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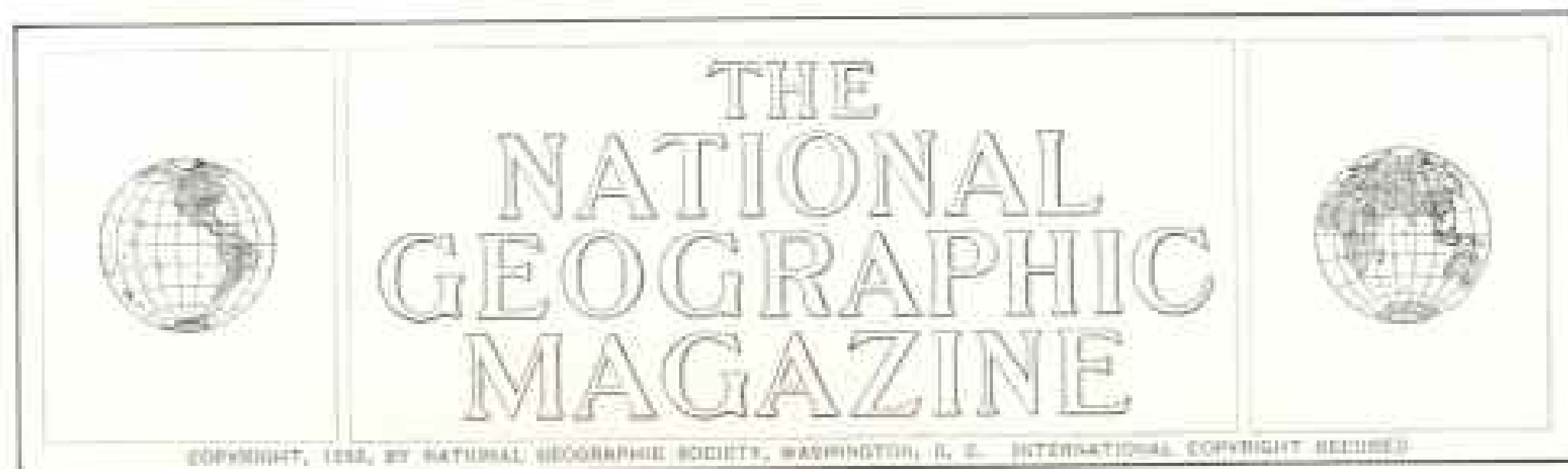
With 27 Illustrations R. M. LOCKLEY

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OUR SEARCH FOR THE LOST AVIATORS

An Arctic Area Larger Than Montana First Explored
in Hunt for Missing Russians

BY SIR HUBERT WILKINS

SOMEWHERE in the Arctic wastes, probably in the Arctic Ocean, lies the wreckage of an airplane in which, on August 12, 1937, six Russians led by Sigismund Levanevsky set out to fly across the North Pole from Moscow to Fairbanks, Alaska (page 147).

The plane never reached Fairbanks.

For seven months after the plane disappeared, searching parties from Russia, Siberia, Canada, and Alaska flew over the Arctic seeking the lost flyers. I had the honor of leading one of the searching expeditions, which operated north from Canada and Alaska (map, pages 144-5).

No trace of the missing machine or its crew has yet been found.

Our expedition, however, was not wholly in vain, for we flew over and explored 170,000 square miles of the Arctic Ocean, of which at least 150,000 square miles, an area larger than Montana, had never before been seen by human eyes (page 169).

As a result, we can safely conclude that there is no new land to be discovered in the Beaufort Sea and the area between longitudes 120° and 145° west and the North Pole. Much of the remainder of the area seen by us was visited in the winter season, a time of year during which it never had been seen before; therefore our flights gave valuable information on winter conditions there.

We flew a total distance of 44,000 miles, made the first winter flights by moonlight ever undertaken in the Arctic, and gained

experience which I believe will greatly increase the usefulness of airplanes in the Arctic during the months of winter.

Levanevsky's ill-fated flight followed the brilliant success of two single-engined airplane flights from Moscow to the United States earlier in 1937. He had a four-engined plane, and with his improved equipment success seemed assured.

He had passed the North Pole and was some 300 miles on the Alaskan side when his last authentic message was received:

"Message No. 19. Motor 34. Flying heavily against 100-kilometer wind, losing altitude from 6,000 meters to 4,300 meters."

Then followed a jumble of signals which only one of the stations listening in interpreted as "48—3400," which when decoded means "We are going to land in . . ."

The message was not complete. We do not know if it meant that he was going to land in a few minutes, in a few hours, or in the water. "Motor 34" decoded meant trouble with that motor, but what the trouble was we do not know.

A CLUE FROM ESKIMOS

On the basis of that message Professor Otto Y. Schmidt, in charge of the Northern Sea Route Administration of the U. S. S. R., directed the search to an area along the line of 148° west longitude and between the Alaskan coast and the North Pole.

The search was begun at once. One pilot of the Mackenzie Air Service started a flight along the Alaskan coast on August

14, landing and questioning every group of Eskimos he saw. Only one group, on Barter Island, off Alaska, reported a clue (151).

These Eskimos, busy butchering reindeer for the fall food supply, had heard what they thought to be the roar of an outboard motor. They could see no sign of a boat, however, and as the noise lasted only a few minutes, they resumed their butchering. On the basis of this report, several American and Russian flyers searched the Alaskan mountains from the air, but without result.

On August 15, I was asked by Counselor Constantine A. Oumansky, then *Chargé d'Affaires* of the Soviet Embassy in Washington, to assist in the search.

In my opinion, August is the least favorable month to fly in the Arctic, especially in a plane fitted with wheels, as was Levanevsky's. At that time of year the Arctic floe ice is much broken. The summer rains have melted the ice surface and deep gutters have been cut in the ice, making it treacherous for any landing on wheels (pages 148 and 153).

There was, in my opinion, only one type of machine suitable for the search—a long-range flying boat. We discovered that such a boat, a Consolidated PBY type, with twin engines, recently had been fitted out by Mr. Richard Archbold for an expedition to New Guinea. Arrangements were made between Mr. Archbold and the Soviet Embassy for me to take over that machine (page 151).

Two of my companions on Antarctic expeditions, Air Commodore Herbert Hollick-Kenyon* of Toronto, and Silas Alward Cheesman of Port Arthur, Ontario, immediately responded to my invitation to join me as pilots, and by August 17 we were flying northward to take part in the search. The two other members of our crew were Gerald D. Brown, engineer, and Raymond E. Booth, radio operator (page 147). I acted as navigator.

NAVIGATED WITH NATIONAL GEOGRAPHIC SOCIETY'S MAP OF CANADA

Crossing the bleak wastes of northern Canada, we flew over the little-known country toward the mouth of the Coppermine River, which empties into Coronation Gulf

* Air Commodore Hollick-Kenyon was the pilot for Lincoln Ellsworth on his flight across the Antarctic Continent in 1935. See "My Flight Across Antarctica," by Lincoln Ellsworth, NATIONAL GEOGRAPHIC MAGAZINE, July, 1936.

on the Arctic Ocean (page 149). It is low and rugged and profusely studded with crystal-clear lakes. In fact, more than half the area, it appeared from the air, was covered by water. The spruce is the most northerly tree growth of this region.

On this flight northward I navigated with the aid of the National Geographic Society's Map of Canada, published in June, 1936.

Toward evening, which comes at about nine o'clock at that latitude in that season, the clouds settled close to the ground. As we were nearing the mountains which fringe the east side of the Coppermine River at its northern end, we decided to alight on a lake.

FISH, AND A CARIBOU

We anchored the plane near shore. Trout and salmon were rising and as soon as the machine came to rest the lake surface was quivering with fish-made rings. After a hasty supper on board, the men sought sleep, but I set myself to keep watch, for it seemed possible that the wind would rise and we were not sure of our anchorage.

In the early dawn I noticed what seemed to me a pair of scraggly dead tree branches, silhouetted against the sky. In a moment they moved and a lone caribou came over the hill, wandered down to the water's edge, and calmly surveyed our plane. Here might have been a chance for a splendid dinner for us, but we were in a game reserve and the caribou went on, unmolested (p. 154).

At full daylight we took off, cooked our breakfast of ham and eggs over a primus stove in the rear cabin of the plane, while in flight, and after flying several hours above and below the clouds we reached the village of Coppermine.

Coppermine is a Hudson's Bay Company post, about 90 miles north of the Arctic Circle. Here are located a post office, a detachment of Royal Canadian Mounted Police, a Canadian Government radio station, missions, and about half a dozen houses occupied by Eskimos.

Three small schooners lay at anchor near shore, and about half a mile from the village, on a small, high island, we could see the tents of several other Eskimo families. Red coats of the Mounties formed bright spots of color in the group assembled to greet us.

We landed in front of the village and were at once received with the open-hearted hospitality typical of the north. Among the men who greeted us was an old friend

of mine, Ole Andreason, a local trader, one of the men who accompanied Vilhjalmur Stefansson on his walk of about 600 miles over the drifting pack of the Beaufort Sea from Martin Point on the Alaskan coast to Banks Island in 1914 (page 158). There, too, were several of the Eskimos I had visited while in that neighborhood in 1915.

