFIES THE DIFFICULTIES AND DANGERS OF FLYING
IN CENTRAL IDAHO

Perched on a small terrace in Big Creek Canyon, this Forest Service aviation base (the light spot lower right) derives its name from the fact that a soldier killed in the Shosone Indian War was buried in its soil. The small field is used principally to unload men and equipment to battle forest fires in the isolated region around it.

we went by car to Redfish Lake, a source of the Salmon River.

We skimmed smoothly over new gravel roads, now past bluffs cut in sediments accumulated when the entire valley was a lake bed, now along the river's edge through ancient lava flows, or slates deposited as clay millions of years ago.

We passed small farms along the river and honked through flocks of sheep on their way to winter pasture.

As we rounded a curve near the Pahsimeroi River, which heads near Borah Peak, 12,655 feet high, we came upon a band of half-wild horses herded by two cow-

boys. The Pahsimeroi Valley has produced some of the finest cattle and rough-riding cowboys in the United States.

Amid white-faced cattle we rolled into the flat country which centers around the little town of Challis. Here we met Pete Grubb, a champion rodeo rider.

After 24 miles of crooked, bumpy road our route melted into a wide highway. Steam shovels were even then at work and we paused to watch the giant machines gulp great mouthfuls of broken rock.

Beyond canyon country painted with splotches of yellow and gold by an early frost we came to Stanley and Redfish



THE MASTER CRAFTSMAN SURVEYS HIS BRAIN CHILD

A veteran riverman, Captain Harry Guleke, the first man to navigate successfully the Salmon River Canyon, fondles the sweeps of the Expedition's scow built from his own design (pages 95 and 99). Forty years ago, before anyone else had dared to make the passage, Guleke worked his way through the gorge, first learning the secrets of one rapid before attempting the next.

Lake. A Basque sheepherder and his flock lent a pastoral touch to the evening scene at the lake.

Back at Salmon we wasted little time in seeking our beds—for tomorrow we expected a Washington National Guard plane from Spokane for aerial photography above the canyon.

At the landing field, provided by Salmon's flying mayor, Flint warmly greeted Observer E. C. French and his old friend and flying companion, Pilot Clare Hartnett. These men, at Flint's request, and in recognition of the National Geographic Society, generously flew 2,000 miles over dangerous mountain country to take the aerial photographs used in this article.

With an afternoon storm already clouding the scene to the west, the plane, refueled, soared gracefully back in the direction

whence it had come, while we returned to the river.

A BOAT FOR AN EXTRAORDINARY VOYAGE

Our 32-foot boat was almost complete. The 28-foot sweeps, with their 6-foot blades, were in place and by tomorrow it would be ready to "sail." What a strange craft it was! To Williams it looked like an antediluvian ark sired by some prehistoric mail-order packing case.

An elevated platform in the center gave the boatmen foothold and a better view while steering. The bottom of this deceptively maneuverable scow was doubly lined with green lumber to withstand the shock of submerged rocks. A raised floor was to keep the seepage water from wetting the equipment. Between double walls on each side were stored our canned goods.

The boat, of a model unchanged since Guleke invented it, weighed about five tons when loaded. Without motive power, it looked clumsy. We were to learn later, however, that Hancock and Cunningham, with sweeps balanced like laboratory scales, could manipulate with surprising dexterity the best-known and most-photographed scow that ever bumped its uneven way down Salmon River.

About 10 a. m. on October 4 Captain Guleke grasped the front sweep, and our scow, empty because of low water, left its birthplace, never to return (pages 94, 109).

Although the old riverman has probably taken his last boat through the canyon the light of adventure still shone brightly in his eyes as he steered our craft the first few hundred yards down the river he conquered but could not tame.

After floating under Salmon's new bridge, we disembarked to put in our time in side trips while the barge descended toward deeper water for cargo and passengers.

To inspect the rugged uplands we motored to the Big Horn Crags country, where Supervisor John Kinney, of the Salmon National Forest, had arranged for Ranger Gutzman to meet us with horses.

In the sixties the gold of Napias Creek attracted 7,000 adventurers, many of them Civil War veterans, and rival factions built up almost overnight the towns of Leesburg and Grantsville. At Forney we turned west over Quartzite Mountain to our rendezvous.

WHEN THE CANYON WAS "IMPASSABLE"

For eight miles we rode our horses deeper and deeper into the crag country. What peculiar yet beautiful freaks of weathering they were, rearing their pock-marked faces spirelike to the sky! Reluctantly we turned back, creakingly crawled into our car, and drove into Salmon under a star-covered sky, tired and stiff.

We set out on Sunday morning to rejoin our scow at Ebenezer Bar.

After 10 miles of wide, cultivated valley the canyon narrows, and at 23 miles below Salmon we noted a decided "pinching in" of the walls. Near this place Toby, an Indian guide of the Lewis and Clark expedition, had convinced Captain Clark that the Salmon River Canyon was impassable, and here the party had turned north to seek a less forbidding "gateway" to the Pacific by way of the Lolo Pass.

We followed the river to Shoup, named in honor of Idaho's first State Governor and United States Senator. It is a strange-looking old place with building lots standing on end, a town where for several years freight and supplies have been transferred from truck to horse. Although Shoup is now booming and new roads simplify transportation, the pack train will not soon end its usefulness in this rugged region.

Near the mouth of Panther Creek we inspected Indian paintings on the rocks, and piles of mussel shells left at an old camp site. Later we were to see many such paintings, as well as numerous petroglyphs (figures cut into rocks), in both the Salmon and Snake River Canyons (page 121).

Indians today have no knowledge of the origin or interpretation of these figures. However, since many portray the mountain sheep, the symbol of the Tukuarika, or Sheepeaters, it seems likely that this tribe was responsible for part of the inscriptions.

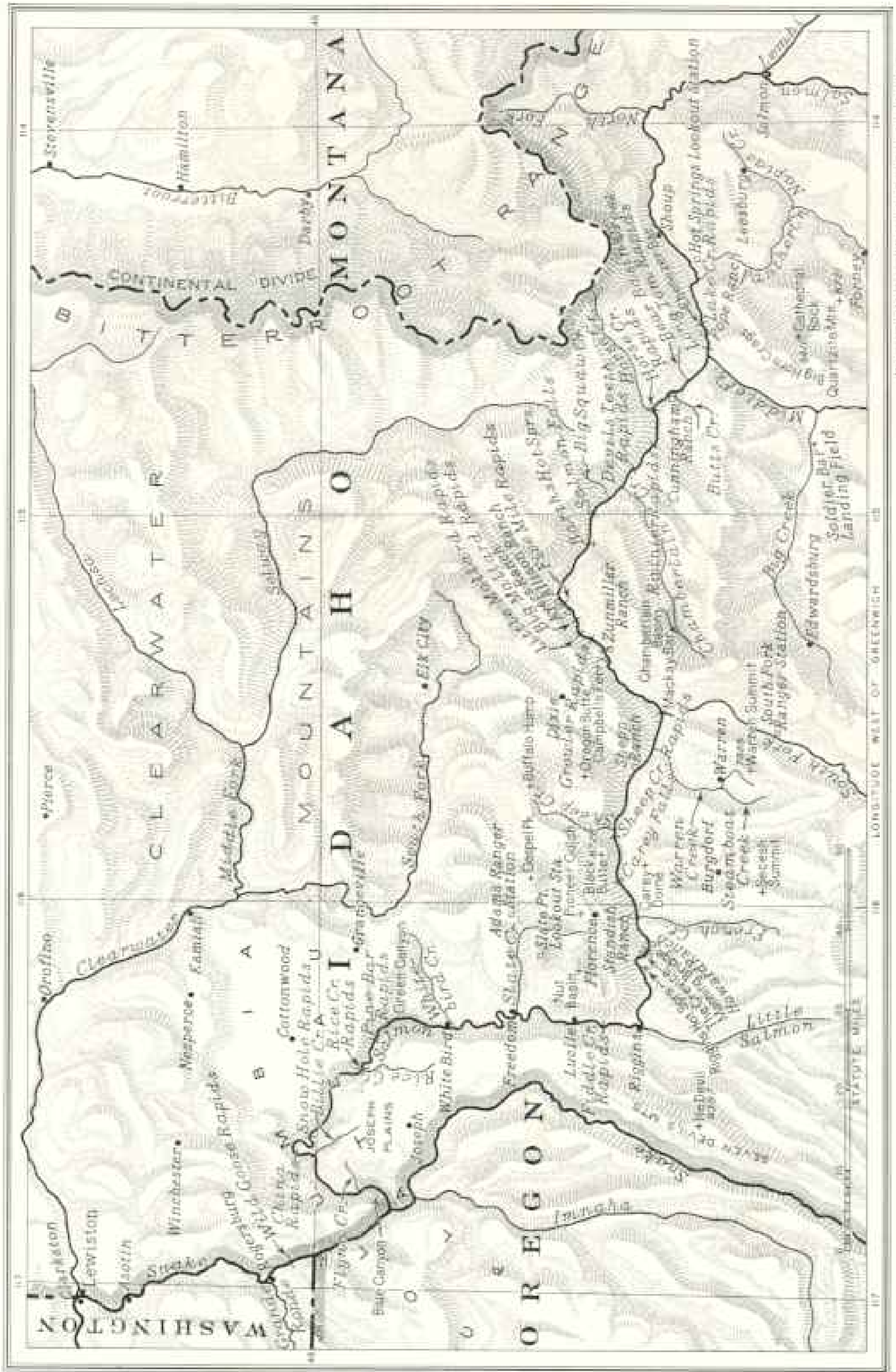
When we reached the boat, we found many people had motored down from Salmon to wish us godspeed on our 2,355-foot descent to Lewiston, 253 miles away.

Low light on the water made it difficult to see hidden rocks, and Captain Hancock suggested that we postpone our start until morning.

Though our scow had looked unwieldy, this advice seemed overcautious. "They're tired," we thought. But before the trip was over we had absolved our boatmen of undue caution and had developed a bit ourselves. We slept in a newly completed camp whence C.C.C. workers are pushing a road down the river with dynamite and "bulldozers," heavy tractors used for shoving obstructions out of the way.

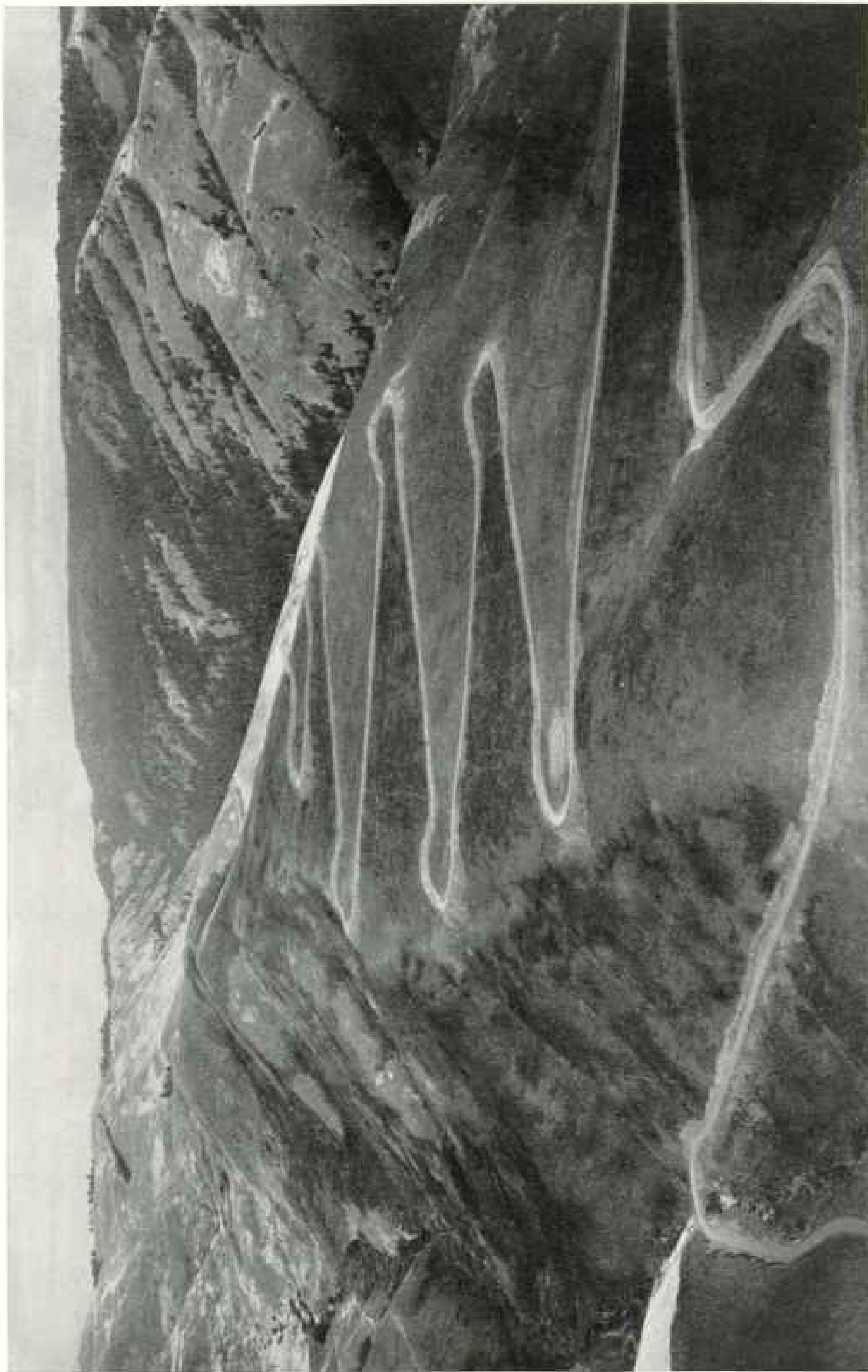
Dave Chard's "Come and get it," at daylight, referred to delicious sourdough hot cakes. Dave had installed his kitchen after leaving Salmon, and a full-sized iron range now sat in a corner of the scow, with work benches close at hand. Since the boat was heavily loaded and the water low in the Lake Creek Rapids, we struck out on foot immediately after breakfast.

We were greeted at the Pope Ranch by Mrs. Mills, an old-fashioned little lady who had read *THE GEOGRAPHIC* for many years and was familiar with Williams' articles. She said she had thought it possible that she might meet him in China or Afghanistan, but that she never had expected to be introduced to him in the Salmon River Canyon.



Drawn by Neuman Hummel and Arthur J. Hanes

THE RIVER OF NO RETURN ROADS: TUMULTUOUSLY THROUGH SOME OF THE RUGGEST MOUNTAIN COUNTRY IN THE UNITED STATES



Photograph by Washington National Guard

THE SWITCH-BACK ON IDAHO'S NORTH-SOUTH HIGHWAY ZIGZAGS UP A LAVA HILL BETWEEN WHITE BIRD AND GRANGEVILLE

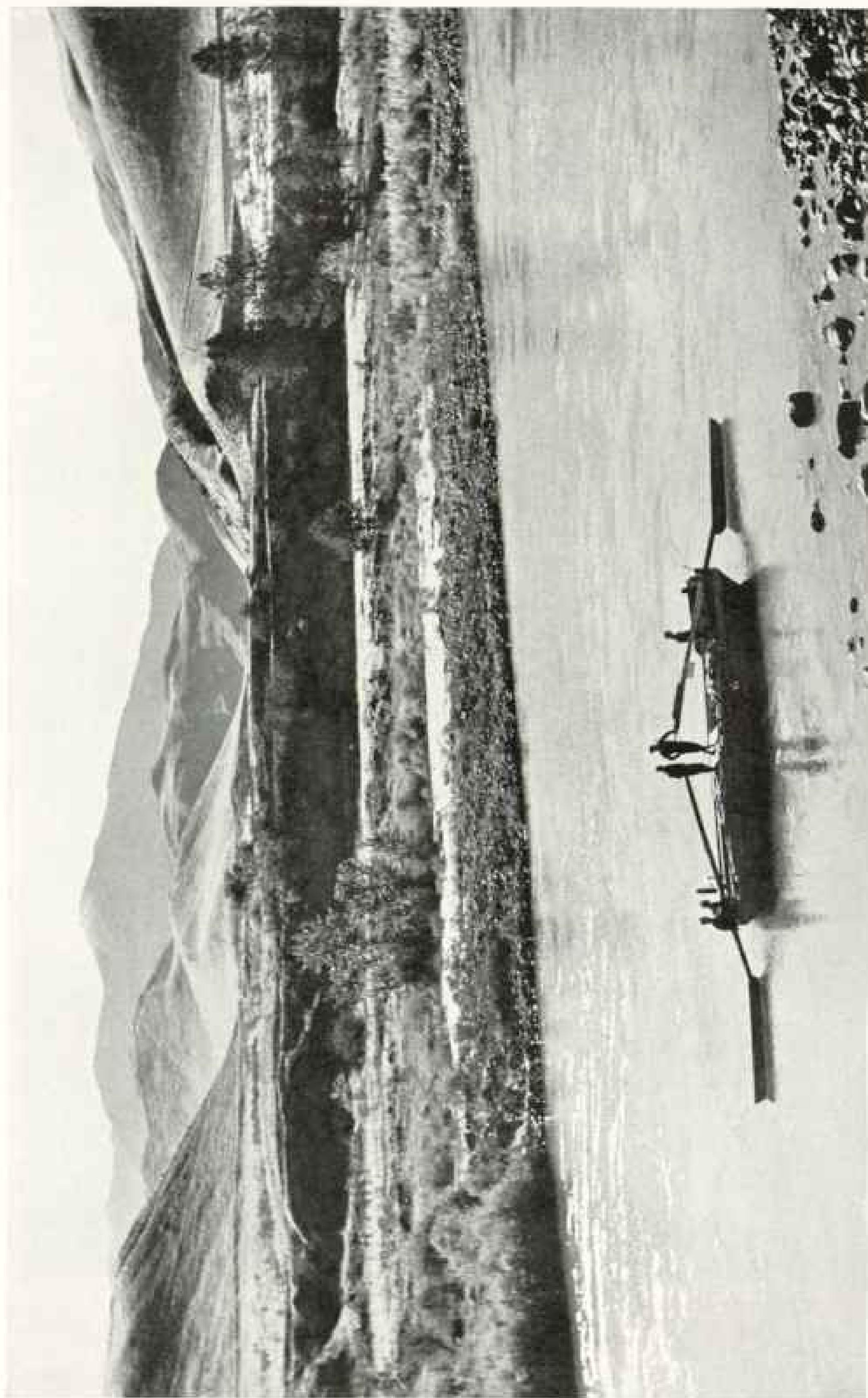
At the foot of this tortuous climb Chief Joseph and his band of braves, in June, 1877, fought one of the opening battles of the Nez Percé Indian war (page 96). Memory of the soldiers and Indians who gave up their lives is perpetuated by monuments close to the highway. The dark, burned-over area on the left side indicates that a recent grass fire failed to jump the road.