At that time these Eskimos had been living in a primitive state. I had found them on the island at Coppermine, which they occupied between the season for hunting seals on the ice and the spring fishing in the lakes on shore.

It was the Eskimo custom not to take any seal-hunting equipment onto the mainland, for fear of offending the land animals. And when they returned from hunting on the mainland, they would cache their land-hunting implements on the island before starting out over the sea ice for the winter so as not to offend the seals.

In those days the Eskimos still retained their ancient custom of propitiating the spirits of animals they killed. A dead seal was given a drink of fresh water, because they believed the only reason a seal allowed himself to be killed was because he was thirsty from having to live in salt water.

A polar bear would never allow himself to be killed, according to the Eskimos,



Photograph by Gerald Brown

SIR HUBERT WILKINS SNAPS A SCENE OF ICY DESOLATION

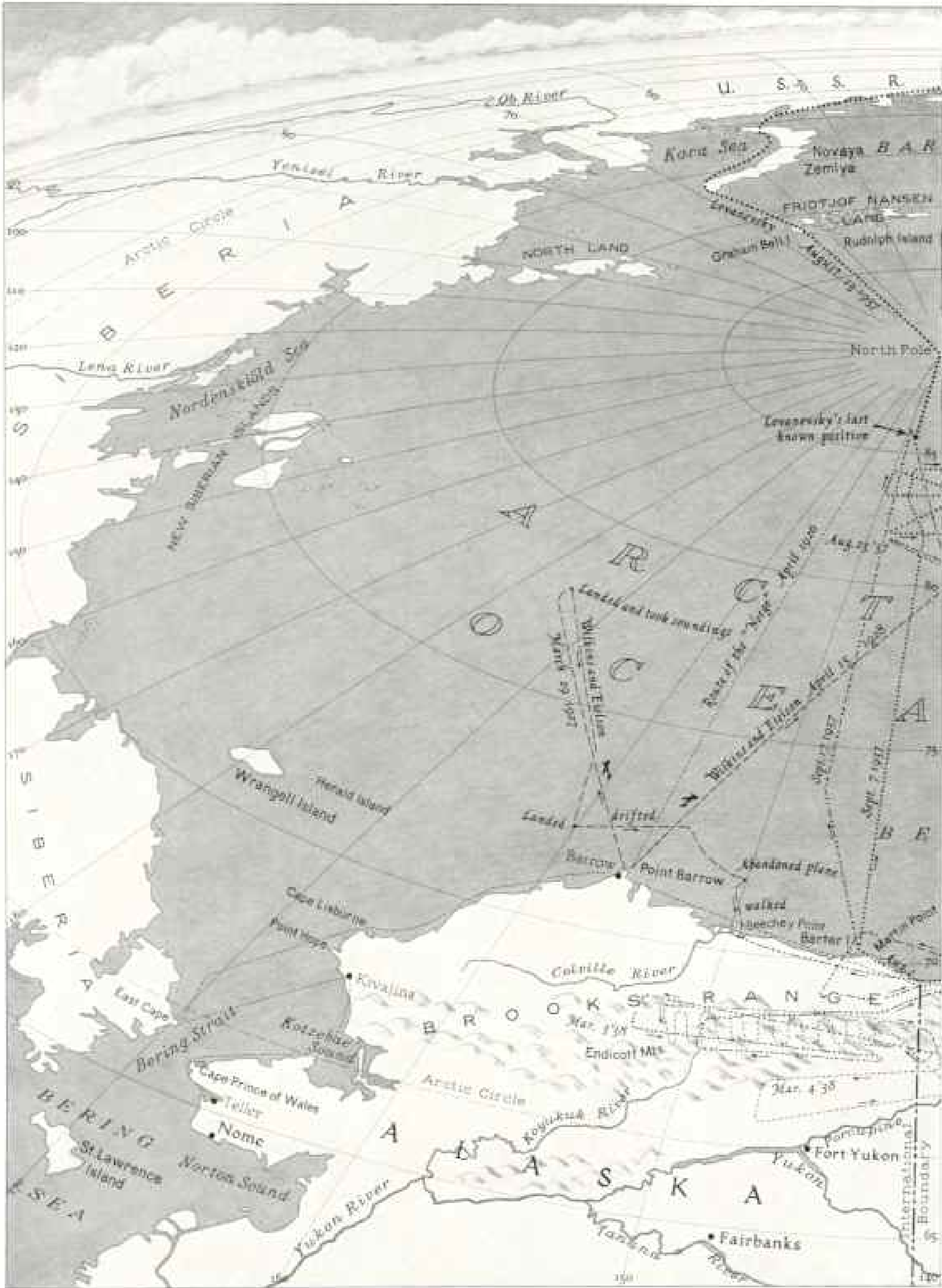
Standing in the aft cockpit of the all-metal flying boat used in the search for the missing Soviet flyers, the expedition's leader "pulls the trigger" of his camera and "shoots" a lonely expanse of the Arctic Ocean. Above appears the riveted main wing; behind is the tail with elevators dropped (page 157).

unless he thought the hunter would present him with a knife (page 170). But this belief did not prevent them from taking back the knife for their own use, for they explained that the spirit of the polar bear needed only the spirit of the knife.

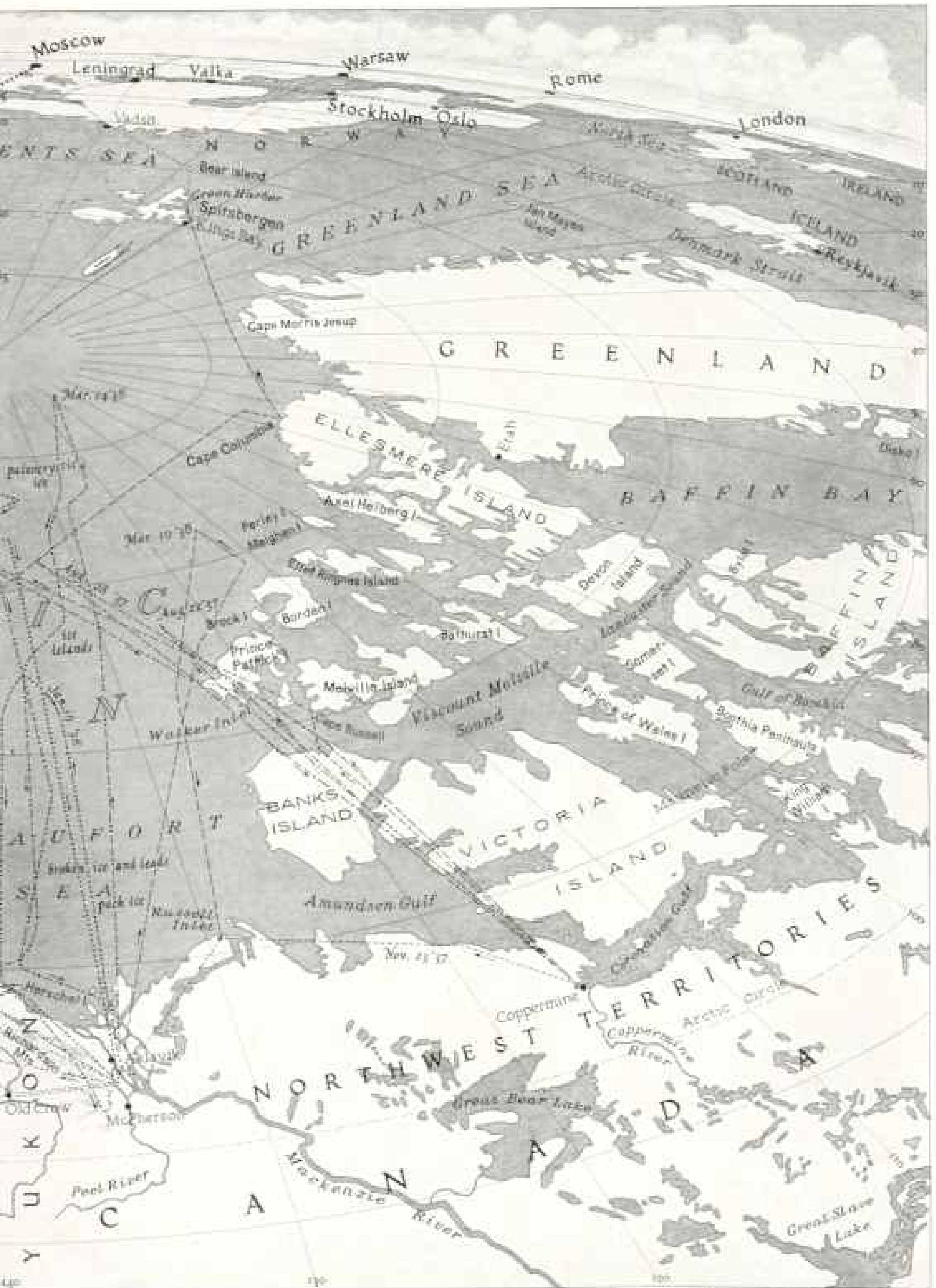
MAIL ORDERS DELIVERED BY PLANE

Today, however, the Eskimos are more or less civilized. They closely follow the prices of furs in the great world markets and order supplies from "outside" to be brought in by the regular monthly plane.