Photograph by Washington National Guard

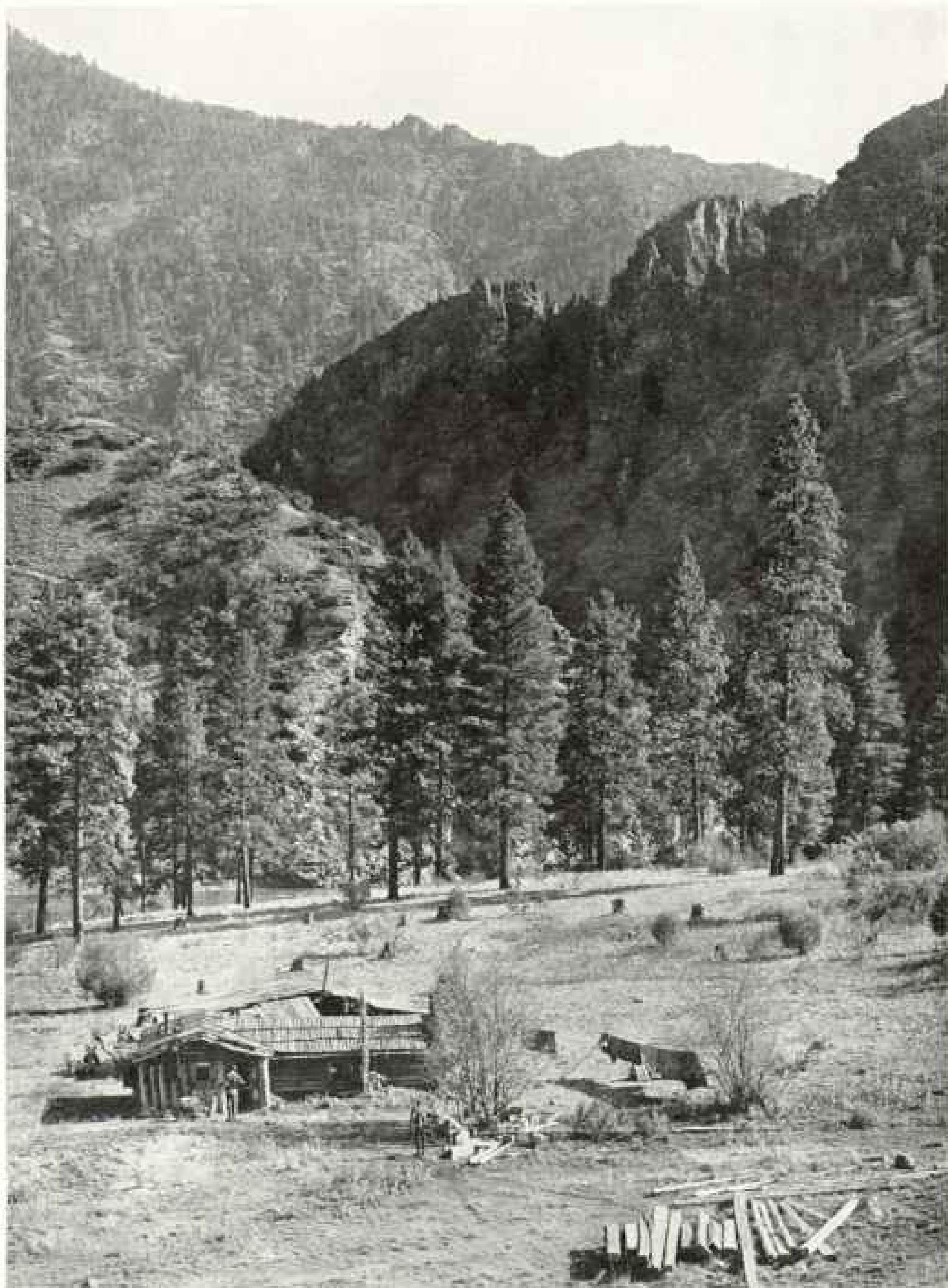
THE SCOW FIRST "SAW THE LIGHT OF DAY" AT SALMON, NEAR WHERE LEWIS AND CLARK CAMPED IN AUGUST, 1805

Captain Clark named the river for his fellow explorer, who was the first white man to set foot on its shores. The name was later changed to Salmon because of the fish that inhabit its waters. During the early gold-rush days of Levensburg, which lies about 10 miles west of here, a ferry was operated near the highway bridge above.



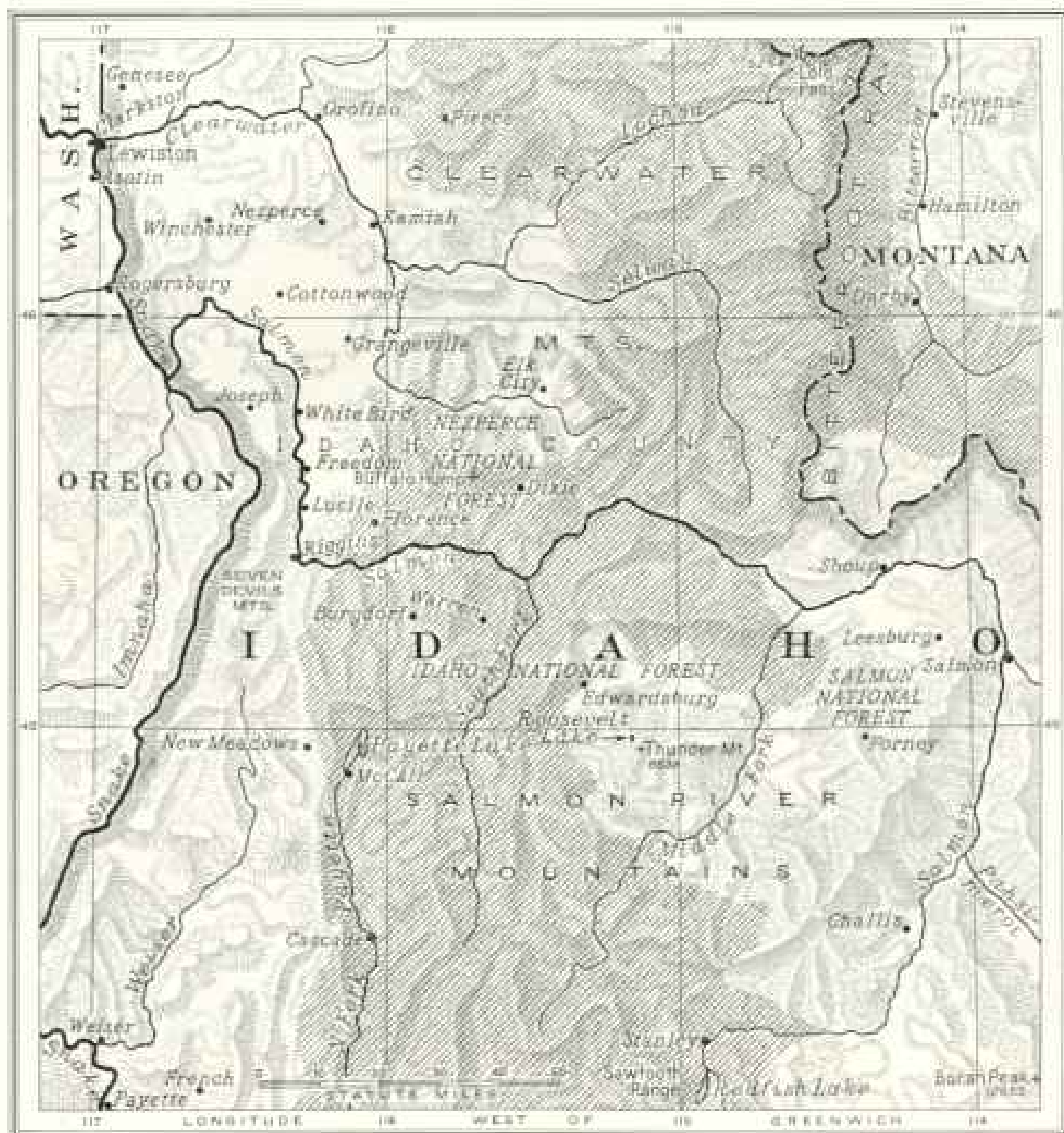
THE SCOW IDLES THROUGH QUIET WATER BELOW FREEDOM

The river once flowed through the gap in the background, but gradually wore a new channel through more easily eroded rock. Thus the stream has reversed the usual process of geology by making a circuitous horseshoe bend rather than following its more direct old course.



A HOMELY PARADISE NESTLES DEEP WITHIN ENCLOSING CANYON WALLS

The cabin lies on a low terrace surrounded by stately ponderosa pines. In it lives John Cunningham, the expedition's second boatman, whose chief outside contact is the NATIONAL GEOGRAPHIC MAGAZINE. After the crew had sampled Jack's watermelons, he showed them his fruit cupboard bulging with bright bottles of preserved raspberries, strawberries, peaches, and apricots, all raised in his garden (page 108).



Drawn by Newman Bushnell

SCIENTISTS SOUGHT TO DISCOVER THE EXTENT OF THE IDAHO BATHOLITH

This huge mass of granite (the shaded portion of the map) was long a challenge to geologists. In the trip down the Salmon River, the National Geographic Society-U. S. Geological Survey Expedition obtained valuable data on the colossal body of rock (page 136).

Jack Cunningham joined us, and we got into the scow. We were now embarked on the "River of No Return."

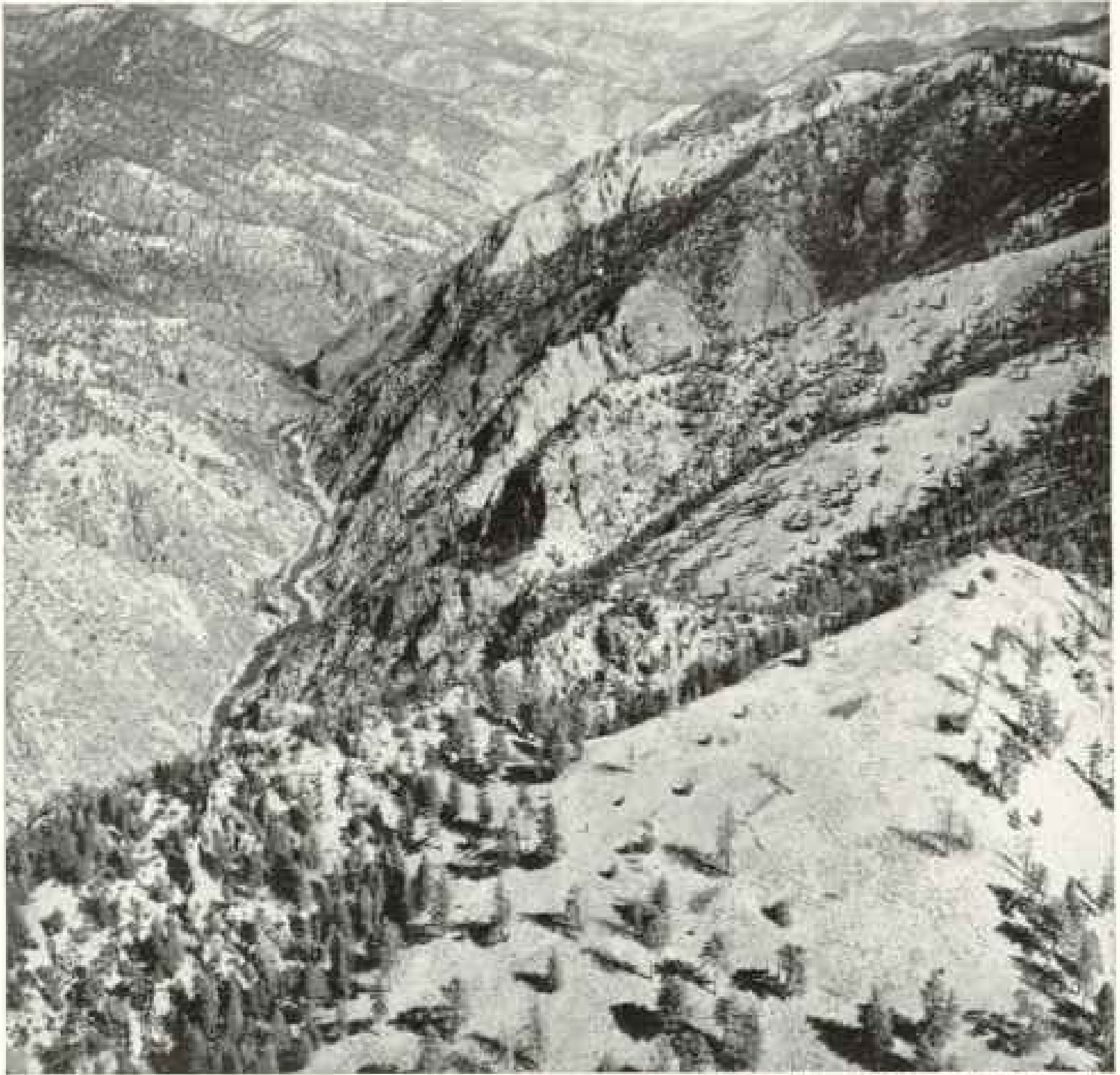
"SALMON RIVER, LET 'ER BUCK"

As we approached the Long Tom Rapids, we could see the expression change in the eyes of our boatmen. With faces set and bodies tense, they picked their way toward the white-flecked crest of roaring water. This lull before the storm we were later to experience many times. The roaring grew louder and louder, and ahead of us we could

see "white water" dashing over partly exposed boulders.

If there was a channel, our inexperienced eyes could not detect it. But on we went; there was no turning back. A quick surge, a rush of water, a few strokes of the sweeps, and we were through! At one moment a huge rock blocked our path. Then it lay behind. With each rapid our respect for the boatmen grew. Their timing and precision were perfect.

Near the mouth of the Middle Fork, Clyde Smith led us up to a high bluff, from



Photograph by Washington National Guard

HOT SPRINGS LOOKOUT STATION IS PERCHED PRECARIOUSLY ABOVE THE CANYON

From such vantage points (right) lookouts keep a constant vigil during the forest-fire season. To the right of the Salmon River, the new highway winds through the gorge and passes the town of Shoup, around the bend in the background.

which we could see steelheads (sometimes known as salmon trout) sporting in the crystal-clear water far below (page 94).

FISHING ON THE SIDE

With light tackle Dean Fahrenwald hooked a fifteen-pounder—one which jumped two or three feet clear of the water. It was beautiful to behold, its glistening green sides tinted with brilliant red. When we started up Middle Fork with the Smiths and Tom Ayers, Flint was carefully studying it while Clark and Fahrenwald were at work on the radio.

At the mouth of the Middle Fork we had not entered the Idaho Batholith, whereas in the Big Horn Crags country, less than 10

miles to the south, we had found solid granite. A short trip up the canyon might disclose its edge; therefore, while Clyde Smith, stripped to the waist, stood in the bow of his bateau, the rest of us, rubber shod, hauled on the towrope to the "Song of the Volga Boatman." Over slide rock and up steep bluffs we scrambled, while Clyde pushed and tugged with a long pole. Where we could neither scramble nor climb we took to the water (page 114).

At dusk, after three glorious miles, we reached an old camp. On each side of us walls of solid rock, forming a box canyon, rose straight toward the sky.

Far above our camp six mountain goats stood like statues, their white coats in



DENSE FOREST OF THE FLORENCE DISTRICT HIDES THIS CABIN

In their comfortable shelter the two sourdoughs (prospectors) in shirt sleeves will "batch it" through the long winter. By Christmas the snow will cover the eaves, but with a good supply of "grub" in their larder and summer promised by next June they face the future with a smile.



EVEN IN THE WILDS, THE MACHINE AGE HAS ARRIVED

A gasoline-powered washing machine, brought by river boat to this ranch deep in the canyon, helped the captain's sister-in-law perform her household duties much as they are done in the towns.

strong contrast with the dark rocks. When night closed in, they were still maintaining their silent vigil.

Next morning, although we had not found the batholith contact, we had to turn back and, with Don Smith at the head sweep and Clyde at the rear, we slid back down the Middle Fork, over thundering falls and rapids, with apparent abandon.

At one point the bright morning sun shone on an emerald-green bluff 500 feet above us. After scaling it, we were disappointed to find the copper stain only skin-deep and not the weathered outcrop of a real copper vein. We were reminded of the old saying that there is enough copper in a penny to stain a mountain.

Such disillusionment is the everyday fare of the hardy prospector in his constant search for gold. A few strike it rich, but most of them barely eke out "beans."

Back at our scow, Flint and Clark, in radio contact with Salmon, reported all well. Everyone was in high spirits, although Captain Hancock and Flint had colds.

At dusk we camped near the mouth of Bear Basin Creek a few hundred feet below some inventor's dream of a short cut to riches, a suction dredge. Since the machinery was still in place, it appeared that the inventor had only lately been rudely awakened.

Jack Cunningham's ranch, situated on an alluvial flat at the mouth of Butts Creek, is framed by high, jagged walls (page 104). Along the river, cottonwoods bedecked in yellow and gold rivaled the more brilliantly colored huckleberry and sumac bushes of the hillsides.

WHERE WILDERNESS IS PARADISE

In the rustic interior of Jack's cabin, which is reached only by boat or by Forest Service trail over the mountains to the north, were copies of the NATIONAL GEOGRAPHIC MAGAZINE since 1916, most of which he had practically committed to memory. His larder was stocked to overflowing with enough preserved fruits and jellies to cause any housewife envy, and from a corner he brought forth watermelons and two jars of home-made wine.

The garden furnishes fruits and vegetables, the cows and chickens supply milk and eggs, and the hillside behind the house yields meat in the form of venison, mountain goat, and bighorn sheep. The hydraulic placer mine below the orchard and an

occasional boat trip supply funds for clothing, magazines, and books. Perhaps Paradise is like that!

A short distance below Jack's place a miner had constructed a crude water wheel by which old coffee and lard cans lifted the water into a trough (p. 120). This device, as it swished and creaked, reminded Williams of similar ones he had seen in Szechwan, China, and on the Oronte River in Syria.

We ended the day by shooting Horse Creek Rapids, much like a dozen others we had been through. Also, like most of the others, these rapids were formed by rocky alluvial fans deposited in the river by tributary streams. Above the fans the water is generally ponded to form the stretches of "polished water." At a sandbar just below a Forest Service pack bridge our Nimrods shouldered rifles and hit off up Horse Creek in an unsuccessful attempt "to replenish the meat supply."

Big game had thus far been scarce. The usual mid-September storms had not arrived, so most of the deer and bighorn sheep were still up in the high country.

BETWEEN WALLS IN THE IDAHO BATHOLITH

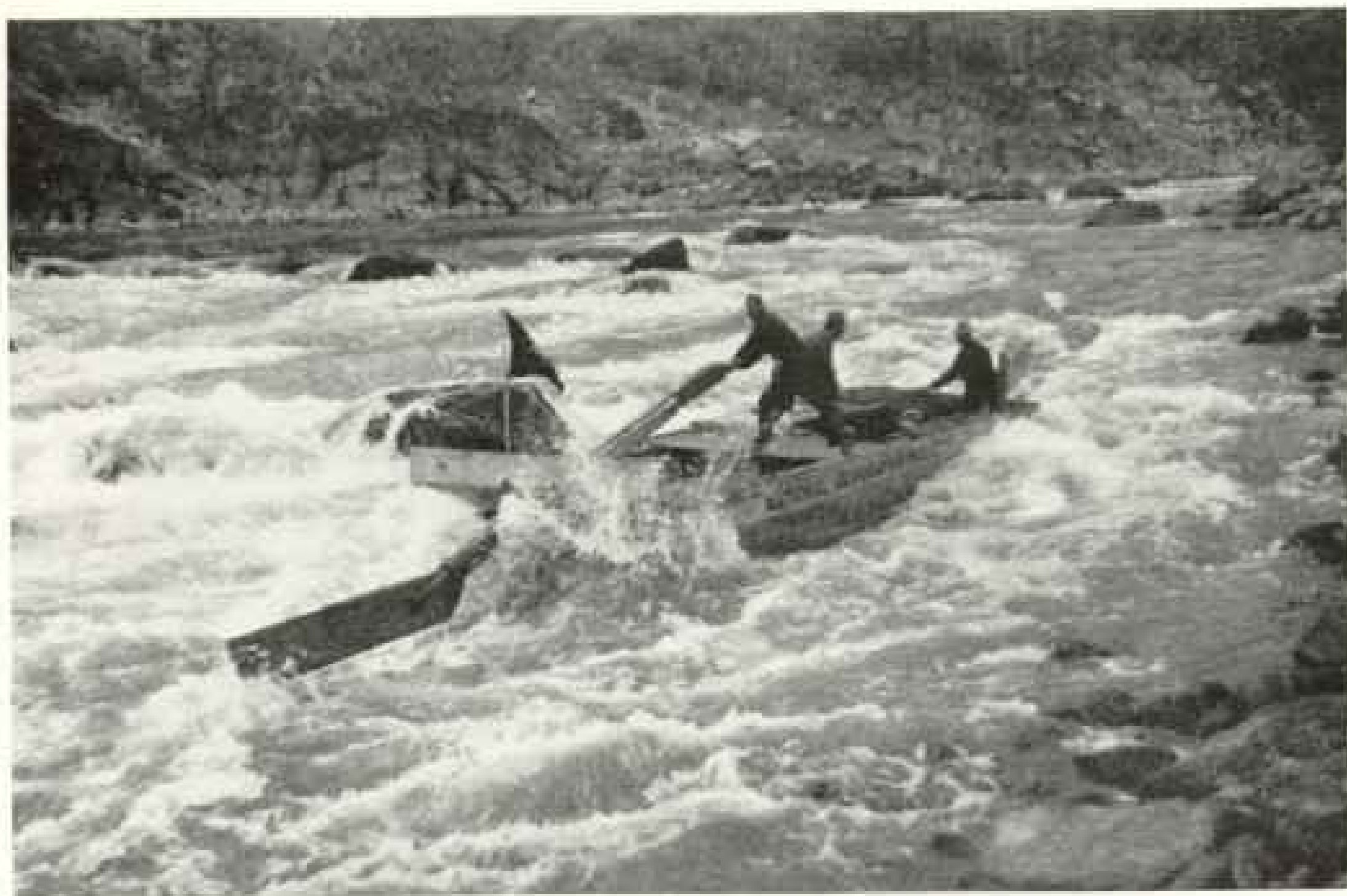
Below Horse Creek are some unusually fine Indian paintings high on a bluff. John E. Rees says these figures tell of a battle in which many warriors and a chief were killed (page 121).

Here, 20 miles farther downstream than we had expected, we entered the Idaho Batholith (p. 105). For the next 90 miles we were to pass between wide-spread canyon walls carved more than a mile deep almost entirely from this great granite mass.

The day was clear and warm. After stretches of polished water, clumsy rapids tumbled us about. But except in Rainier and Devils Teeth our anxious moments were few.

Next morning we inspected a quartz vein situated a half mile below Big Squaw Creek camp. Where exposed it was 30 to 50 feet wide, but it had a "lean" look. A new location certificate and recently dug pits served notice that some prospectors "had 'er made."

We were approaching Salmon Falls, the rapid that only two years before had almost taken the life of Captain Guleke. Now, because of unusually low water, it was particularly dangerous. To select the south



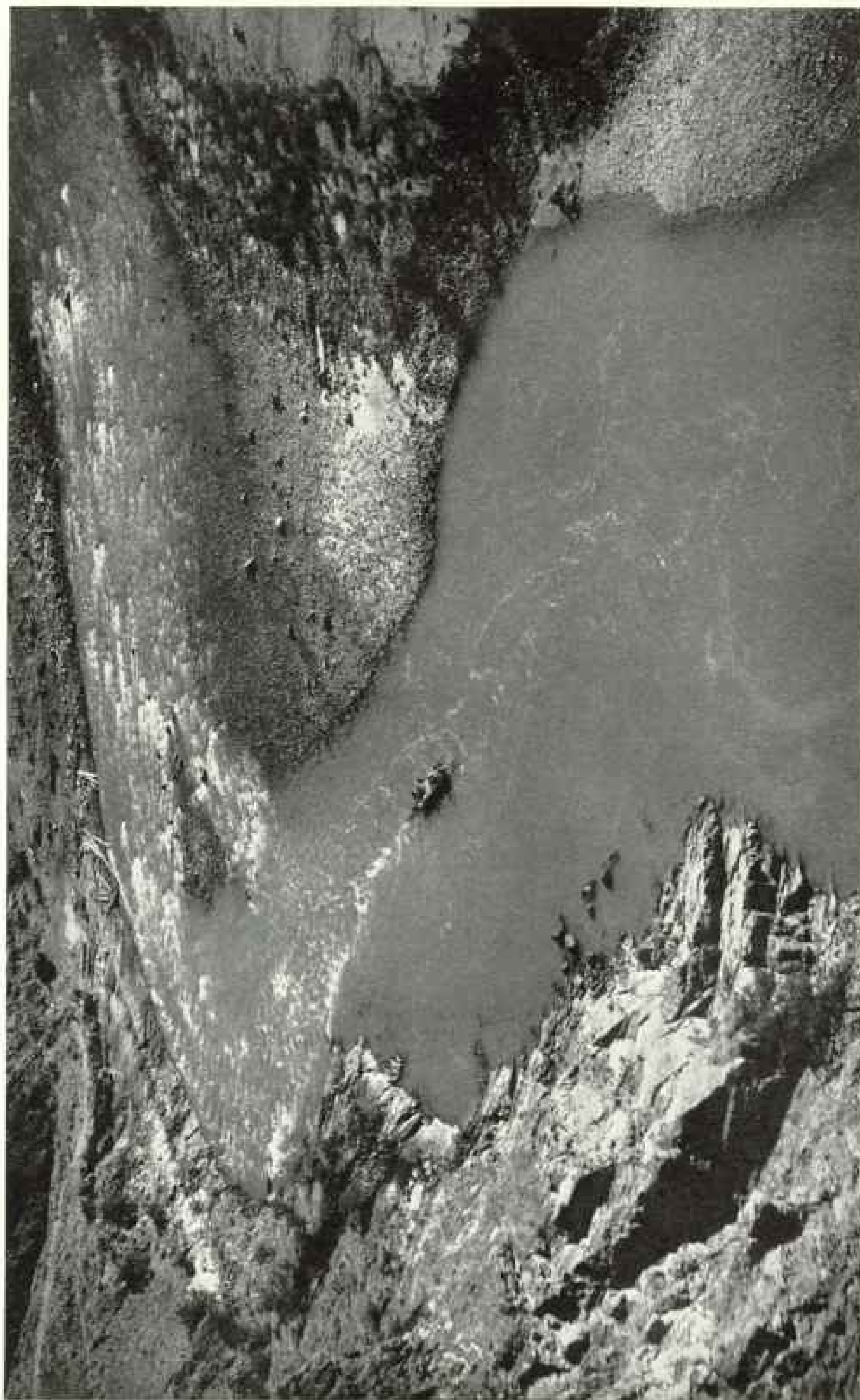
THERE WAS A ROAR OF RUSHING WHITE WATER; THEN CALM

A rapid in the lower canyon above Bille Creek, not dangerous in most years, was a real hazard because of the low stage of the river. All except the boatmen and Shenon, who had bruised his hip in Rice Creek Rapids, disembarked to lighten the craft.



THE SCOW LEAVES ITS BIRTHPLACE, NEVER TO RETURN

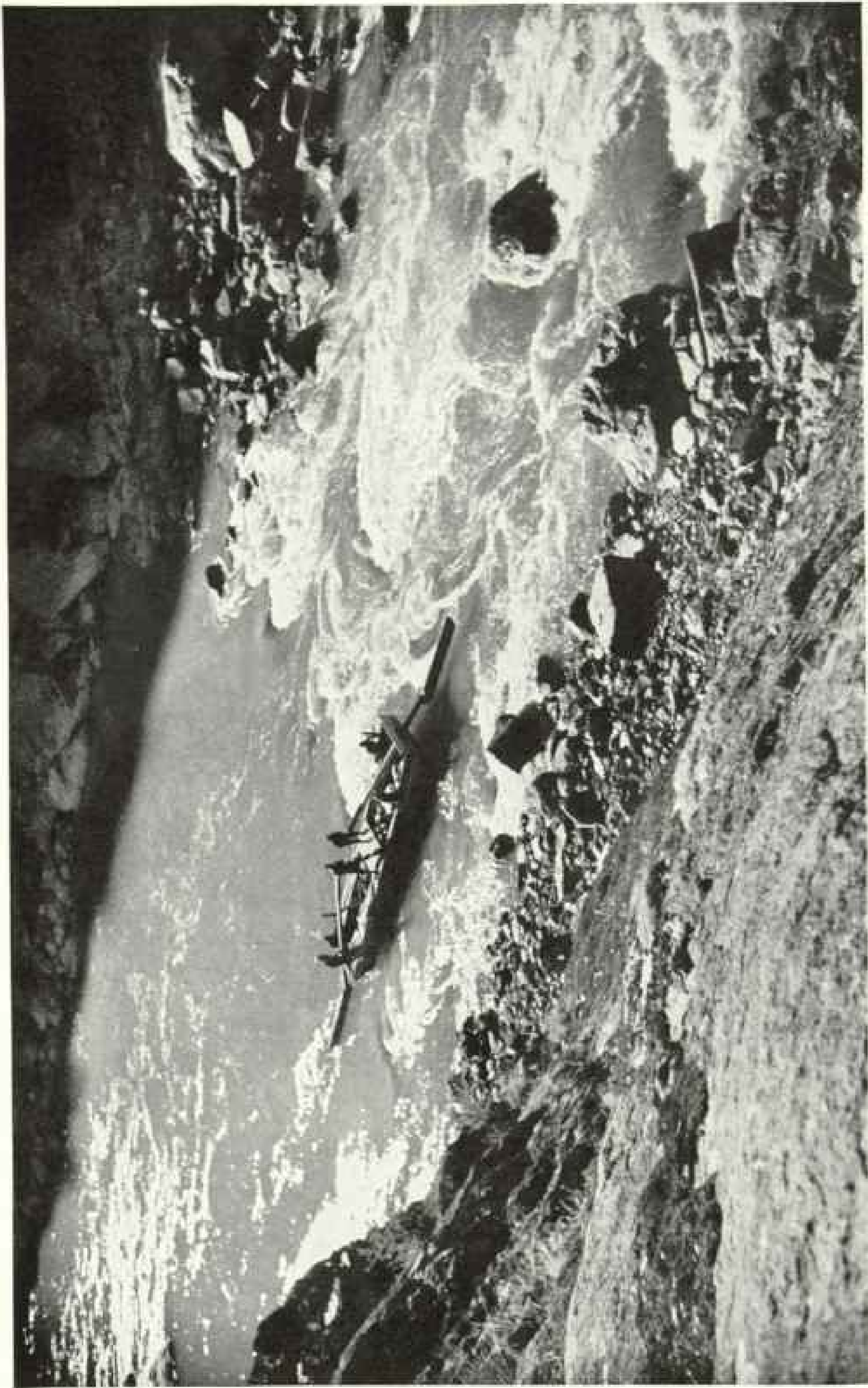
Because of exceptionally low water the good ship *National Geographic Society* is riding light and equipment will be loaded at Ebenezer Bar, at the end of the Salmon River road (page 94).



Photograph by Washington National Guard

THE "WHITE WATER" NEAR RIGGINS LOOKS EASY AFTER THE UPPER CANYON

As the adventurers bade farewell to Riggins, the Washington National Guard plane with Hartnett and French abated roared overhead, circled, and dipped its wings in salute. This scow is unusually seaworthy and tight. Little water was bailed from her bilges, and most of that came over the sides in spray. Canned goods were stored in the double walls of the boat, and a small kitchen stove was carried in one corner for the "galley."