Coppermine was so named because of the

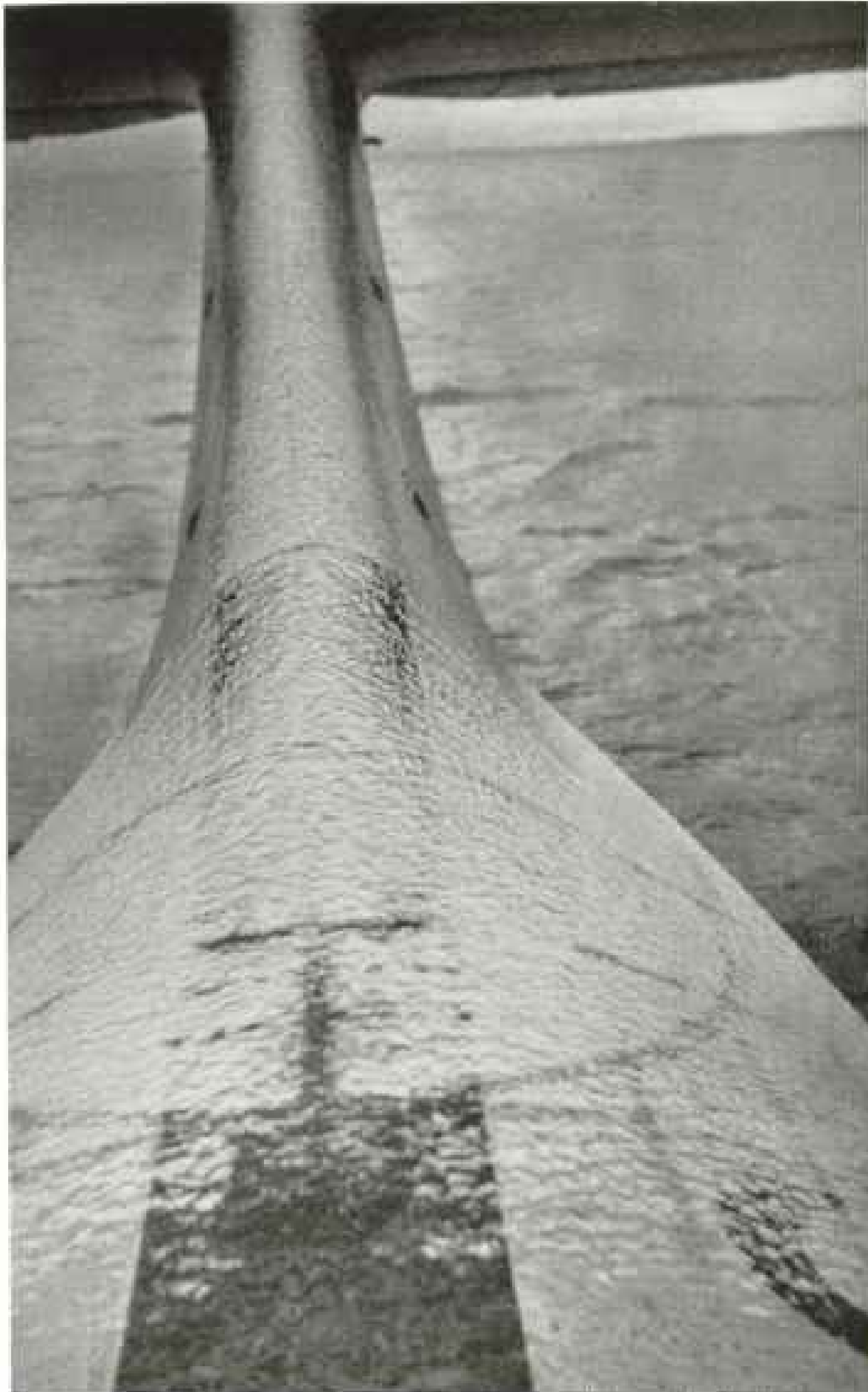


THE TOP OF THE WORLD IN PERSPECTIVE, SHOWING THE KNOWN ROUTE OF THE



Drawn by Albert H. Dumont

LOST SOVIET AVIATORS AND THE NETWORK OF SIR HUBERT WILKINS' SEARCH FLIGHTS



Photograph by Genah Brown

ICE ENCRUSTS THE FLYING BOAT'S BROAD WHALELIKE BACK

Sleet and salt-laden hoarfrost sometimes dangerously caked the heavily loaded plane. In wing tanks and reserve fuel drums the explorers carried enough gasoline for nonstop flights of two or three thousand miles. They found that in the early Arctic autumn air grows warmer, not colder, at high altitudes. Warm air rises in the Tropics, flows toward the poles, and then, cooling, drops to the surface and flows back toward the Equator.

large deposits of copper in the vicinity. Behind the village rise low, rolling hills, covered with dense vegetation. At the time of our arrival, the hills were sprinkled with many highly colored flowers, such as Arctic poppies, daisies, primroses, bluebells, and many flowering species of dwarfed saxi-

frage, bunches of mottled caribou moss, and heather blended with the moss and lichen-covered rocky surfaces.

We accepted the kind invitation of Mrs. Webster, the wife of the missionary, who, in spite of having to look after her few weeks' old baby, had prepared an excellent meal for the five members of our crew and for several of the white inhabitants as well.

We purchased some supplies from the Hudson's Bay Company, but the most treasured item I obtained was ten pounds of dried caribou meat, which Ole Andreasen brought to me from his scanty stock.

I have found that dried caribou meat is most satisfying for chewing on the trail. Some men prefer tobacco, but caribou meat is much more sustaining.

This meat was of course set aside for extreme emergency. In fact, we had no need to use it, and I now have it stored for use on our next expedition. It will keep indefinitely.

Some of us had fur clothes retained from our last expedition, and Ole Andreasen's Eskimo wife kindly

made fur garments for the others.

A NEW REASON FOR A HAPPY MARRIAGE

Ole was of much assistance and was highly pleased with his marital situation. He said, "This is the life for me. When I married my wife, she had three grown sons;



Photograph by Sir Hubert Wilkins

GASOLINE GURGLES FROM SPARE DRUMS TO SLAKE THE WINGED GIANT'S THIRST

At Cape Russell, Melville Island, extra fuel carried in the cabin is emptied into a wing tank to extend the flying boat's cruising range. Left to right: Ray Booth, radio operator; Gerald Brown, engineer; Pilot Herbert Hollick-Kenyon (who flew with Lincoln Ellsworth across the Antarctic Continent), and Al Cheesman, reserve pilot.



Photograph from Wide World

SOVIET FLYERS POSE WITH THEIR PLANE BEFORE START OF TRAGIC POLAR FLIGHT

Levanevsky and his five companions were 300 miles beyond the North Pole when their last radio message was heard, ending with the ominous words: "We are going to land in . . ." The flyers took off August 17, 1937, confident of their four-motored ship because of two previous successful flights from Moscow to the United States in single-engined airplanes. Lined up at the Moscow airport left to right are: Nikolai Galkovsky, Nikolai Kastanayer, Sigmund Levanevsky (leader), Grigory Pobozhimov, Nikolai Godovikov, and Victor Levchenko.



Photograph by Sir Hubert Wilkins

GRINDING, DRIFTING ICE AS FAR AS THE EYE CAN SEE—AND NO TRACE OF THE MISSING FLYERS

Floxy clouds partially hide the pack ice northwest of Priner Patrick Island. Although only about half the distance flown was in clear weather, close observation was possible over an Arctic area of 170,000 square miles, "of which at least 150,000 square miles, an area larger than Montana, had never before been seen by human eyes." Sir Hubert requested and obtained weather reports by radio from Fairbanks, Alaska. All countries bordering the Arctic Ocean contributed meteorological data. So accurate became the forecasts that the plane at times flew for hundreds of miles through clouds to find clear weather, as predicted, in the area to be searched (page 160).



© Royal Canadian Air Force

TOYLIKE HOUSES OF COPPERMINE HUDDLE IN A FRIENDLY CLUSTER ON THE SHORES OF CORONATION GULF

Sir Hubert Wilkins made his first base at this tiny village, just west of the mouth of the Coppermine River. Large deposits of copper are in the vicinity. Here, about 90 miles north of the Arctic Circle, are a Hudson's Bay Company post, barracks of the Royal Canadian Mounted Police, a post office and Government radio station, church missions, and about a half dozen Eskimo houses. From this isolated Canadian settlement, the search expedition made three northward flights, totaling about 7,000 miles, over Victoria Island, Banks Island, Prince Patrick Island, and the Arctic Ocean, reaching, on the second trip, latitude 82° north.

and they do the work." Ole is one of the oldest inhabitants of this area, and is generally looked upon as the unofficial "mayor" of the village.

The tanks of our machine carried 1,760 gallons of gasoline—enough for a 3,000-mile flight—but we decided to load ten extra drums of fuel in the cabin of the plane, giving us 500 miles additional range. By August 22, four days after we had acquired the machine in New York, we were ready to set out on our search over the Arctic area. We taxied out, but found an oil line leaking. The lower temperature had loosened all connections, and a complete checkup was necessary before we could take off.

The temperature at Coppermine was then a few degrees above freezing. At high altitudes, however, it grew warmer instead of colder. This was because air heated over the Tropics rises, flows toward the poles, then falls toward the surface again, where it is cooled and flows back toward the Equator.

A MIRACULOUS ESCAPE

When we started our first flight we had no means of knowing what the weather ahead of us was like. We climbed above the clouds which blanketed Melville and Banks Islands, and then ran into what perhaps was the most dangerous experience we had throughout our search.

Our Eskimo helpers had filled our spare gasoline drums right up to capacity. When we reached an altitude of 10,000 feet, the reduced air pressure enabled the gasoline to expand, and, coming back from the navigator's cockpit after two hours in the air, I found the cabin floor covered two inches deep with gasoline. It was really miraculous that it had not already caused an explosion.

Hastily closing the cabin doors, which shut off the pilot's and engineer's compartments, I sopped up the gasoline with old rags and strung them from the ventilators at the rear of the plane. After working for two hours I finally had the gasoline evaporated. It was a great relief when the floor was again dry.

We flew northwestward from Prince Patrick Island for 130 miles, but saw only a few patches of ice here and there. All else was blanketed in fog and cloud. The ice we saw was much broken, and the leads of open water were filled with fragments of ice. Landing by any type of plane would

have been dangerous. Mounting cloud banks finally forced us to return. We were out all night, but nights are not dark at that time of year.

During the flight we had called Levanevsky by radio every half hour, and listened for his signals 30 minutes of the hour, but heard no sound from him. We were frequently in touch with the *New York Times* radio station during this and subsequent flights.

The radio station at Coppermine kept a loud-speaker tuned on our wave length all the time we were in flight, so we could call them whenever we wished, sometimes when conditions were good on voice, but generally in code. We had the close attention and co-operation of the radio men at Coppermine. This aid, sincerely appreciated, continued with utmost fidelity throughout the whole of our operations in the north.

Our first flight over the ice lasted 13½ hours, and our average speed was above 135 miles an hour.

In the evening of the next day we set out again, and landed in open water near Cape Russell, on Melville Island, to transfer fuel from our spare drums to the wing tanks (page 147).

We continued on until we reached latitude 82° north and longitude 147° west.

At first I was asked to search only as far as 82° north, 148° west. The Soviet flyers, working from Rudolph Island on the Siberian side and from Point Barrow on the west, were to search other areas. Later I was asked to search as far north as 88° north and between longitude 90° and 153° west.

Soon after we turned back, Coppermine radioed that ceiling there was zero, so we landed at Walker Inlet, on the southeast side of Prince Patrick Island, to await clear weather. We had flown 15 hours.

MANV TRACKS, BUT NO GAME

Shortly after the anchor was down, I went ashore in our small, collapsible canvas boat to hunt. On these northern islands we expect to find caribou, fox, and wolf, as well as owls, ravens, and ptarmigan (page 171). Although I hunted for several hours, I saw no game.

I observed many tracks of caribou, fox, and wolf, however, and many families of little lemmings scampered out of their holes as I approached. On most of the hummocks were scattered bones and horns of



Photograph by Gerald Brown

IN FLIGHT, POWERFUL TWIN ENGINES BURNED 73 GALLONS OF GASOLINE AN HOUR

Steel fuel drums lie on the shore at Aklavik, Northwest Territories, where Sir Hubert Wilkins established his base for most of the autumn and winter flights. The navigator's cockpit below had a rotating top affording good visibility and a window near the water gave a good view downward. Windows of the pilot's compartment are above. The engines are twin-row Wasps of 1,000-horsepower each. The U. S. Navy has nearly 200 similar ships for use as long-range bombers.



Photograph by Sir Hubert Wilkins

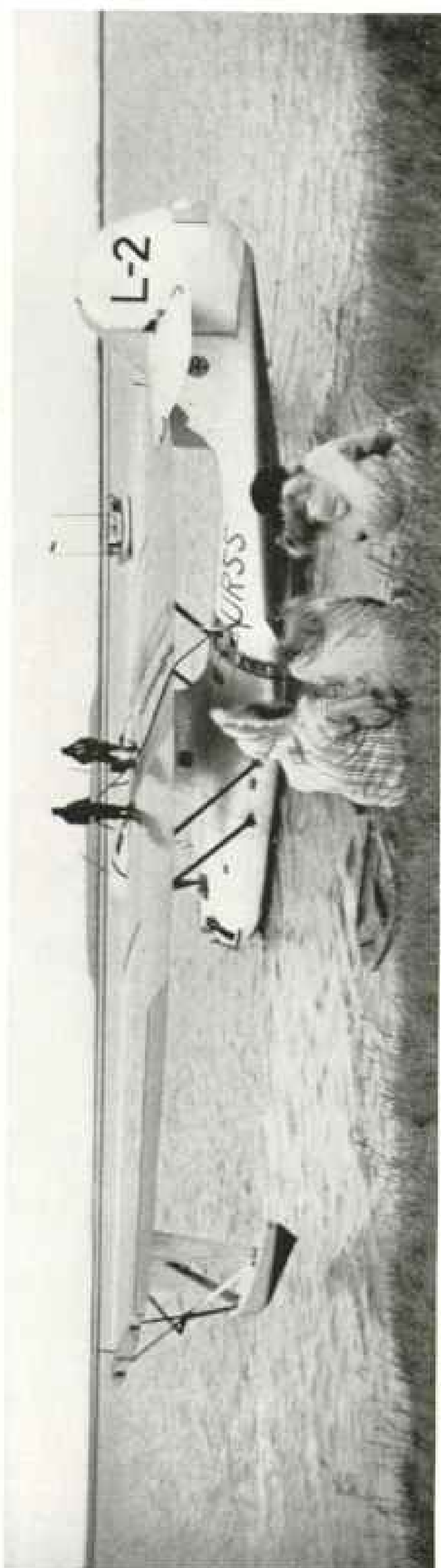
ESKIMO RUMOR STARTED ROBERT RANDALL ON THE FIRST SEARCH FOR THE FLYERS

Beside his plane at Aklavik stands the veteran Mackenzie Air Service pilot who began looking for the Russians two days after their last radio message was received. At Barter Island, off the north Alaska coast, he questioned Eskimos who "had heard what they thought to be the roar of an outboard motor." When the boat failed to appear and the noise faded, they went on butchering reindeer (pages 141-2).



Photograph by Sir Hubert Wilkins

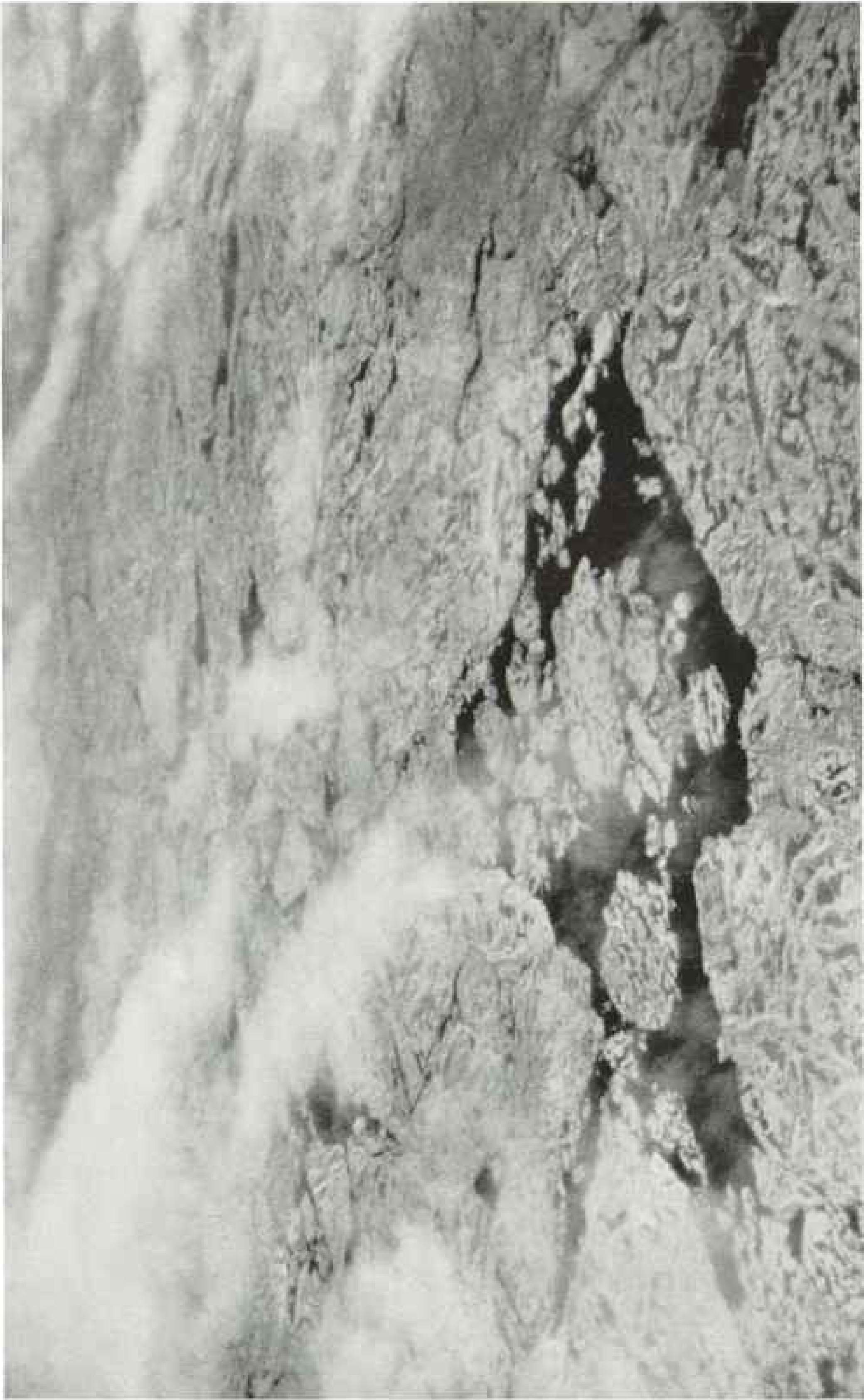
BENEATH THE BROAD WING OF THE "USSR" UNROLLED THE BROOKS RANGE, 8,000-9,000 FEET, WHERE NO TREE GROWS