A MOMENT'S BREATHING SPACE PRECEDES THE MAD PLUNGE

With bodies tense the boatmen "ease" into the chosen channel. Snow-Hole Rapids, which fall 10 feet in 150, give the crew some of their most anxious moments. A few inches too far to the right or left might spell disaster (page 112). Sweeps have no sculling action at all; they are used merely for steering. Unlike a rudder, they are held above the surface except when needed to sweep the craft clear of an object or keep it on the course. No power was provided for the boat; it simply floated downstream with the current.



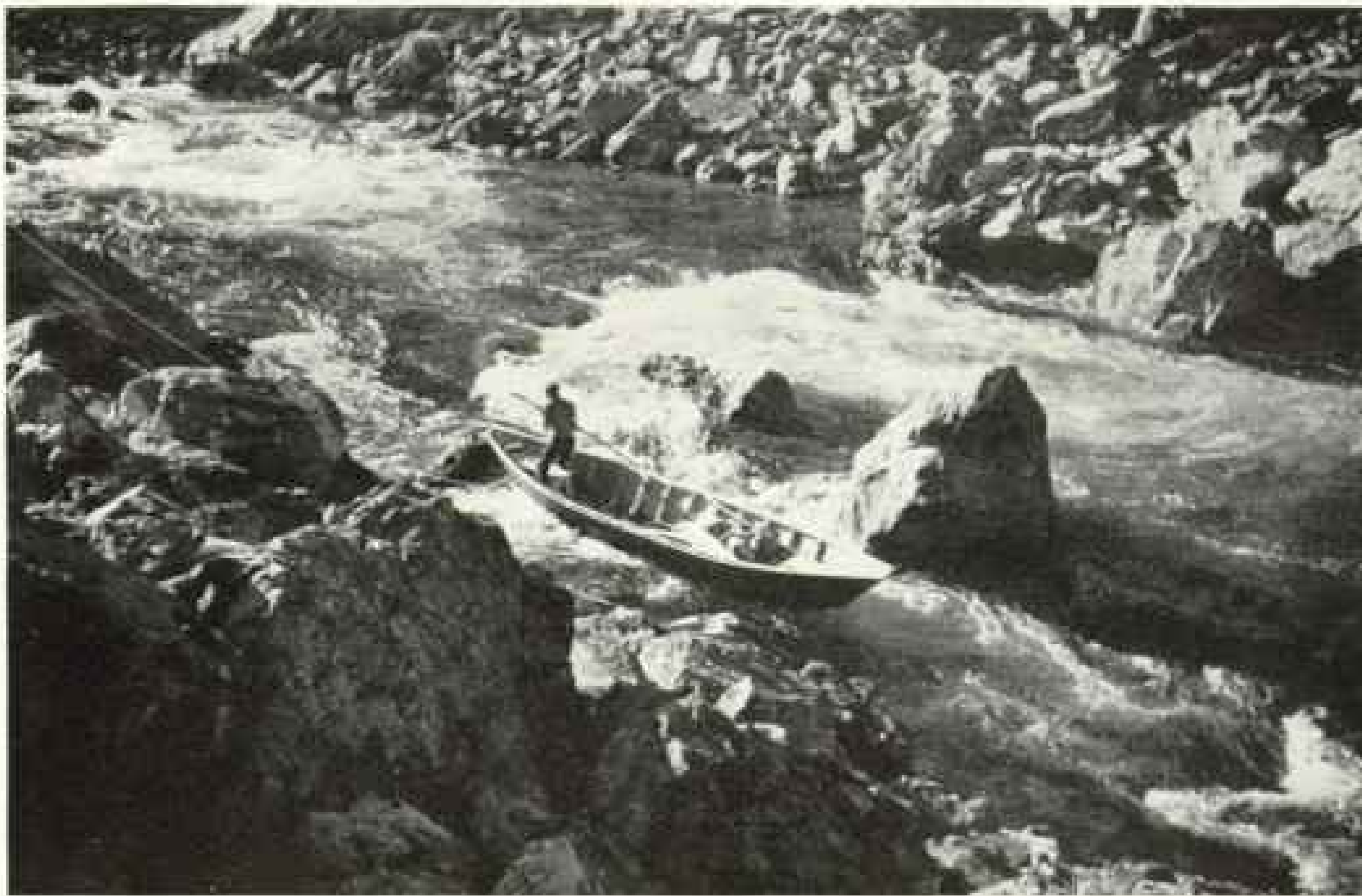
IN MIDSTREAM A THRUST-UP ROCK LOOKED AWESOME AS GIBRALTAR

A few quick tugs on the sweeps, the roar of the water around the scow, and the adventurers were through Snow Hole Rapids, one of the most dangerous on the river at the extremely low stage of water (page 111). There were many such wild rides "between Scylla and Charybdis."



PIDDLE CREEK RAPIDS ARE NO PLACE FOR PLEASURE PADDLING!

The thunder of the rapids, the faint shouts of the crew, and the express-train speed of the boat seem expressed by this picture of a breath-taking ride. For 33 miles below Riggins the North-South Highway follows the Salmon River. Crowds along the road, after watching the scow "take" one rapid, rushed ahead to the next. They had one opportunity to make return for their entertainment by pulling the crit off the rocks.



THE BOX CANYON OF THE MIDDLE FORK PUT UP ACTIVE RESISTANCE

While four of the party tugged to the tune of the "Volga Boatman," Clyde Smith pushed and pried to keep his small craft off projecting rocks.



A QUIET STRETCH ON THE MIDDLE FORK MEANT TOIL FOR SOME

While his fellows scrambled over slide rock or bluffs with the towrope, Clyde Smith stood poised to push his bateau away from submerged rocks. Where the towing crew could neither scramble nor climb, they took to the water with the rope.



SALMON FALLS TOSSED THE SCOW UPON PROJECTING ROCKS.

Here the rocks almost proved the expedition's undoing. While two prospectors pried with a long pole, Williams, after taking this picture, braced his back against a huge boulder and pushed with his feet.



THE SAIL PROVED MORE OF A HINDRANCE THAN A HELP

Reed and Chard tried to make the scow a "windjammer" in a stretch of "polished water," but their scheme was not entirely successful because the tarpaulin obstructed the view of the boatmen and the wind started to blow upstream.



RAPIDS AHEAD! THERE'S THE COURSE!

The short log attached to the sweep near Captain Hancock's hand balanced the steering device like a laboratory scale. About midway through the canyon the boatman replaced his first piece of sapling by another, for the green wood had dried out enough to become lighter than he liked.



QUICK FOOTWORK PREVENTED THE SCOW'S BEING SUCKED SIDEWISE INTO A RAPID

Here in the Green Canyon, as elsewhere, a wrong choice of channel might have meant disaster. At some bad places the boatmen went ahead on the bank to pick the best course. Care was taken going down rapids, for if the bow sweep should "trip" or become caught in an eddy, the handle would be wrenched violently from the boatman's hands and the craft would be out of control.

channel would probably spell disaster; to use the north one almost certainly meant a hang-up on protruding rocks.

With a creak and a groan the boat slid upon the boulders and stopped short—stuck fast! Two placer miners, who had come to watch the fun, dashed to the rescue. With a long pole they pried while the boatmen tugged on their sweeps. Williams, lying flat with his shoulders against a rock, shoved with both feet (p. 115). Grudgingly the boat gave way and then, like a fallen warrior running the gauntlet, it was off again with a rush between lines of boulders.

At Barths Hot Springs a copious flow of hot water issues from joints in the granite. Its temperature, about 134 degrees Fahrenheit, is hotter than we could stand. The river was 54 degrees Fahrenheit, too cold for comfort.

Where a big stream of hot water joined the cold, we underwent the peculiar sensation of standing in a bathtub in which the water chilled our feet and at the same time nearly scalded our shoulders.

Flint felt better after his bath, but during the rainy night he somehow rolled out of bed, and before he was thoroughly awake was wet to the skin. In the morning he was weak and we decided to rush him to a hospital. Reed walked ahead to a Forest Service phone. The rest of us broke camp, carried Flint to the boat, and set out in the rain.

Arrangements were made for a plane piloted by Dick Johnson, Flint's buddy on many a hazardous trip, to fly from Missoula, Montana, to Mackay Bar, a flat terrace which is the only emergency landing field in the canyon. Even that was 25 miles away—two days by boat. Everything else was forgotten. We had to get Flint out!

THE RIVER BARES ITS TEETH

A mile below Allison's ranch we escaped disaster. All except Dave Chard, Flint, and the boatman had unloaded for a rapid which, except for being shallow, did not look particularly bad. However, as the boat swung to avoid one boulder it smashed into another with enough force to throw it partly out on the shore. For an instant it perched at a dizzy angle and then glided back into the water.

We touched at the Ayers ranch only long enough for Captain Hancock to say hello to his wife and then on we splashed through the Big Mallard and Little Mallard Rapids to the Growler Rapids.

With Flint confined to his sleeping bag, we could take no chances. Hancock chose the safer but shallower channel, toward which the heavy boat plunged at top speed. Then a sickening creak and groan, and we were stuck, this time on a three-point suspension that held with viselike tenacity.

For two hours we pried and pulled, to no avail. The dean cut a long pole while the rest of us tediously unloaded the boat over a slippery bridge of saplings. Then, with a rope tied two feet or so from the bottom end, we applied the tree-trunk lever and, led by Representative Clark, pulled as never before (page 123).

The boat moved inches. Again we pulled. It moved a foot, then two feet, then slipped free. Though darkness was upon us, we pushed on to the hospitality of Joe Zumiller's ranch, where Flint was given broth and placed in a warm bed.

The early-day trail to Thunder Mountain crosses the river at this place, known as Campbells Ferry. Near it we found hundreds of dikes cutting the granite. They line up with the dike zone of the Edwardsburg district, where they are closely associated with gold deposits.

AN AIRPLANE TO THE RESCUE

In the cold dawn we carried Flint down to the scow on an improvised stretcher. On through rapids and polished water we hurried. At noon we chatted a few minutes with Mrs. Jones and Mr. Painter.

On the previous day, this fine old gentleman had celebrated his seventy-fourth birthday. Years before, he had hired Captain Guleke to float from Salmon mine boatloads of machinery, which is now installed at his mine. Although one boat was wrecked, Captain Guleke had delivered all the machinery.

The moment the boat touched shore at Mackay Bar, we climbed to the landing field, to find Dick Johnson, who had just landed, looking for us. While he was cruising about, seeking a place to land in the depth of the canyon, his gasoline supply had run low and he had made a side trip to replenish it from a Forest Service cache in Chamberlain Basin.

After seeing the landing field, we could well understand why this small, powerful plane had been selected. We arranged an improvised bed in the front cockpit, bundled Flint in his sleeping bag, and fastened two safety belts securely over all (page 124).

As he bade us farewell, his last words were: "Well, fellows, if the doc lets me, I'll join you at Riggins," and then up into the familiar and friendly sky he sailed with his old flying comrade, winging his way toward the "Great Divide."

While we made camp, two visitors approached us. One of them, a former trapper named Moore, had been badly mangled several years earlier by the explosion of a box of giant caps when he started a fire in a deserted cabin. He had suffered four days of agony before his partner arrived.

Today Mackay Bar landing field is a monument to the suffering Moore endured. This crippled man cleared it himself so that if others in this back country should meet with misfortune their trials would be less than his. To this field Dick Johnson had dropped from the sky for his last rendezvous with his old air buddy, Howard Flint.

Flint's death in Missoula, Montana, while the expedition was in progress took from us a beloved companion and ended the career of a true scientist. He was an avid student, and his many years of experience as Forest Supervisor, aerial photographer, and Regional Forest Inspector had enriched him with encyclopedic knowledge of mountain lore.

The next morning a big yellow and green plane bearing the insignia of the Washington National Guard hove in sight. Our friends Hartnett and French were with us again. Three times they tried to bring their plane down on the tiny field, but had to zoom past to avoid the hills.

Shortly after we passed the mouth of the South Fork, a message fluttered to earth. Not having heard about Flint's sickness, they were at a loss to know why they could not reach us by radio. Flint alone knew how to operate ours. From the Shepp ranch, a few miles farther downstream, we sent them a message of explanation.

ROMANCE FROM PIONEER DAYS

Across the river stood the former house of Polly Bemis, "the Chinese slave girl," about whom many legendary tales have been told.

We asked an old-timer, "Is it true Polly was won in a poker game?"

"Well," he replied, lifting the greasy brim of his old hat to scratch his head, "poker had something to do with it. Warren was a wild town in those days and gold dust and poker chips seemed to reach out toward each other.

"But Polly? It's a shame to spoil a good story. They're getting scarce. But I guess the fact was that Bemis got hurt in a poker game, Polly nursed him back to health, and Nature and a minister did the rest."

For many years the generous hospitality of Polly and her husband was a byword among the mountain people. Her death, three years ago, removed Salmon River's most romantic figure.

The Forest Service cabin at the mouth of Sheep Creek was occupied by miners, so we spread our beds on the sandbar.

Next morning, after collecting samples of concentrates from one of the sluice boxes, we passed through several exciting rapids, including Sheep Creek and Carey Falls.

A stiff up-river breeze developed in the afternoon and in stretches of polished water we "spelled off" on some crudely improvised oars.

ROADS UNLOCK THE MOUNTAINS

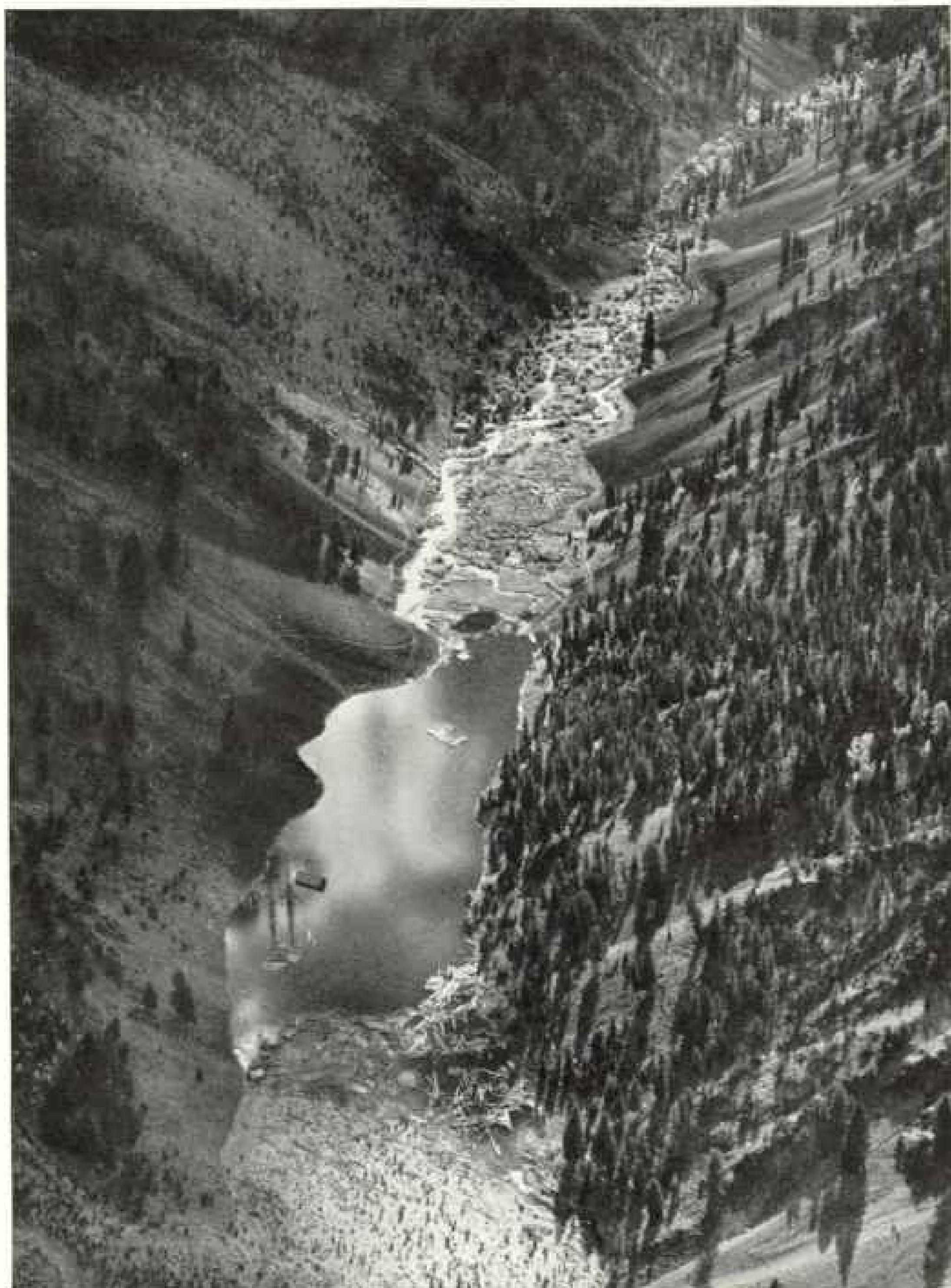
Near French Creek we heard blasts, and saw rocks falling into the river. For the first time in a hundred miles we were now in sight of a road. As we drew closer, we could make out C.C.C. boys, like ants on the hillside, drilling or prying away at boulders.

We stayed that night at the C.C.C. camp, and next morning two New York boys waked us while kindling a fire. When it was going well, we ventured out of the blankets. We missed our downy sleeping bags under a canopy of clouds and stars; but a roaring stove and a dry floor on a frosty morning were easy to take.

With the officers of the French Creek camp and Ranger Briggs and Fritchman of the ever-helpful Forest Service, we left our scow and started the long automobile climb out of the canyon to have a look at mining and forestry activities. From a bend we could see the road weaving back and forth above us, in and out of a small valley, in a breath-taking series of switch-backs.

This road is one of an amazing number built in the last few years by the Forest Service and the C.C.C. (page 127). Supplemented by mountain-meadow airplane fields, such highways have revolutionized transportation in central Idaho. Last summer when the Warren baseball team played Elk City, 40 miles away across the canyon, the team went by plane in 20 minutes.

The present road distance is about 140 miles, practically all mountainous, but still



Photograph by Washington National Guard

STREETS ONCE TROD BY THE HOBNAILED BOOTS OF PROSPECTORS LIE BENEATH THIS
MOUNTAIN LAKE

In 1909 a landslide started at the Dewey Mine on Thunder Mountain. It flowed three miles down Mule Creek Canyon, dammed Montimental Creek, and flooded the mining town of Roosevelt, causing its abandonment. The few buildings that still jut above the resulting Roosevelt Lake are now the homes of beaver and rainbow trout.



THE RED MAN NOW REACHES HIS HUNTING GROUND BY AUTOMOBILE

The adventurers met these members of the Nez Percé tribe while they were on their way into the Nezperce National Forest to shoot deer. The old brave cannot speak English, but through an interpreter he said he well remembers the Nez Percé war of 1877. Comparison of the man's hands with those of his wife illustrates the Indian custom of letting the squaws do the manual labor.



MINERS HARNESS THE SALMON TO SEPARATE GOLD FROM DRÖSS

So swift is the current that it easily turns the crude paddles of this wheel. Coffee cans fastened on the wheel scoop up water and pour it into the trough. Led to a sluice box on a trestle, it washes the earth and gravel and leaves the precious metal on the bottom.

good enough to make an easy day's drive. Only about five years ago, however, the road distance was 225 miles, and much of it steep and rocky, so that at least three days would have been required for the trip.

Pack train and foot travel are still in vogue in large areas yet inaccessible by road, and will be for many years to come.

The mountain hotel, store, and few cabins that constitute Burgdorf have grown up beside a freely flowing hot spring in which the natives bathe outdoors, even in the dead of winter with the temperature at 40 degrees below zero. Faces are surrounded by a heavy coating of frost as bathers dash to the warmth of the glowing hotel stove.

This is the only settlement for miles. Twenty-seven miles away (as the crow flies) over Secesh Summit lies McCall, at the south end of Payette Lake. Twelve miles eastward Warren still mines gold; and 22 miles northwestward, on Salmon River, is Riggins, on the Idaho North-South Highway.

A short divergence took us to a tall steel tower on Carey Dome whence an unobstructed panorama stretches in all directions.

To the northward, at our feet, yawned the mighty canyon, more than a mile deep

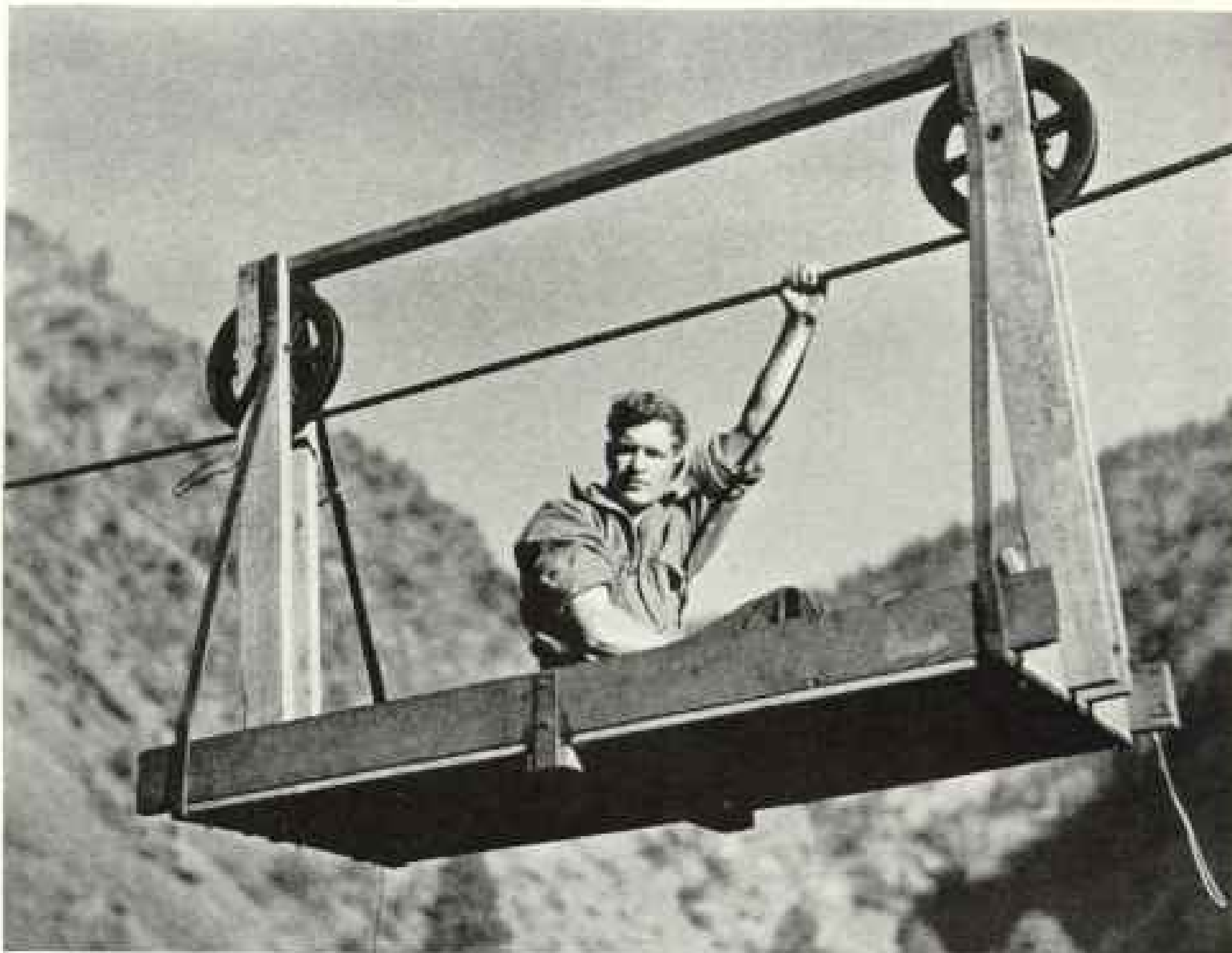


PRESENT-DAY INDIANS CANNOT READ THESE PICTOGRAPHS

John E. Rees, a student of Idaho Indian history, says this group on the north side of the river below Horse Creek records a battle in which many braves and a chief were killed. The paintings are in red on a gray background. The nature of the pigment has not been determined, but it has soaked into the rock for about a sixteenth of an inch and is not just a surface coating (pages 99, 108).

and about eight miles wide, and beyond stretched mile after mile of our old stamping ground, the Nezperce National Forest, where we had worked as members of the U. S. Geological Survey. Oregon Butte, Buffalo Hump, Gospel Peak, Black Butte, and Nut Basin—all were clearly visible in the clear, cold air. In the west, the jagged Seven Devils Mountains pierced the sky above America's deepest canyon—that of the Snake (see page 95).

From our eminence we could pick out more than a half dozen lookout stations



A DARING YOUNG MAN RIDES A "FLYING TRAPEZE" TO HIS MINING CAMP

Don Smith of the Middle Fork demonstrates the operation of one of the cable cars used in the Salmon River Canyon to transport passengers and goods from bank to bank.

forming part of the marvelous network from which, in the dry summer season, watchful eyes are constantly on guard to spot and quickly report that great destroyer of the forests—fire.

A "GHOST TOWN" RESURRECTED

The strident note of an iron poker beating a steel triangle was our breakfast call on the 17th. Then Briggs and Fritchman appeared in their Forest Service truck, and we were off for Warren.

At Steamboat Creek we saw our first gold dredge, looking like a Mississippi River steamboat lost in the mountains.

Much of the valley has been dug up by these floating monsters, which chew away hunks of landscape and spew out worked-over gravel as they swing back and forth across the flat. In their wake they leave a gleaming, hummocky, and totally barren surface marked by crescentic boulder ridges that cross and recross the valleys as if raked there by a gigantic comb (p. 131).

Warren, twice a ghost town, is now in

its third period of activity. The depression, \$35 gold, and more efficient handling of low-grade gravels have resurrected the once glamorous town (page 125).

Three dredges and a quartz mine are operating 24 hours a day. Prospectors are scouring the hills for likely places to dig from old Mother Earth her well-guarded treasures of precious metals.

Some have set up sluice boxes in valleys already placered two or three times by whites and Chinese and are extracting fair wages from the worked-over ground and the few patches of virgin gravel overlooked by earlier miners.

Here on a steep hillside is all that remains of an old placer ditch, dug for miles with infinite labor and patience, and used to carry water for washing gold from some rushing mountain stream to the diggings.

Occasionally one finds windowless cabins, not much larger than dog houses, once the homes of Chinese miners. Thousands of these orientals, released from the Central Pacific payroll after a golden spike joined



AN OLD CITY FIRE ENGINE PUMPS WATER FOR PLACER MINERS

A few miles below Freedom prospectors work the gravel on the terraces above the river. As the expedition boat passed this old "fire hog" a blast from its proud whistle announced high noon.



THE SCOW HAD TO BE LIGHTENED BY A TON AND A HALF

The rushing water of the Growler Rapids served only to lodge the boat more firmly on the rocks. In desperation the crew finally unloaded, over an improvised gangplank of pine poles, some of the heavier pieces of freight, such as the radio batteries. The high-riding scow was finally pulled free by means of a lever pole attached to the rope fastened to the bow.



FIVE MILE RAPIDS ALMOST GET THEIR PREY

The bend here is so sharp and the current so swift that the scow was flung up on a shelving rock before it could be brought about. It tipped enough to ship water, but fortunately slid free and continued unharmed. The backbone of the craft is made of green timber and is flexible, so that one corner can tip up at an alarming degree without injury or danger of upsetting.



PILOT DICK JOHNSON FLEW INTO THE CANYON TO RUSH FLINT TO A HOSPITAL

Howard Flint contracted a cold on the trip which aggravated a sinus infection and had to be flown out of the narrow canyon. His parting words to his companions as they put him aboard the plane were: "Well, fellows, if the doc lets me, I'll join you at Riggins." But he never returned (page 118).



MINING CAMPS, LIKE CATS, HAVE MANY LIVES

Warren, a "ghost town," is now experiencing its third boom. A roaring placer camp in the sixties, dead in the seventies, revived in the eighties, dead again in the early 1900's, it is now resurrected in the 1930's (page 122).

that railroad and the Union Pacific on May 10, 1869, swarmed over the mining camps of the Northwest, making a living from ground too lean for the white men.

Copper opium boxes about the size of cigarette packages are still common around these cabins and occasionally flagonlike rice-whisky bottles of pottery are found, some still preserved in the original wicker baskets in which they traveled from China nearly 70 years ago.

Trees more than 50 years old grow in some of the old pits, but it will take a long time for Nature to hide all the ugly scars of the early gold-rush days.

THE MOTOR AGE REACHES THE WILD

Today, Warren, though over 30 miles from a railroad, is booming. Unpainted log and board houses closely line the part of the mountain road that forms the street.

But modern ways of living have intruded even into these mountain fastnesses. Late-model cars line the streets; radio aerials, stretching from pine tree to log cabin, link this outpost with the world's broadcasting stations; a plane zooms down to its field in the meadow.

One dredge, named "Mickey Mouse" by Al Fisher's two-year-old daughter, had just passed through town, turning back yards into rock piles; and "bulldozers" were again leveling off the town lots (page 129).

After an elk steak lunch at the Warren hotel we set out, with the foresters and our Army friends from the French Creek C.C.C. camp, for the South Fork Ranger Station. At Warren Summit, a crudely lettered sign announced that here were to be had guides and horses for hunting parties.

Guides and horses indeed! A few hours ago at Burgdorf we had seen a car sagging under the weight of three fine deer. The driver was complaining that it was no fun, for his party had shot all three from the road and their whole season was over in 20 minutes!

"Couldn't they have held their fire?" asked Williams, himself incapable of doing so with a camera.

Nestled in a scene of grandeur amid high mountains and beside the sparkling stream lies the South Fork Ranger Station—cabin, barn, and warehouse, of which Ranger Briggs and his associates are justly proud.

Several lookout men were here on their

way to the outside after their lonely summer. Bed rolls, saddles, canned goods, lanterns, tents, shovels, and all the other paraphernalia needed for fire control were being checked and stored.

Back at Warren we saw an ancient Chinese gold balance which once belonged to "China Sam."

Warren has not been the same since Sam's death, two years ago. Honest, public-spirited, and industrious, this "heathen Chinese" had the reputation of being Warren's best citizen.

Before rolling down through the night to the French Creek camp, we carried miners' lamps nearly a mile into the Unity Mine at Warren, where a tiny rotary pump kept the drainage of a mountain side from drowning us all like rats in the dark.

Across the river from French Creek nestles the house of Mrs. Standish. It is now barricaded by heavy planks. A rock fully a foot thick had been blasted across the river by the road builders and lay partly embedded in the ground just outside her door.

Her home boasted a lawn, with piped water and a whirling sprinkler. She even showed us a small potted lemon tree grown in that sunny pocket at the bottom of the canyon.

At Howard's ranch our hostess remarked that it was so good to see people after being isolated for many years that she would not have objected had the new road gone right through the "front room."

BY RIVER TO RIGGINS

A mile below Howard's ranch the river narrows to The Crevice between almost perpendicular granite walls several hundred feet high.

The C.C.C. lads had been given a holiday in honor of our voyage, and two truckloads followed, like a regatta cheering section, along the corniche road they had built through this difficult region. As we passed under Manning Bridge, it was lined with smiling, cheering faces and waving arms.

A brisk run through several rapids put us in Riggins about noon on Saturday, October 19.

To most down-river voyagers Riggins is journey's end. Several scows, here broken up after their short but thrilling life of adventure, have been transformed into rest-houses for motor travelers.

That night we attended a dance in the

schoolhouse. Oxfords, high-heeled cowboy boots, hobnailed high-tops, silk stockings and wool—all were equally at home. People had come for miles, as they do every Saturday night, to this "fifty-gallon" dance. Here were officers and boys from the French Creek camp, the Howards, the Casners from Riggins Hot Springs, "schoolmarms" from White Bird, cowboys, miners, and even grandpa and the babies.

On the morning of the 20th, while we were just below Riggins, a plane droned high overhead, zoomed down upon us, practiced aerial acrobatics between the canyon walls, and went its way. It was the Washington National Guard plane again, with Hartnett and French in to photograph us from the air and deliver to us Spokane Sunday papers before late-rising citizens of that city were out of bed.

Riggins' motorists were out in force, following our progress, or darting ahead to vantage sites overlooking the rapids, here almost devoid of thrills.

From Riggins to White Bird, a distance of 33 miles, the river is paralleled by the Idaho North-South Highway. Throughout this stretch the canyon is generally more open and there are a number of ranches, placer mines, and even two intermediate settlements, Lucile and Freedom.

The surface of the older, more resistant rocks of the mountains was beginning to pass below the younger surface formed of the great plateau flows of lava, and these nearly horizontal flows were now visible, capping the hills high above us.

As we proceeded, the lava became more and more the dominant rock, sometimes forming the whole canyon. But at most places the river has cut through the flows and thus exposed the older rocks below.

THE RIVER MAKES A SUDDEN TURN

At Riggins, after maintaining a westerly course for many miles through the mountains, the river suddenly turns north and flows roughly parallel to the Snake River a few miles to the west. Apparently a block of the earth's crust roughly coextensive with the area between the two great rivers has been uplifted across what otherwise would have been the course of the Salmon, and thus forced the stream to flow north along the "fault zone" for more than 40 miles.

We passed several placer outfits working the bars along the river or the terraces above. New lumber of flumes, sluices,



Photograph by Washington National Guard

C. C. C. BOYS HEWED THIS ROAD FROM THE CANYON WALLS

The route crawls like a snake more than a vertical half mile up the south face of the Salmon River gorge near the mouth of French Creek, the stream at the right (page 118). Rancher York, who farms the small terrace above the creek, is reported to look up his stovepipe in the mornings to see where his horses have strayed during the night!

trestles, and shacks gave visible proof of the recent stimulus to gold mining.