Photograph by Charles Kelch, courtesy The Journal

THE FLYING BOAT USED IN AUTUMN WAS LETTERED "USSR"; THE MONOPLANE ON SKIS FOR WINTER FLIGHTS BORE THE INITIALS "USSR"

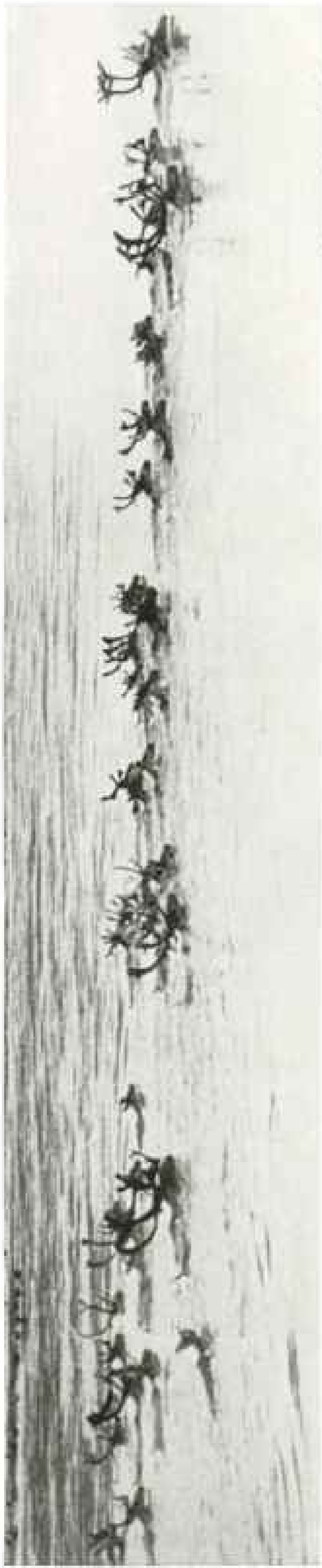
Both sets of letters stand for the name of the land flyers' fatherland. In Russia civil planes often bear *USSR*, a contraction of the Nation's French name, "Union Républiques Socialistes Socialistes." *USSR* on the other plane represents the English "Union of Soviet Socialist Republics." Wing floats fold flush with the wing tips when in flight.



Photograph by Sir Hubert Wilkins

THROUGH RIFTS IN FOG AND CLOUDS, WATCHERS FROM THE SKY SCANNED THE MONOTONOUS PATTERN OF BROKEN PACK ICE

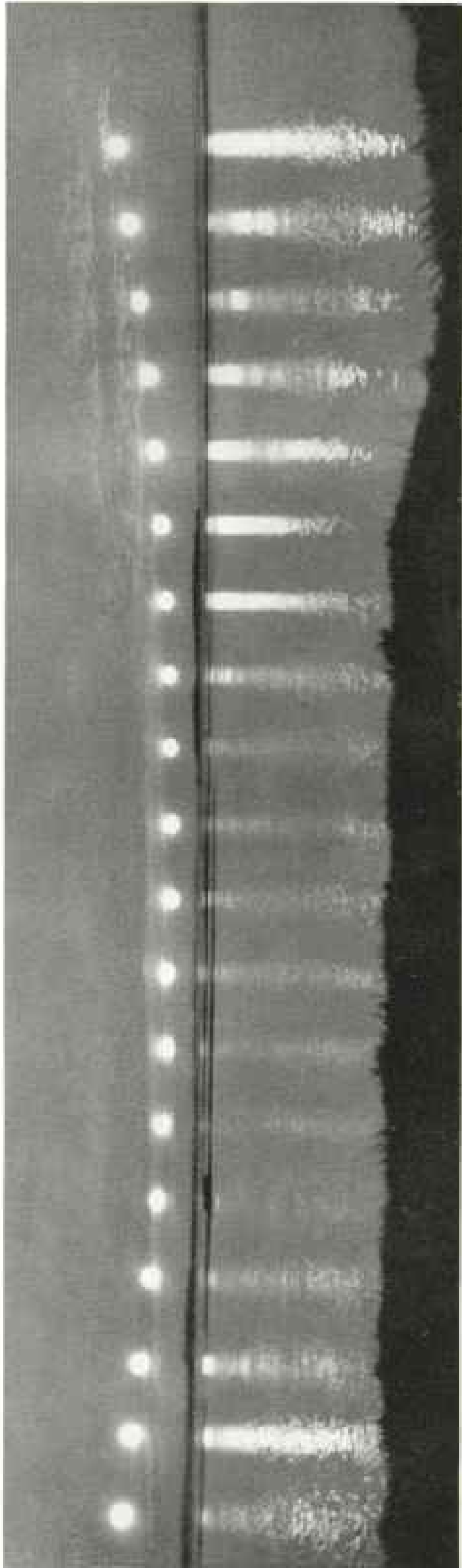
Leads of open water in the Arctic Ocean northwest of Prince Patrick Island were found full of ice fragments in September. Alighting in the flying boat would have been extremely hazardous. For a wheeled plane, such as the Soviet flyers used, the rough, hummocky floes, pock-marked with pools of melted snow, would have offered scant chance of a safe landing. A radio call to Levanevsky was sent out every half hour from the search plane, and the operator listened for reply signals during 30 minutes of the hour. No sound from the missing Russian trail-blazer was picked up during the six months or so of attempted radio contact.