At Freedom our Forest Service friends had left new beds and mattresses for us at a C.C.C. camp, now deserted for others deeper in the hills. At dark, thinly covered boulders in a small but difficult rapid proved too much for our heavily laden craft and we came to a grinding stop only a few feet from shore. A group of onlookers soon pulled us free, letting go our rope just in time to avoid dragging us upon some new Scylla after we had escaped Charybdis.

While we huddled under our kitchen tent at breakfast the next morning, Forest Supervisor Roy Phillips arrived to escort us

over the top to Florence and Adams Ranger Station.

Tire chains enabled us to proceed through a blinding snowstorm to Slate Point Look-out Station, about 6,000 feet above the Salmon. A small herd of cattle, pitiful in the snow, was congregated around the look-out, and inside the cabin we found some cattlemen on their way from the high range down into a more equable climate.

At any season of the year the Florence country has a weird, eerie appearance. It is an extensive flat, bounded abruptly on the south by the Salmon River Canyon, and on the east and west by mountain ridges. Quiet streams meander through

swampy peat bogs screened by symmetrical spruces. The tempo of life is slowed, with a resultant calmness, aided perhaps by the quiet beauty of the enveloping shadowy forest.

At length we reached Jack Hardin's cabin at Florence, and stamped gratefully toward its sheltering warmth to be met, not by jovial prospector Jack and his motherly Scottish wife, but by the comely young daughter of another miner. The Hardins had gone to Lewiston for winter supplies.

On our way to the site of the original town of Florence, we stopped for a moment at the deserted hotel which, with two or three old cabins, still marks the "New Florence" of the naughty nineties.

Of the "Old Florence" of Cherokee Bob nothing remains (page 134). The very ground on which it stood has been sluiced for the gold for which the early comers lived and died.

HARDSHIPS OF EARLY DAYS

The blizzard recalled tales of Florence's terrible first winter of hardship and privation, as told by Bancroft. Discovered accidentally by a party of nine men in September, 1861, the fabulously rich district had, in spite of impending winter, attracted 1,000 miners by November, thus leaving its predecessors, Pierce and Elk City, almost deserted.

That winter the snow was as much as ten feet deep and by January there was nothing to eat for sale in the camp except a little flour at \$2 per pound. For weeks men kept body and soul together with bread and snow water, or tea made from fir needles.

Not until May could pack trains get within ten miles of Florence. From there supplies were back-packed at forty cents a pound "and the starving were glad to perform this labor for wages."

We came to the old Florence cemetery, on a few of whose wooden headstones the painted letters rise in relief above the unpainted portions, nibbled away by time.

Here hard-working miners lie side by side with desperadoes, dance hall girls, claim jumpers, and the rest. Slightly deeper pits, now empty, mark the temporary resting places of oriental miners, whose remains have long since been sent back to China.

The low, earth-covered cabin of Albert Adley stands in Pioneer Gulch, once most productive. Adley is successfully "go-phering" out small rich stringers exposed

in the granite bedrock of old placer diggings. He trundles his rock by wheelbarrow several hundred yards to the creek, where he feeds it by hand through a small home-made mill constructed from an old boiler shell, with a few pieces of discarded steel shafting as a grinding medium.

Within a short distance of Adley's cabin are the new "digs" of Bill Pape, former officer of the Imperial German Navy, who saw service on the Kaiser's yacht before the World War and on a submarine during it.

Before we reached the Adams camp, headquarters of Ranger McConnell, the clouds broke a little and we were able to look out over the country through which we had just come.

We invaded the Adams "hotel," only to acknowledge defeat at the heavily laden table of Mr. and Mrs. John Wilson. Our quarters, that cold night, were in two ancient but still comfortable log cabins.

The road to Freedom led down through the beauty of snow-ermined forest under a sky with touches of blue—winter caught lovingly in the arms of conifers.

A low rock overlooking a flat terrace below Freedom was pointed out to us as the spot from which Chief Joseph harangued his warriors just before the Nez Percé Indian war (page 96). Vic Peterson, of Grangeville, an enthusiastic friend of the expedition, rode with us on the barge, and Al Wagner abandoned car for scow.

From the mouth of Whitebird Creek we were taken as guests of the Grangeville Commercial Club to Grangeville, where hospitality crowded the best hotel and speeches truthfully began, "Unaccustomed as I am."

A COUNTY LARGER THAN NEW JERSEY

Jack Cunningham thus visited his county seat for the first time. This is easier to understand when one learns that Idaho County not only reaches all the way across the State from the Bitterroots to the Snake, but is more than 1,000 square miles larger than the land surface of New Jersey. For every Idaho County inhabitant the eastern State has 400.

At the scene of the White Bird battle of the Nez Percé war, monuments to both soldiers and braves stand within a mile of each other. The road cuts beds of soft rocks containing the abundant fossil remains of a forest long extinct (page 101).

Below White Bird we entered the little



THE BACK YARDS OF WARREN ARE DEMOLISHED BY "MICKEY MOUSE"

This dredge handles about 3,000 cubic yards of gravel a day. Power for it, the Unity Mine, another dredge, and the town itself, comes from a hydroelectric plant on the South Fork of the Salmon several miles away. The machine is making a good "cleanup" from gravel that lay too low to be worked in the old boom days. At the right are the buildings of the U. S. Forest Service Ranger Station.

known but more thrilling lower canyon. The depth and ruggedness of the gorge have rendered it comparatively inaccessible, although much of the plateau country on top belongs in the famous northwest wheat belt. For the most part, the lower canyon is wider at the top and not so deep as the upper canyon.

A characteristic feature of the lower gorge is its steplike appearance, the result of erosional control by the lava flows, contrasting sharply with the jagged, rounded, or irregular walls and spurs upstream.

A few miles below White Bird the bottom few hundred feet of the canyon walls have been cut in a hard, dense, green rock, called greenstone, underlying the lavas. The greenstone is traversed by several sets of joints and one of them, about parallel to the river, is nearly vertical.

This set makes the lower walls steep and smooth. Although the river is generally narrow, deep, and quiet between them, the rock faces, on which the flood waters had left their record high above our heads, are so precipitous that there were but few

places where we could tie up or go ashore.

This stretch, the Green Canyon, is notable for its long, straight reaches of polished water reflecting green cliffs and cloud-studded blue sky.

The Green Canyon ends at Pine Bar Rapids, one of the worst in the river. At the foot of a steep, rocky slope we saw the crumpled body of a cow. High above, others placidly grazed their way around the cliff face.

A PRECARIOUS GANGPLANK

At dusk we approached Rice Creek where a narrow, rough road from Cottonwood bridges the river on its way to the Joseph Plains, between the Salmon and the Snake.

Although we chose the deepest channel, we rode high on a buried rock and stuck. The water was too deep and swift for us to wade to shore. It was too far to jump. Unshipping the rear sweep, we let the rushing current carry one end aground. On this unstable gangplank some of us did a tight-rope walk.

Our old device of the rope and a lever



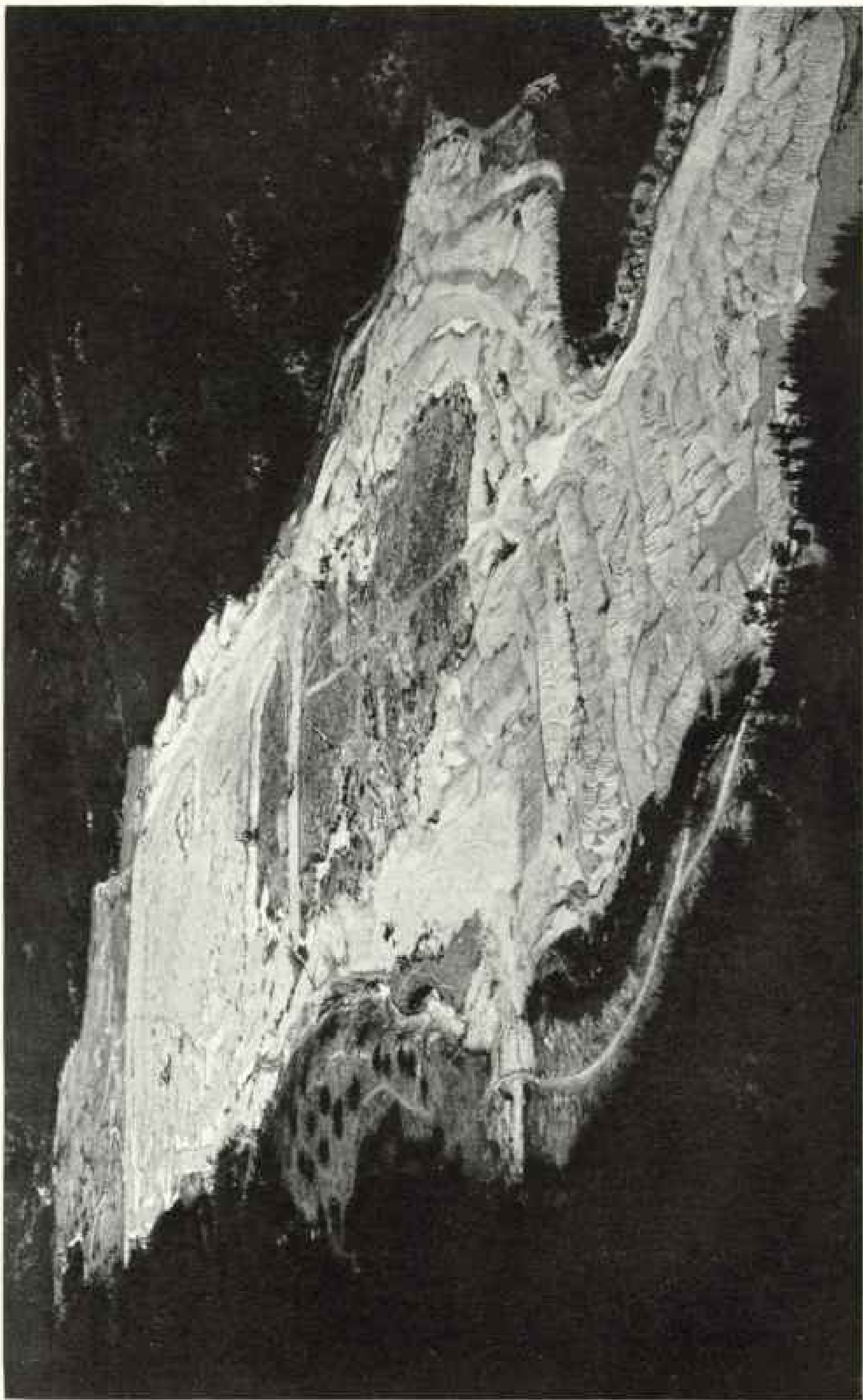
YOUTH FINDS ROMANCE AND REALITY IN GOLD DIGGING

Passing down the Salmon, the expedition met several young placer miners who were trying their luck on the river banks. This couple has stopped prospecting long enough to accompany the *National Geographic Society* from Long Tom Rapids to the mouth of the Middle Fork.



A NEW GENERATION AND A RELIC OF AN OLDER ONE

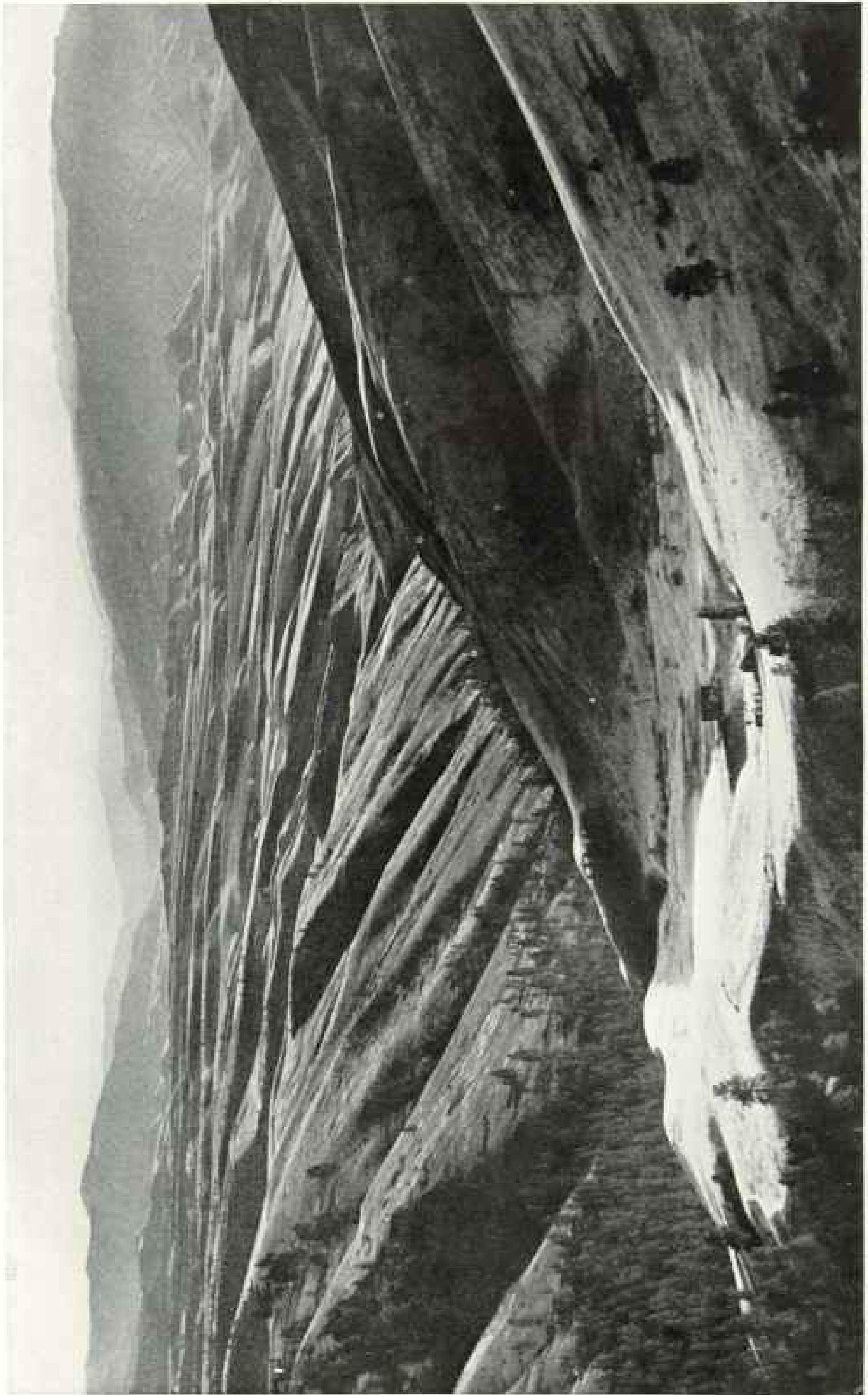
The dredge "Mickey Mouse" unearthed this beaten-iron pike from tailings left by miners more than 60 years ago. Musket balls and hand-made nails are common. Around Chinese cabin ruins are found rice-whiskey flasks and copper opium boxes (page 125).



Photograph by Washington National Guard

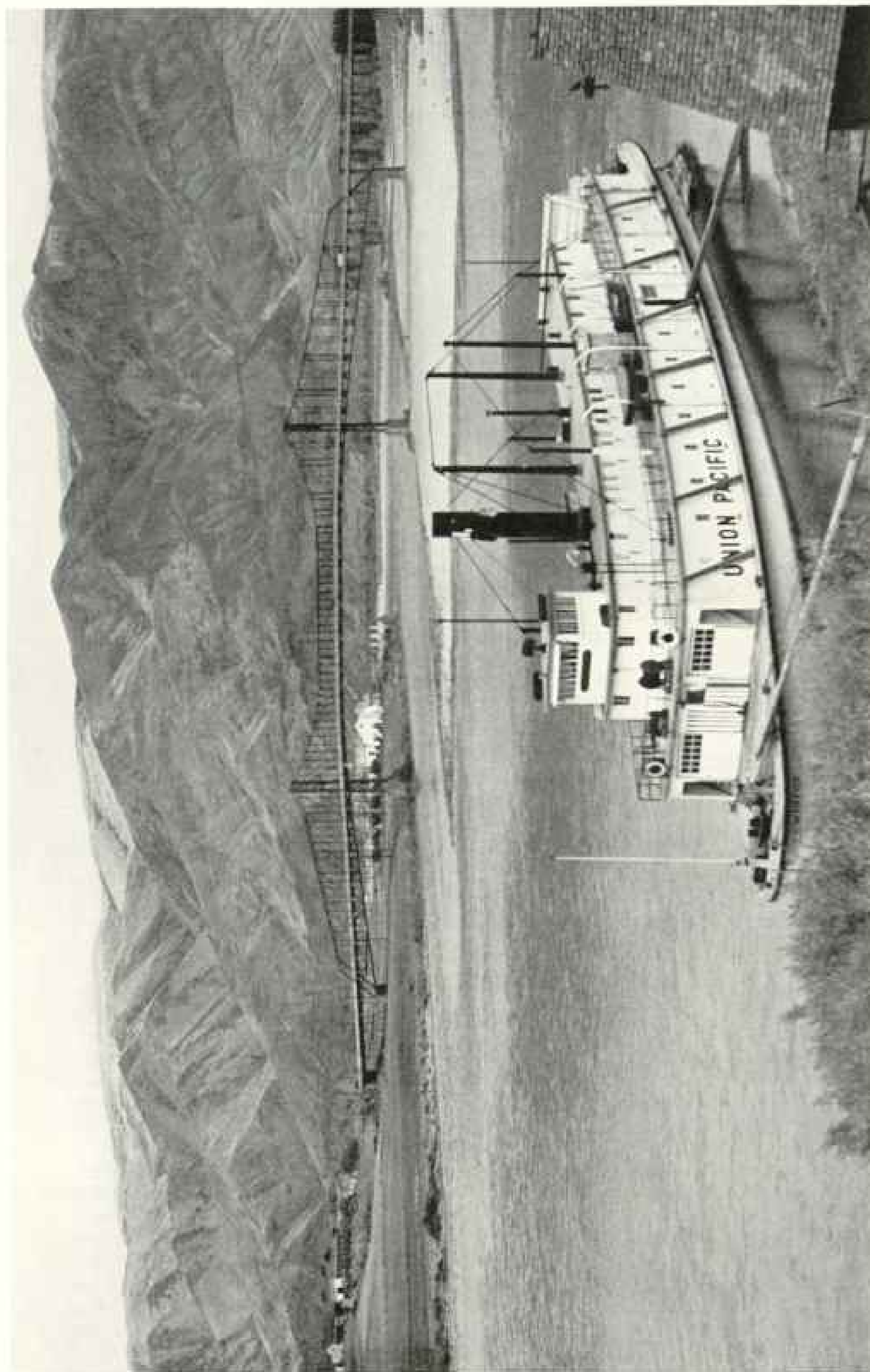
TAILINGS ARE PILED LIKE FANTASTIC FROSTING ON A CHOCOLATE CAKE

In the early placer days miners worked with shovel and sluice box or rocker. Today three huge dredges chew into the valley floors near Warren, spewing out boulders in uneven windrows. The one operating in the background, after working the ground in the center of the picture, will skirt the side of the basin, mining as it goes, to reach the far end of the valley, now used as an airplane field.



A "DRY RANCHER" FINDS ROOM FOR HIS BUILDINGS ON THE FLAT UPPER SURFACE OF A LANDSLIDE

A few years ago the North-South Highway, from which this view was taken, was displaced about six feet when more than a square mile of earth slid down the slope. Such avalanches are constant hazards to plow and irrigation ditches. The open mesa country beyond is grazing land adjacent to the Nezperce National Forest.



AT "JOURNEY'S END" AN INTERSTATE BRIDGE CONNECTS THE TWIN TOWNS NAMED FOR LEWIS AND CLARK

The steamer *Lewiston* hauls grain on the Snake River to and from the shipping points shared by Lewiston, Idaho, and Charleston, Washington (left). Here it is moored to the Idaho bank, near where the stream is joined by its tributary, the Clearwater. In 1825 Lewis and Clark reached this river junction. The huge white "C" on the mountain to the right was built of painted rocks by students of Clarkston High School (page 156).



CHEROKEE BOB DIED OF "LEAD POISONING"

His Christian name was Henry Talbotte and he came from Georgia. "Bob" tried to make the local gentry recognize his low-caste "gal" Cynthia, but the resulting quixotic battle ended in his being shot. Even to the placer miner, a burial place is sacred ground. Although this grave is at the head of one of Florence's richest gulches, the soil has not been washed for gold.

pole was without immediate success, principally because we pried loose huge boulders instead of moving the boat. But after a half hour's labor the boat was again free.

Rice Creek was our first camp without good fresh water, thus marking the transition from the mountains, where clear streams abound, and the more arid plateau country. Below Rice Creek we used boiled river water.

It was late on the 25th before the sun rose high enough to warm the huddled group on the scow and make a camera more than a burden. Our course now lay through lava that extended to the water's edge. Its pillarlike columnar jointing is similar to that of the Giant's Causeway in far-away Ireland. Locally the jointing radiates in huge rosettes as much as 50 feet in diameter.

At the treacherous Snow Hole Rapids, about 63 miles below Riggins, the whole volume of the river is concentrated in a narrow stream that roars and foams between angular blocks of rock rising 20 feet or more above the water. No choice of channels was offered and there was no chance of simply hanging up on rocks until

the boat could be pulled free. Obviously we would either rush through without a scratch or the boat would be demolished.

Slowly the scow eased toward the brink, became caught in the now swift but still smooth current, and then was hurled bodily into the churning, foaming wildness of the Snow Hole. Through the spray we could see the sharp edges of the cold, wet rocks as they appeared to grasp for our frail craft, and some missed by inches only. In a few moments it was over and the boat was flung out into a quiet, sunny, foam-flecked pool.

Sixty-eight miles below Riggins, as the low-hanging sun began to throw chill shadows across the stream, we tore through China Rapids, deadly at high water but comparatively easy at this low stage.

Beds were made as Dave started supper, and Captain Hancock soon had a roaring campfire on the beach near Billie Creek. As we gratefully crowded around its warmth we were visited by a local prospector and his wife. The soft-spoken, intelligent conversation of the girl led Williams to ask the name of her college. To our surprise she was not a graduate but, like a majority of



JUST BELOW RIGGINS FRESH NEWS DROPPED FROM THE SKIES

Chard and Shenon became absorbed in the Sunday papers brought by plane from Spokane, while Congressman Clark meditated.

these hardy and independent people, was intensely interested in affairs of State and Nation and extremely well read.

PROSPECTORS INVADE THE BANKS

The number of prospectors along the river had been a never-ending source of surprise to us. We more or less expected them along the bars in the upper canyon, but were not prepared for the tents, sluice boxes, small pumps, tailings piles, and other evidence of their current activity seen every mile or so all the way to the Snake.

With the sun behind us, we started early on the 26th. The current was generally swift, there were many small rapids, and we made good time through a most picturesque part of the canyon.

Occasionally bits of trail could be seen and at one place three youngsters raced us on a galloping horse, finally waving their arms in friendly defeat as they were swallowed in a cloud of dust.

Near the mouth of Flynn Creek greenstone again displaces lava in the lower walls and the sides steepen to form some of the most rugged canyon we had yet seen. This, the much-feared Blue Canyon, extends all the way to Snake River. Since the river

had constantly been increasing in volume, we fairly tore through the Blue Canyon.

About noon the high rock wall of the Oregon shore appeared dead ahead and we were whirled out into the Snake, 86½ miles below Riggins and 260 miles from Salmon.

In the narrower places along the Snake we observed high sandbars and huge tree trunks lodged along the cliffs high above the river. These indicate the tremendous seasonal variation caused by increased flow when the snow on the mountains melts.

That evening we camped in Oregon, only 38 miles above Lewiston. We were visited by Mr. J. L. Chapman, who next day showed us some of the many Indian paintings and caves along the Snake River.

The scow cast off early next morning and made no stop until it reached the small store and several cottages that make up Rogersburg, Washington, at the mouth of the Grande Ronde River, on one of whose tributaries gold was found in the fifties.

After a brief tie-up all haste was made to Asotin, only seven miles above Lewiston. Representative Clark had long since developed into a crack oarsman, and in spite of a head wind we put more than 30 miles of river behind us that day.

The next morning a cold wind was blowing. Winter, long at our heels, was ready to empty its snows on our heads. Below Asotin, Hartnett and French dipped their wings in our first welcoming salute.

Soon a huge white "C," built of painted rocks by the students of the Clarkston High School, appeared through the mist, and about ten o'clock we anchored at Lewiston's bathing beach within sight of the interstate bridge that spans the Snake between the twin cities named for Lewis and Clark (page 133).

With mingled regret and anticipation of warm rooms and hot baths, we carried our duffel ashore. A grand trip was over.

SCIENTIFIC SECRETS DISCLOSED

A voyage rich in adventure lay behind us and we had learned much of scientific and economic value. The canyon, cutting deep down into the huge Idaho Batholith, had shown us the inside of this vast granite mass as easily as one might cut a cake to learn what lay under its frosting (p. 105).

Measuring 240 miles by 70, this huge body of granite is one of the largest of its kind in the world. Pushed up as molten rock from deep in the earth many million years ago, it holds important clues to the manner in which valuable minerals are formed.

Contrary to expectations, we found there is no sharp dividing line between the granite mass and the rocks that enclose it. The surrounding rocks were "soaked" with molten granite for a distance of several miles when the batholith first pushed upward into the earth's outer crust, as a pie filling may soak into the enclosing pastry.

Gold is the most important metal found in and near the Idaho Batholith; central Idaho now produces nearly \$3,000,000 worth a year. Gold veins are numerous near the top of the granite mass.

We sought to learn whether they penetrate deep into its interior as well. The voyage down the canyon showed us a cross section of the interior. But gold veins along the river were few.

What is the origin of gold and other minerals? Originally, it is believed, they came up toward the surface from deep in the earth in the form of hot solutions, later crystallizing into the ores we know. In parts of the Idaho Batholith streams of molten rock, or "dikes," have pushed up from below into fissures in the hardened

granite. The solutions that formed mineral deposits may have come up with the dikes, or soon afterwards.

On the voyage we studied many dikes and from them we learned more of how Nature caches her riches among the rocks.

West of the batholith, the canyon's deep cut showed us the "inside" of another kind of rock mass—lava—one of the largest and thickest lava masses on earth. About thirty million years ago this lava poured out of volcanic vents to cover western Idaho and most of Washington and Oregon east of the Cascade Range. It has formed the rich soil that makes possible the fertile wheat country of the Northwest.

Our voyage helped solve the problem of how the river cut the deep canyon across the grain of the hard masses of the granite batholith and its surrounding rocks. Once central Idaho was a flat surface close to sea level. Quiet streams flowed across it, probably from north to south. Then the plain was tilted toward the northwest and uplifted, and new streams cut energetically into the surface. As the uplift went on, the streams cut deeper, forming canyons. Today the streams are cutting the canyons ever deeper, but they have not cut downward as fast as the country has risen, for the upper river is still several thousand feet above its mouth.

At various heights on the canyon walls are terraces, marking the banks of the Salmon in former days when the uplift halted from time to time. On many of the terraces are old gravel banks laid down by the river in those distant ages, and in many of them gold is found today.

TRUSTY SCOW PRESERVED

Lewiston's hotel was crowded the night we arrived for a dinner given by the Lewiston Chamber of Commerce. The toastmaster, R. G. Bailey, had provided favors with the menu printed on Idaho white pine.

Captain Hancock presented to the State of Idaho the scow that had safely carried us through many hazards. Today it rests on the campus of the State Normal School in Lewiston, a specimen of the strange craft that conquered the Salmon but may soon disappear before the advance of the cross-state motor road. On it, side by side, are the banners of the National Geographic Society and the United States Geological Survey, co-sponsors of our thrilling trip down Idaho's "River of No Return."

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded forty-eight 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 which The Magazine can use, generous remuneration is made. Contributions should be accompanied by addressed return envelope and postage.

Immediately after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

The Society cooperated with Dr. William Beebe in a deep-sea exploration of undersea life off Bermuda, during which a world record depth of 3,028 feet was attained August 15, 1934, enabling observations of hitherto unknown submarine creatures.

The Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole, and contributed \$100,000 to Admiral Byrd's Antarctic Expeditions.

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.

The Society's notable expeditions to New Mexico 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 have solved secrets that have puzzled historians for three hundred years. The Society is sponsoring an archaeological survey of Venezuela.

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 an officially recognized altitude record of 72,495 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, which obtained results of extraordinary value.

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HEADQUARTERS: Transportation Building, Washington, D. C.



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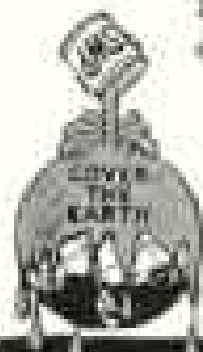
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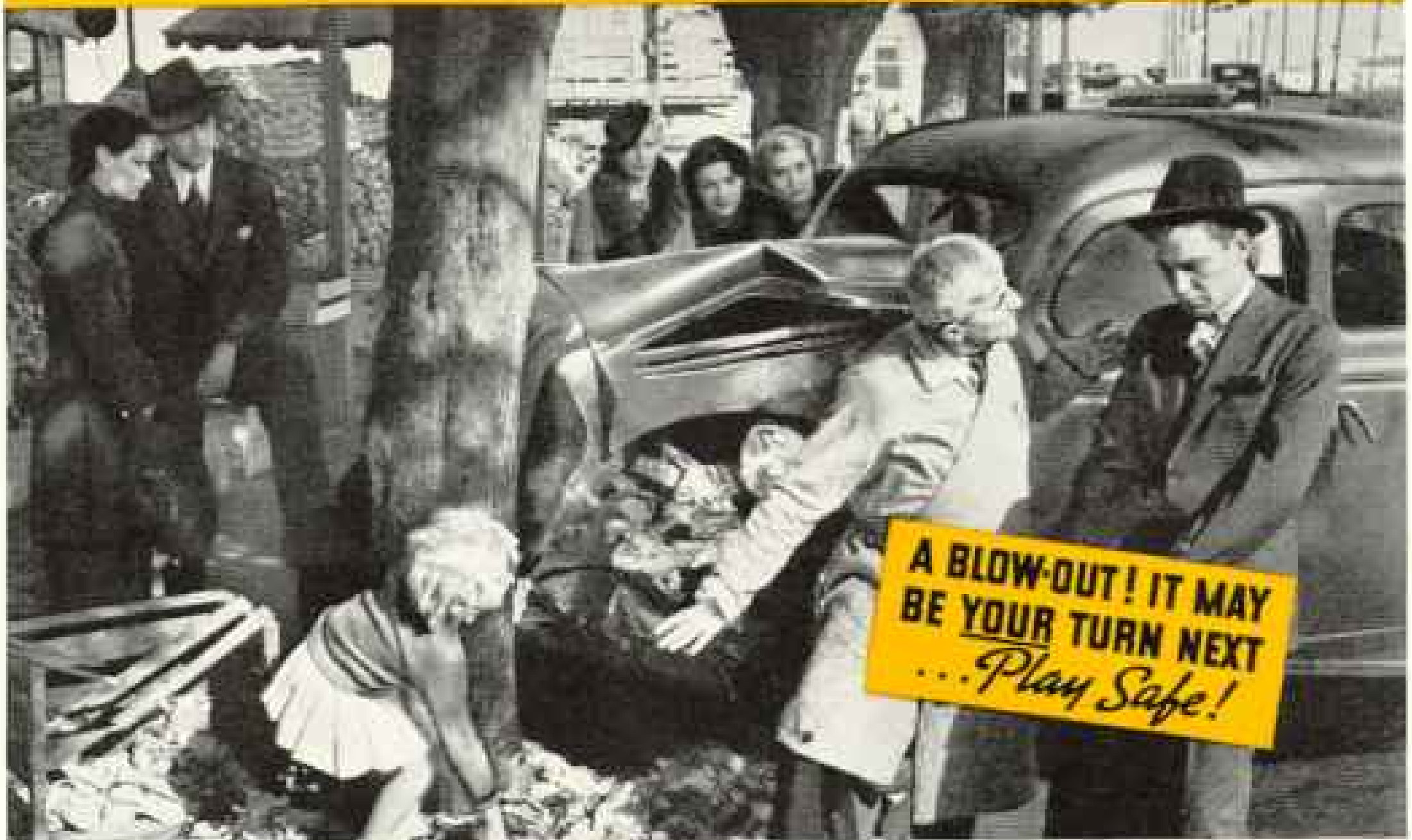
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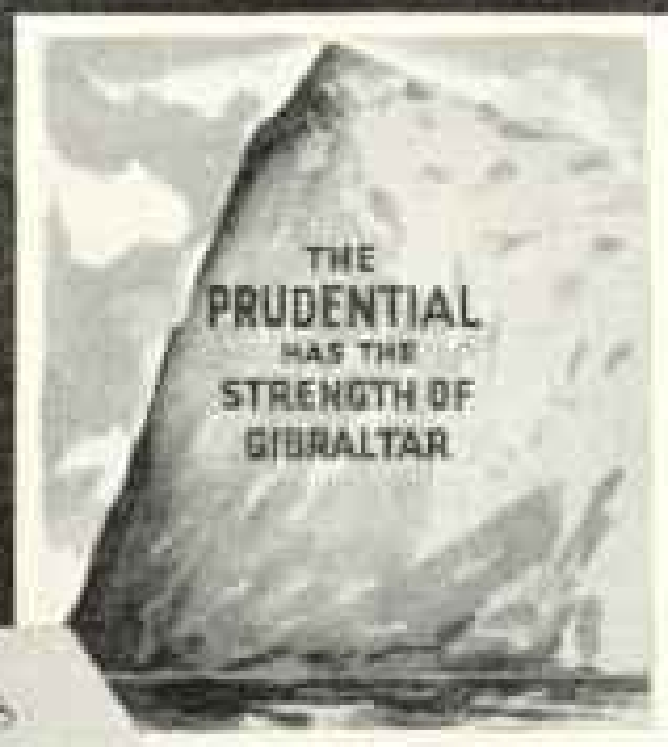
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"Not a light showed anywhere, only the cold, heaving sea, the dark, cloud-ridden sky and the icy gale that tore at me with the clammy claws of Death.