Photograph from Annon Bury

SWIMMING SWIFT RIVERS, CARIBOU FOLLOW THE LEADER AND CHURN THE WATER MADLY AS IF WOLVES WERE AT THEIR FLANKS

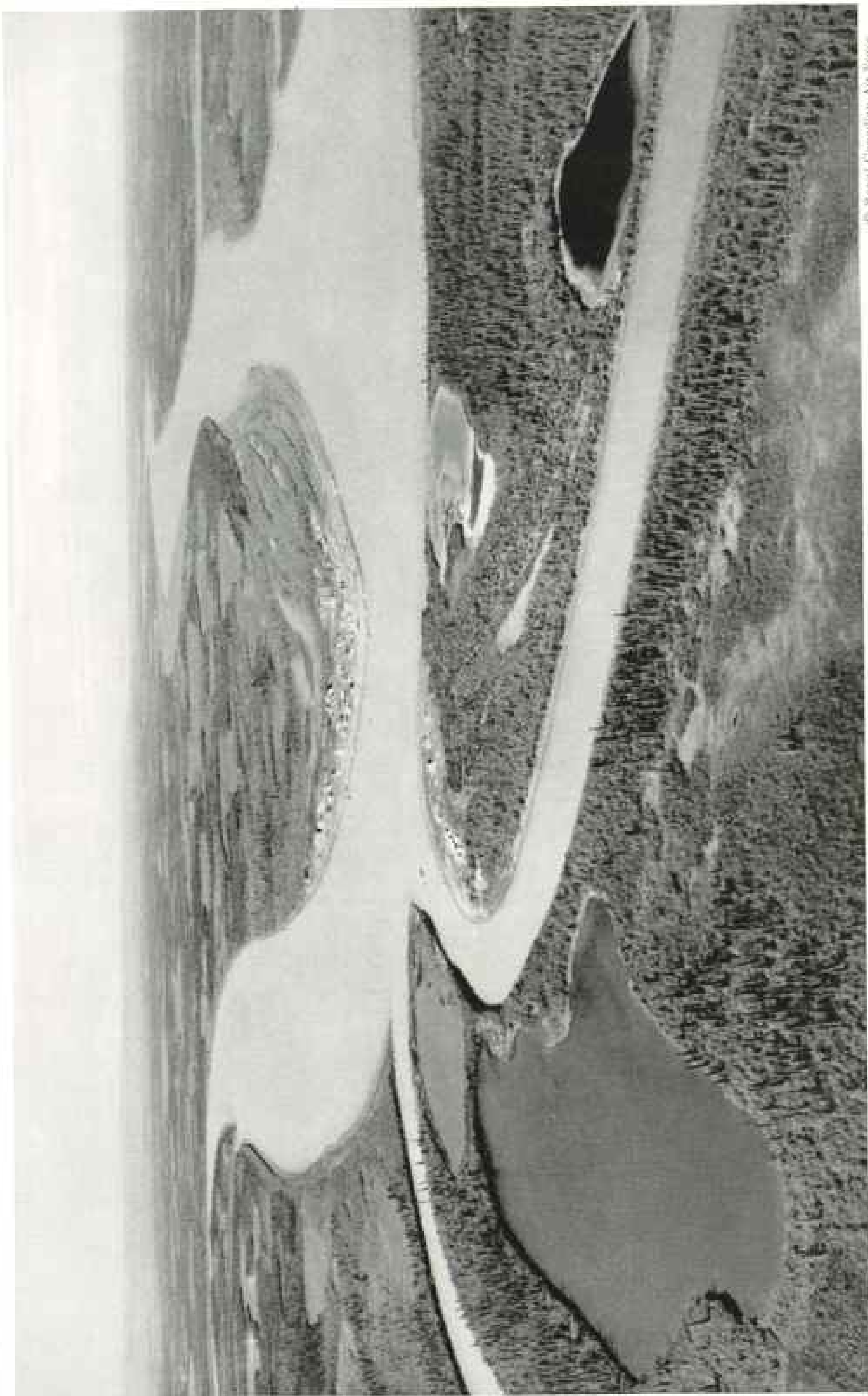
In Arctic regions the abundance or scarcity of caribou may spell the difference between plenty and hunger for the Indians and Eskimos. Meat and bone marrow supply food; skins are made into trousers, parkies, and moccasins; horns are fashioned into implements; split sinews outlast the finest spun threads.



Photograph by Charles Reich, courtesy The Peary

PICTURE STORY OF THE MIDNIGHT SUN; THREE HOURS OF ARCTIC "SUNSET" AND "SUNRISE" PHOTOGRAPHED AT TEN-MINUTE INTERVALS

Here at Copestamine from May 28 to July 17, natives see the sun day and night if the weather is clear. The nearer to the North Pole, the longer the annual period of continuous sunlight. The exposures were made in June on the same negative, the camera remaining stationary on a tripod.



© Royal Canadian Air Force

FROM THE AIR, COSMOPOLITAN AKLAVIK IS A WELCOME LANDMARK IN THE FLAT WILDERNESS OF THE MACKENZIE DELTA

Farthest-north port of call of the supply steamer from the south (page 163), the busy little metropolis stands on a sharp bend. The settlement's inhabitants are Indians, Eskimos, and a few whites of various nationalities. The river received its name from Sir Alexander Mackenzie, who discovered and first explored it to its mouth in 1789. In the Delta, close to the Beaufort Sea, thrive some of North America's most northerly forests. The Mackenzie, about 2,500 miles long, drains almost a fifth of the total area of Canada. What appear to be cleared fields beyond the village are actually distant ponds and patches of marshy green meadow (page 157).



Photograph by Sir Hubert Wilkins

LOOKING FORWARD ALONG THE STREAMLINED HULL OF THE "URSS"

The plane's sleek metal flank and engine nacelle frame a distant view of Melville Island, one of the big detached land masses in the Canadian Arctic Archipelago. A collapsible canvas boat was carried as a life raft and used as a tender for going ashore from the plane on far-northern islands.

musk oxen, none of them recent. Musk oxen are, no doubt, still to be found on Prince Patrick Island. On our next flight we saw from the air several bands of caribou and many ptarmigan.

The next day a snowstorm detained us at anchor until late afternoon, and we finally flew back to Coppermine in the clouds, depending mostly upon instruments.

During our absence the police boat, which brings supplies for the village once a year, had arrived. The boat service to Coppermine is either from the Mackenzie River or through the Bering Sea, though boats from Alaska cannot always reach the Coppermine River if the ice is too heavy.

The difficulties encountered with the weather during our first two flights pointed to the need for some sort of weather forecast to prevent a great deal of useless flying. To reach the area where Levanevsky was last heard from, we had to fly out 1,000 miles. It would have been useless to continue flying back and forth up to that area if we could not have been reasonably sure that the area itself was clear.

We wirelessly to the Soviet Embassy in

Washington, requesting further meteorological co-operation, and received immediate response. Not only the Governments of the United States, Canada, and Russia, but the meteorological bureaus of all other countries bordering the Arctic Ocean agreed to furnish reports having a bearing on Arctic conditions.

WEATHER REPORTS FROM MANY LANDS

Mr. Edward M. Vernon, of the United States Weather Bureau, was sent to Fairbanks to assist Mr. Michael V. Beliakov, the Soviet meteorologist, in correlating all the data and issuing to us a 36-hour forecast of weather conditions over the whole of the polar area.

Thus we obtained extensive international co-operation in forecasting weather over the Arctic regions. Throughout our search, the forecasts given by Beliakov, Vernon, and later by Mr. Howard J. Thompson, also of the United States Weather Bureau, were remarkably accurate. The information from the Russian North Pole station, adrift on the ice, was extremely valuable, and we also had helpful reports

from Spitsbergen, Greenland, Fridtjof Nansen Land (Franz Josef Land), New Siberian Islands, and Wrangell Island.

I might mention in passing that the real objective of the submarine expedition under the Arctic ice, which I hope to carry out, is to provide with that submarine comfortable living quarters and a mobile base for scientists who will later maintain a weather-forecasting station between Point Barrow and the North Pole, an area where there are no islands.

A TROUSER TRAGEDY

Continuing bad weather marooned us at Coppermine, and, while overhauling the plane, Al Cheesman spoiled his fur trousers with oil. But the corporal of police saved the day by selling Al his only pair, and chilled his legs in woolen pants until new fur ones could be made.

On August 28 our reports predicted bad weather over the Arctic Ocean, but fairly clear conditions as far north as Prince Patrick Island. I decided to fly as far north as possible, land, and await clear conditions. With our short-wave radio in the plane we could receive weather reports direct.

We took off and made two landings, once being forced to move when a shift in the wind drove drifting ice toward us. With better weather indicated to the north, we flew out over the ice, but found that while the sky was fairly clear of clouds, low, thick fog—mostly the product of frost smoke from the open water between the floes—hid the ice from our view; so we returned to Coppermine.

On our three flights we had covered a flying distance of over 5,000 miles, but more than half the distance had been flown over clouds or in fog.

There were five of us in the machine, all keeping a keen lookout whenever conditions were favorable. I spent most of my time in the navigator's cockpit at the nose of the machine, wearing four-power spectacle binoculars. When any dark object or anything suspicious was observed, I would use a high-powered set for close inspection.

If we had sighted the missing men, we had food, fuel, and a radio ready to drop to them on parachutes. Then, if possible, I would have landed and picked them up at once, for they might be carried far away on the drifting ice before a rescue ship

could reach the point where they first were seen.

Navigation over the ice proved difficult, because of the erratic behavior of our four compasses, frequent clouds, and varying winds. Sometimes the compasses would set up a swinging motion, and when we took the readings, each would give a different one, sometimes differing as much as 40 degrees. This was partly because of the nearness of the North Magnetic Pole, which was only about 600 miles away, and partly, I think, because of vibrations set up in the plane.

We had been using a gasoline supply of the Royal Canadian Air Force, deposited at Coppermine for just such an emergency, but since our plane burned about 75 gallons an hour, the supply was soon used up. Therefore, I decided to move our base to Aklavik (page 155), about 600 miles west of Coppermine.

At Aklavik the timber extends north almost to the Arctic Ocean, so the town, although more than 100 miles north of the Arctic Circle, lacks the appearance of being in the Arctic. Spruce trees grow to a height of 50 to 60 feet, while larch and willow and many other shrubs line the river banks.

Aklavik is on the flat Delta of the Mackenzie, one of the world's great rivers, which flows north into the Arctic Ocean.* The village is on a bend of the westernmost of the Mackenzie's four main mouths.

The houses of the village, scattered along the river bank, present a frontage as imposing as that of a good-sized provincial town. There are two large mission stations, both equipped to accommodate some 200 or more pupils.

SCHOOLS, BUT NO JAIL

The Eskimo and Indian children live in dormitories, attending school about four or five years. They learn domestic science and other things useful in their way of life. The hospital has the most modern equipment, except for lack of running hot and cold water.

Since there is no jail, an Eskimo serving a life sentence for murder was confined in the hospital. Every day he was taken about the village for exercise by a policeman, always over the same route. While we were there the Governor General of

* See "On Mackenzie's Trail to the Polar Sea," by Arno Berg, NATIONAL GEOGRAPHIC MAGAZINE, August, 1931.



Photograph by Charles Briach, courtesy *The Beaver*.

SIR HUBERT MEETS AN OLD FRIEND, OLE ANDREASEN

They were together in the Arctic with Dr. Vilhjalmur Stefansson 22 years ago. Andreassen's Eskimo wife made fur garments for expedition members. Ole is one of the oldest inhabitants of Coppermine and is considered its unofficial "mayor." "This is the life for me," the fur trader said. "When I married my wife, she had three grown sons, and they do the work" (pages 143, 146).

Canada granted him a reprieve, but the old Eskimo continued to walk over his customary route alone, showing to his friends with much satisfaction that he no longer needed to be escorted by a policeman.

There are three trading stores, two hotels and restaurants, a post office, three churches, police barracks, and many other buildings at Aklavik, and about 60 to 70 white people. In the summer, when we first arrived, there were about 300 natives, both Eskimos and Indians, as well.

FURS FOR FRUITS, SHOES, AND RADIOS

Most of the Eskimos occupied thirty or more small river boats, which were tied up to the bank awaiting the arrival of the Hudson's Bay Company steamer, which was coming down the Mackenzie to trade. The Eskimos trade furs for fruits, vegetables, silk stockings for the women, bright prints, radios, phonographs, and even high-heeled shoes, which the women wear in summer in the village on special occasions.

According to the story, Aklavik grew up on this site by accident, in 1915. A trader had been dispatched to establish a trading

post on the Aklavik branch of the river, which lies two miles downstream from the present village. Apparently he ran ashore and damaged his boat. While making repairs, he began using some of his supplies, among which was a barrel of whiskey, and by the time the whiskey was gone, a small colony of people had grown up on this site.

While the Eskimo and Indian population at Aklavik is fairly large, the families scatter during the winter and hunt. They are assured of a fair number of fox, mink, and marten, but they depend mostly on the muskrat, which never fails them. One of the traders estimated a recent total catch in the Aklavik area to be a million skins. In civilization these skins frequently become "Hudson seal."

In some years the wild caribou are numerous in the vicinity of Aklavik, but this time the herds were not seen north of Fort McPherson, about 60 miles south of Aklavik. Therefore, not only were the Eskimos short of meat this season, but the hotels and restaurants also had a hard time to meet the demands.

With the development of civilization,



Photograph by Sir Hubert Wilkins

GAS MASKS COME INTO STYLE IN THE ARCTIC—FOR "DOPING" GASOLINE!

A representative of the Ethyl Gasoline Corporation of New York traveled all the way to Aklavik to mix Ethyl fluid with the search expedition's fuel, to improve combustion and eliminate knocking. Rubberized clothes and gloves were worn for protection against tetraethyl lead, the principal constituent of Ethyl. After the fluid has been added to the gasoline, the mixture is harmless and may be handled in the ordinary way.

considerable changes have come about in the native attitude toward work. We found neither Eskimos nor Indians willing to give us any voluntary assistance, and they were not especially anxious to be hired at any menial job. It was practically impossible to get any fur clothes made at Aklavik.

MORE CIVILIZATION! LESS WORK

Only after considerable persuasion, and with the influence of my old Eskimo friends whom I had known during my visit in 1914-1916, was I able to get a few pairs of fur mittens made and some slight repairs done upon our clothes.

Some of the Eskimos now must pay income tax, for several of them have developed large trading stations, which keep in motion many thousands of dollars.

Eskimo family relationships are so involved, moreover, that it is necessary to establish the family connections of every one in order to determine who should pay the taxes.

Here, far north of the Arctic Circle, the life of the white residents is much like that

in any country town farther south. Business suits, white collars and ties, low-cut evening frocks, and social entertainments are the vogue, within, of course, several social grades. The craze for the game of "pick-up-sticks" had just developed before we arrived at Aklavik.

Because conditions at Aklavik were not really suitable for an expeditionary base, I decided to remain only long enough to fill our fuel tanks and then fly on to Barter Island, where some Eskimos had heard what might have been the motor of Leva-nevsky's plane. Barter Island is west of Aklavik, in Alaskan territory. We landed there on September 2 in rain and fog, and fog continued for the next five days.

At last we received a forecast of fair weather to the north, so we flew out through fairly stormy conditions for the first several hundred miles before coming to clear weather in which we could observe the ice.

North of 82° we began our intensive search and zigzagged back and forth over the area between 82° and 85° north latitude, and longitudes 135° and 150° west.

Our radio was in constant service, sending messages for Levanevsky or listening for an answer to our signals, but none was heard. Finally, with darkness closing in, we turned back to Aklavik.

We had been in the air 20 hours and 40 minutes by the time we landed, and, although much of the time had been spent in flying blindly through the clouds, we had made a fairly satisfactory examination of the area in which we believed Levanevsky must have come down.

The season for using flying boats was fast drawing to a close. At night a thin skin of ice would form on the surface of the water. Ice and sleet would pile up on the wings and fuselage and remain fast even when the machine was at anchor.

OFF IN A HOWLING GALE

We returned to Barter Island, but not until September 17 were we able to get away on our next flight north. Even then we had to take off in a howling gale, snow and sleet obscuring all vision at a distance greater than 200 yards. We flew through these conditions almost 400 miles before coming to the clear weather (near 75°) predicted by our meteorologists.

This was an example of the accuracy and competency of the weather men. They had said that we would find bad weather up to latitude 74°. Within twenty miles of where they indicated, we flew from the snowstorm into sunshine.

We continued flying to north of 86°, in alternately clear and cloudy weather, but finally the thick clouds and ice on our wings forced us to turn back on our course for Aklavik.

We flew for several hours through darkness, when we came to where we believed the coast to be. So we remained flying back and forth above the clouds, awaiting daylight before we dared determine whether land or water was beneath us.

Shortly after daylight, we found ourselves over the Mackenzie Delta. We flew back toward Aklavik, but found the fog there so dense that it would have been impossible to make a safe landing. Above the fog we flew around Aklavik, waiting for the weather to clear, but finally we had to go 30 miles to the east and land on a lake.

With winter coming on, and a freeze-up likely at any time, it was too late to attempt any further flights with the flying boat, and we flew our machine back to

New York. In all, we had flown more than 13,000 miles over the Arctic Ocean, constantly sending signals and listening for any sign from Levanevsky and his companions, but without result.

Of the 30 days we had been in the north on this first phase of our rescue expedition, 27 had been spent on the flying boat itself. Only seven nights were spent ashore.

HAM AND EGGS IN A PLANE

In the plane we cooked our meals of reindeer meat, ham and eggs, or whatever else we happened to have along. There was no need for long preparations to start, and we could take off and cook our breakfast on the way. We took turns doing the cooking.

Hollick-Kenyon was voted the most fastidious and satisfactory cook. When his turn came, it was necessary to call all hands an hour or two earlier than usual, for he could never set about his job until he had had a leisurely sponge bath and shave and smoked a cigar.

I was accused of never volunteering to cook until there was an accumulation of odds and ends to make a stew. Actually, of course, I was interested in wasting nothing, and tried to conserve all the left-overs.

I have never traveled with a more cheery crew than that made up of Hollick-Kenyon; Cheesman, who was relief pilot; Brown, an Australian boy who was engineer; and Booth, an ex-U. S. Navy radio engineer (page 147). They were always ragging each other, and no matter how fatiguing their task, they always set about it cheerfully.

At the end of the season for flying boats, there came a period in which it would have been impossible to fly, for the thin ice on the water would not be strong enough to support a machine on skis.

The Soviet Embassy in Washington, most anxious to continue the search, bought for me the plane flown by Dick Merrill across the Atlantic and back, in May, 1957, on the good-will Coronation flight (page 169). Skis were fitted on it at Edmonton, Alberta. This plane was considerably smaller than our flying boat and carried only two men at a time on long flights, but it was well adapted for our purpose because of its long cruising range.

Allan T. L. Dyne, engineer from the Canadian Airways, and W. R. Wilson, radio



© Department of the Interior, Canada.

LAUGH, AND AN ESKIMO LAUGHS WITH YOU

Unlike the "poker-faced" Indian, he thoroughly enjoys a joke. From the grim face of the man in the background and the keen enjoyment of the women, it appears that the joke must have been on him. These Copper Eskimos, on Coronation Gulf, are dressed for a ceremonial dance.



Photograph by Sir Hubert Wilkins

CHILDREN'S FASHIONS IN THE FAR NORTH STRESS WARMTH, NOT LOOKS

Dark young Eskimo and Indian girls from a mission school at Aklayik wear print dresses (often their own handiwork) over fur parkas to keep snow out of the fur. Boys and girls live in dormitories while going to school for four or five years. Parents provide clothing; missions all else.