"There seemed little use of holding on any longer... when a searchlight from a distant boat cut through my despair! With all my strength I shouted for help. Finally, that bright finger of light pointed me out. If I could hang on just a few more minutes, I would be saved!

"Safe aboard my rescuer's boat, I said it was a good

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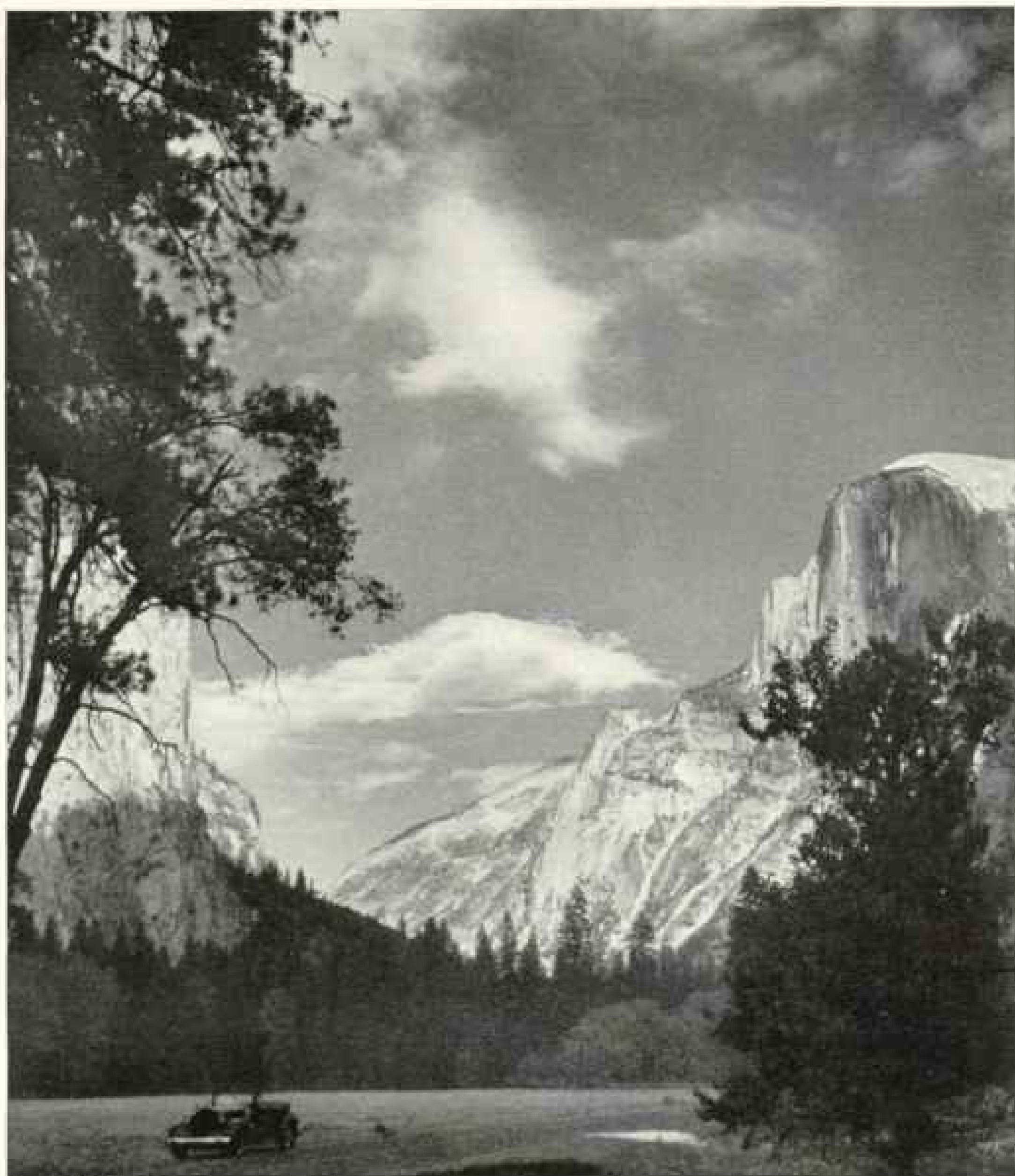
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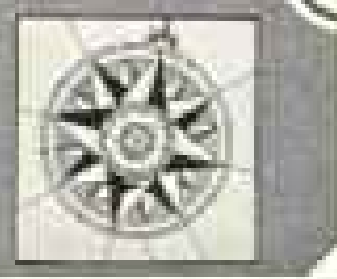
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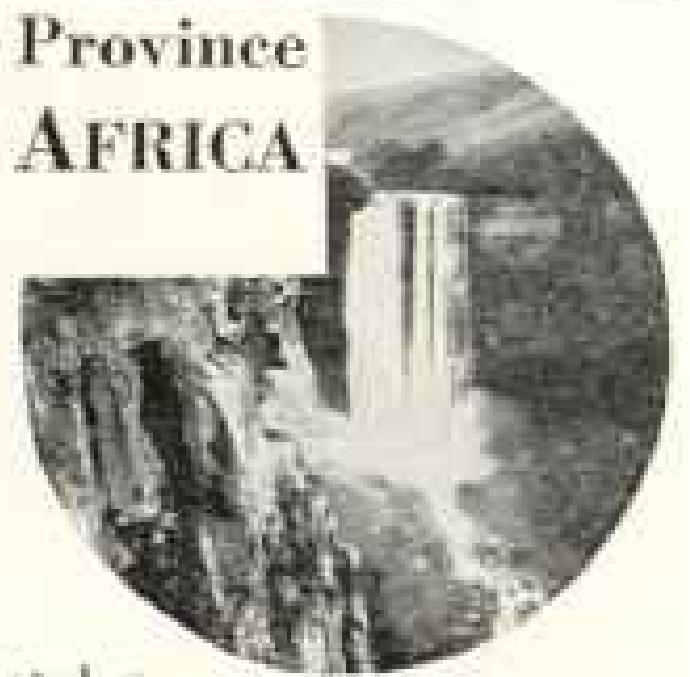
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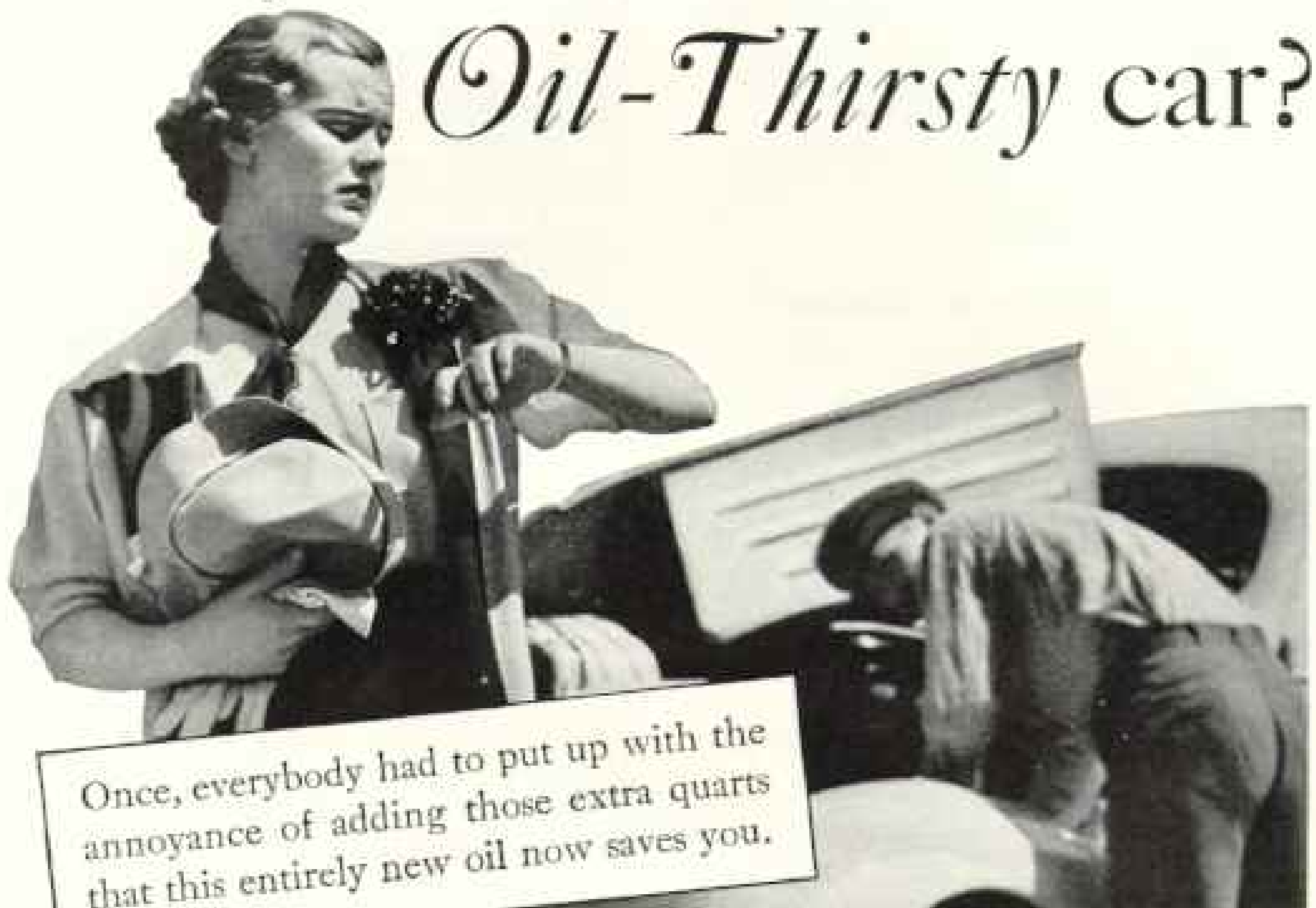
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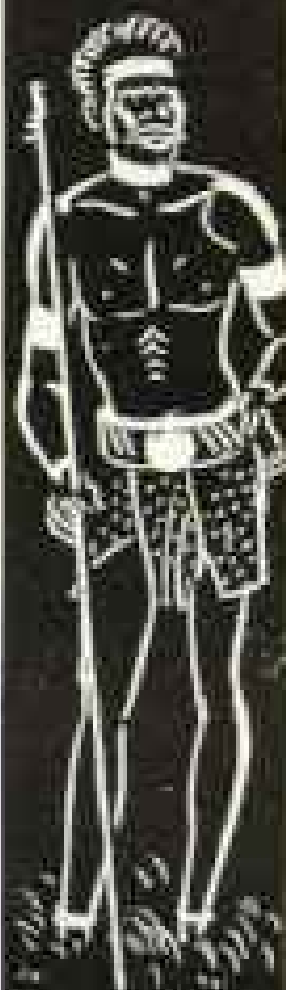
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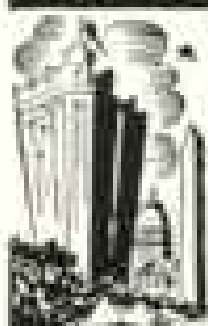
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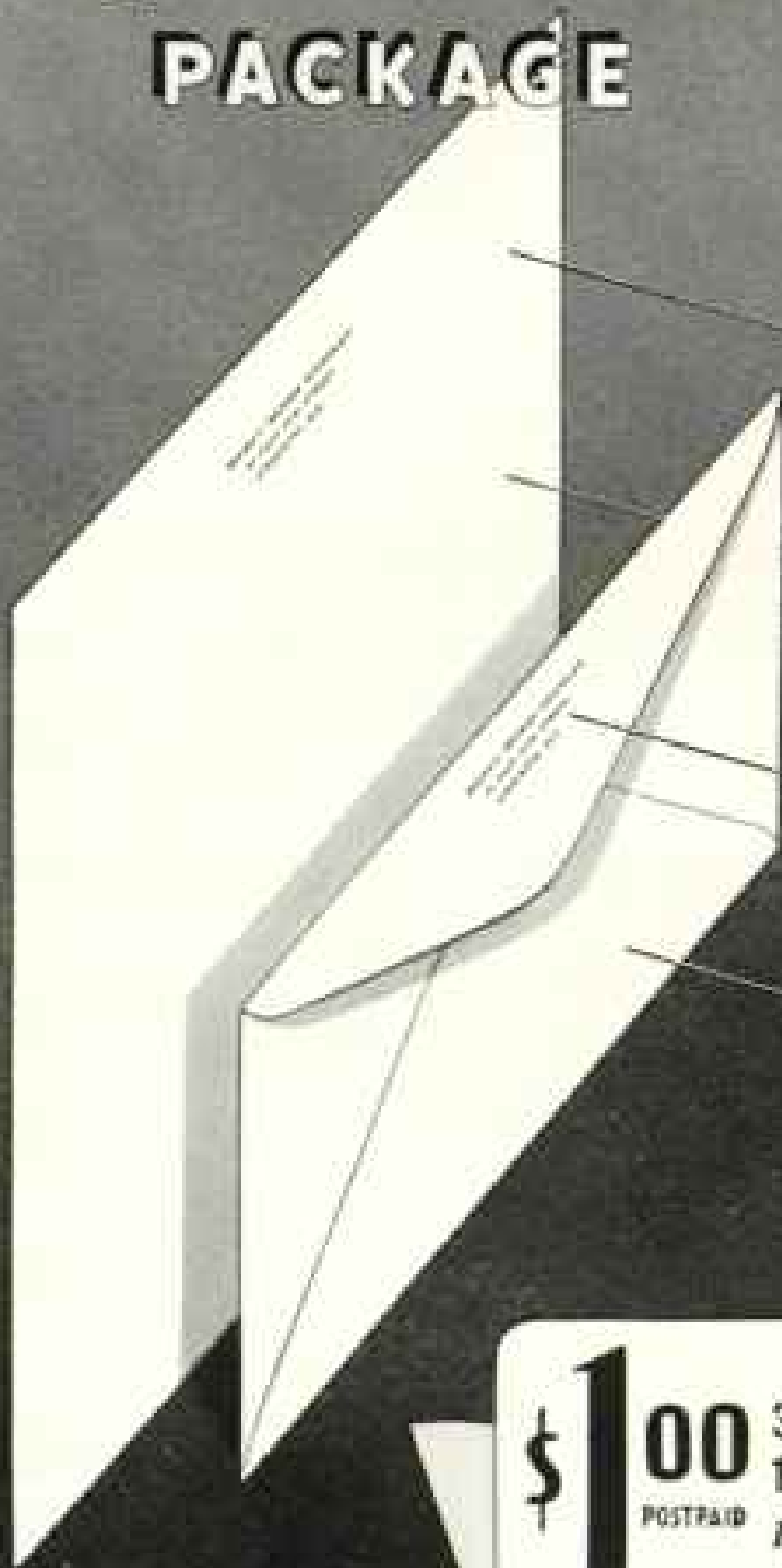
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*ALL HONOR
TO SHARP
PENCILS*

WHEN A MAN makes a revolutionary discovery which presents to industry a totally new common metal, he may be pardoned for visionary dreams of an easy path to fame and fortune.

Certainly this was the expectation of Charles Martin Hall, the 22-year old woodshed experimenter who, in 1886, discovered the commercial process whereby Aluminum could be produced economically.

But Hall and his venturesome backers of fifty years ago made little progress in creating an Aluminum industry until they grappled with the realities of the sharp pencils of commerce: the calculating pencil of the engineer, the challenging pencil of the architect and the designer, the close-figuring pencil of the purchasing agent.

It was because of the challenge of these sharp pencils, in the hands of customers and competitors, that the pioneer makers of Aluminum (originally the Pittsburgh Reduction Company, now Aluminum Company of America) eventually found themselves part of a thriving new industry.

The obligation of a business to its customers is obvious. But this business owes quite as great a debt to its competitors.

The keen competition offered by the many fabricators within the Aluminum industry has not

only stimulated our own efforts, but has also spread the gospel of Aluminum faster than any one organization could possibly have done.

To the producers of other basic materials and metals also belongs a generous measure of credit for the progress of the young industry. Their honest competition speeded the search for cheaper methods of Aluminum production and fabrication, and the development of new strong alloys. Their well-earned position in many fields has forced Aluminum to create new markets for itself, thus serving its own best interests as well as the general economic good.

After all, is there any real conflict between the basic metals and materials? Is not the actual conflict with natural forces — against gravity, in the matter of weight; against inertia as affecting mass-in-motion; against corrosion and harmful chemical action; against stresses and other created forces?

These natural forces the Aluminum industry regards as its real competition. In the fullness of time every basic material will find its own natural and intended place in the economic scheme of things.

Meanwhile, Aluminum asks to be looked upon as a friendly metal, ready to go to work in effective partnership with other metals and materials wherever and however the sharp pencils of commerce figure that human welfare can best be served.

A FIFTIETH ANNIVERSARY MESSAGE FROM

ALUMINUM COMPANY OF AMERICA