Photograph by Sir Hubert Wilkins

MRS. ROST'S 10-ROOM HOTEL WAS A SNUG BASE AT BLEAK AKLAVIK

The landlady's husband is a trapper and hunts to supply the hotel restaurant with meat. Big glasslike cubes cut from the river ice are melted for drinking water in winter and summer because the Mackenzie is contaminated by hospitals farther up the river. Several years ago there was a typhoid epidemic. This double-walled frame structure with sitting room, dining room, and kitchen, heated by wood-burning stoves, served as expedition headquarters from September, 1937, to March, 1938, except for a short stay at Point Barrow. When the picture was taken, during brief daylight hours in February, the temperature was 40° below zero; yet good meals were served and the accommodations were as comfortable as in many country hotels.

engineer of the Canadian Marconi Company, were engaged to replace Booth and Brown, who could not continue with our party.

LAND OF THE MIDDAY MOONLIGHT

It was decided to continue our search throughout the perpetual darkness of the Arctic winter by the aid of moonlight. The moon in the Arctic gives off no greater light than in lower latitudes, but in the north, moonlight reflected by the snow, with the air free of dust, will easily permit reading of newspaper print. Furthermore, in December, January, and February, the full moon in the Arctic circles continuously above the horizon for 24 hours a day, lasting, at the average latitude of our flights, some five to eight days a month.

After a long wait for sufficient snow to permit flying our plane on skis, we reached Aklavik on November 23.

We had brought along two long-wave radio direction-finding outfits to aid us in

fixing our position while in flight. One we set up on the ice in the middle of the river opposite Aklavik and the other on the coast at Point Barrow, Alaska, 600 miles away, most northerly point under the United States flag (page 167). Each station also was equipped to send and receive messages by short wave.

Point Barrow is the "capital" of Arctic Alaska. Since 1928, when I flew with Carl Ben Eielson from Point Barrow across the Arctic to Spitsbergen (map, pages 144-5), the village had grown considerably, but the leading citizen was still Charlie Brower, "king of the Arctic," who has been a trader in the village for more than 50 years, and acts as postmaster and magistrate. He was absent during our stay, however.

I was told that the Eskimos no longer get much fur from the Alaskan Arctic coast. Year after year, the number of foxes and other fur-bearing animals has dwindled. This is believed to be due to the fact that, with the decline of whaling



Photograph by Richard Nash Hounie, courtesy *The Beaver*

S.S. "DISTRIBUTOR" GLEAMS IN THE LIGHT OF THE MIDNIGHT SUN

From the small wharf at Aklavik, north of the Arctic Circle, the Hudson's Bay Company's Mackenzie River stern-wheeler turns back for the long upstream pull. Three times every summer, the white supply boat churns down and back, from Fort Smith almost to the Arctic Ocean, covering 2,400 miles on each round trip. The Mackenzie is open to navigation from mid-June until late October. Almost blended with gray clouds on the horizon loom the Richardson Mountains.

in this region, whale carcasses no longer are distributed along the beach to furnish food for the animals.

Yet, without the furs, the Eskimos are perhaps more independent. The reindeer, since their introduction into Alaska, have so increased that each native family owns enough animals to fill its needs. The ruling last year at Point Barrow was that Eskimos were allowed credit at private stores and at the Eskimo communal store until Christmas. But if they had turned in no fur supplies by that time, their credit was stopped and they had to depend upon the reindeer for food.

FUR CLOTHING, MADE TO MEASURE

At Point Barrow we were able to complete our outfits of fur clothing, each man being supplied with two fur coats, two pairs of fur trousers, fur boots, socks, and mittens.

All these were made to our measure by the Eskimo women, but only the older ones would undertake the task.

The younger ones did not like the hard

work of scraping and preparing the skins for clothing. Eskimo women hold skins in their teeth while stretching them, and to a casual observer it appears that they are chewing the skins.

Many Eskimos at Point Barrow no longer wear fur clothing, as they do not need it under civilized conditions. To make good and comfortable fur clothing requires considerable skill. One must be able to slip his arms out of the sleeves inside the fur coat without much effort, so that chilled hands and fingers may be held against the body to warm them.

The hood is so arranged that when it is turned up the whole garment hangs lightly from the head. This insures that, when turning the head slightly from left to right, the hood is carried with the face of the wearer.

Fur boots, unless built with the fur sloping in the right direction, and then sewed with extreme care, will soon get out of shape or turn over on the side, much as does cheap footwear anywhere.

At Point Barrow there are a school, a

church, a radio station, and some trading stores; a new hospital soon will replace one destroyed by fire. Five white families, aggregating 16 people, were there during our stay, including Sergeant Morgan, in charge of the U. S. Army Signal Corps radio station, a missionary, doctor, school-teacher, and several children.

Many young people in recent years have died of tuberculosis. The United States Government has two specialists carrying out research work at Point Barrow in connection with the health of the Eskimo race.

AMERICA'S MOST NORTHERLY NOTARY

While we were at Barrow, Al Cheesman, our reserve pilot, was re-elected alderman of his home town, Port Arthur, Ontario.

He was required to swear a statement of acceptance of his office, and this he did before Charlie Brower's son, who is the most northerly notary in North America. But later it developed that a newly elected alderman must attend the first meeting of the board. This, of course, he could not do: so, to legalize his re-election, a special act was passed by the Canadian Parliament.

We had hoped to be able to make our first winter flight during the December full moon period, but this passed with continuous clouds and bad flying conditions.

We spent a jolly Christmas, for the celebration lasts several days. Each white family at Barrow entertains the others in turn, so everyone has five or six Christmas dinners! Much snow fell, but we did not experience a blizzard during our whole winter in the Arctic.

By January 12 the snowdrifts at Point Barrow were so high that to take off with a maximum load would have been dangerous. So we decided to return to Aklavik, where the river ice would provide a smooth field. Then we found that the accumulation of salty hoarfrost had formed a solid coating of ice both on the inside and outside of our plane. It was only with great difficulty that we were able to remove this ice, by tapping with hammers.

On January 16, with the moon full, the weather north as far as 80° was forecasted as clear, with scattered clouds farther north.

It was 44° below zero when we started our moonlight flight. While we were warming up, our engines belching fire from the two exhausts made the machine look like a huge dragon. The hot air from the engines set up a fog which soon enveloped the whole

village of Aklavik. It was necessary to taxi two miles down the river where the wind was across the runway before we could take off.

When a dog sniffed at the plane's fuselage his moist nose stuck fast to the cold metal. He yelped, finally broke away, and went howling off down the river. Many finger tips were frozen while we were filling the tanks with gasoline.

Snow crystals and high cumulus clouds dimmed the moonlight at the take-off and we passed through clear and clouded patches as we flew at altitudes varying from 2,000 to 4,000 feet. The maximum extent of good visibility was about three miles on either side of the plane.

Between belts of clouds, when the atmosphere was clear, we could see quite well. Pressure ridges distinguished the rough ice from the smooth. The leads of open water—and there were many—were conspicuous. Shadows cast by huge lumps of ice, standing out distinctly, could well be mistaken for dark tents or other objects on the ice.

We came to regular pack ice at latitude $71^{\circ} 30'$, and thirty miles farther north we were going over broken ice and many leads.

From 8 p. m. until 9:30 p. m. we ran into thin clouds at intervals of about five or ten minutes, with equal intervals of clear moonlight. Then heavier clouds closed in and we turned back, at latitude $77^{\circ} 40'$ north, longitude $157^{\circ} 30'$ west.

FLYING IN A SNOW CLOUD

As we turned, we ran into a hard, granular snow, which stung our faces as it blew through the open cockpit windows. For half an hour we flew in this snow cloud, which obstructed all visibility outside the cockpit. The windows were kept open in flight, despite the extreme cold. Otherwise, hoarfrost formed on them and prevented us from seeing out.

When taxiing down the river at the start of this flight, one of our propellers hit a stick which we did not notice because of the hoarfrost on the windows. We heard the sharp crack, but thought it an engine back-fire. This accident led to damage which made it necessary for me to fly to Edmonton in another plane and obtain a new engine.

By February 26 the new engine was installed, but the weather remained bad. While waiting for the March full moon, we decided to make some flights over the Alaskan mountains. This was to test our

new engine before venturing out over the ice, and to see if the missing men might have landed in the mountains, as indicated by the report of the Eskimos on Barter Island, who had thought they heard a plane flying over on August 13 (page 142). By now, daylight lasted nine or ten hours a day.

On March 3 the weather was perfect—a cloudless sky, with crystal-clear conditions. We flew westward over the Richardson and Brooks Mountains, including the Endicott Mountains, to 153° west longitude.

Caribou and mountain sheep are to be found in this region. From the air it looks like an "irregular waffle," many of the valleys being blind (page 152). The country is uninhabited and has been very little prospected or mapped because there is no timber for fuel. Moss, lichens, and other hardy plants are the only vegetation.

Then we followed the mountain range to Herschel Island, and back again to the Colville River, before returning to Aklavik. We flew 1,300 miles east and west along the mountains that day.

The next day the visibility was again perfect, so we flew on short northern and southern courses, covering the mountain ranges from Aklavik to latitude 152° west.

We also made two long flights over the foothills and southward over the mountains, covering 1,800 miles, and landed at



Photograph from Kathleen Shackleton

A SIX-YEAR-OLD HOLDS HIS OWN TRAPPER'S LICENSE

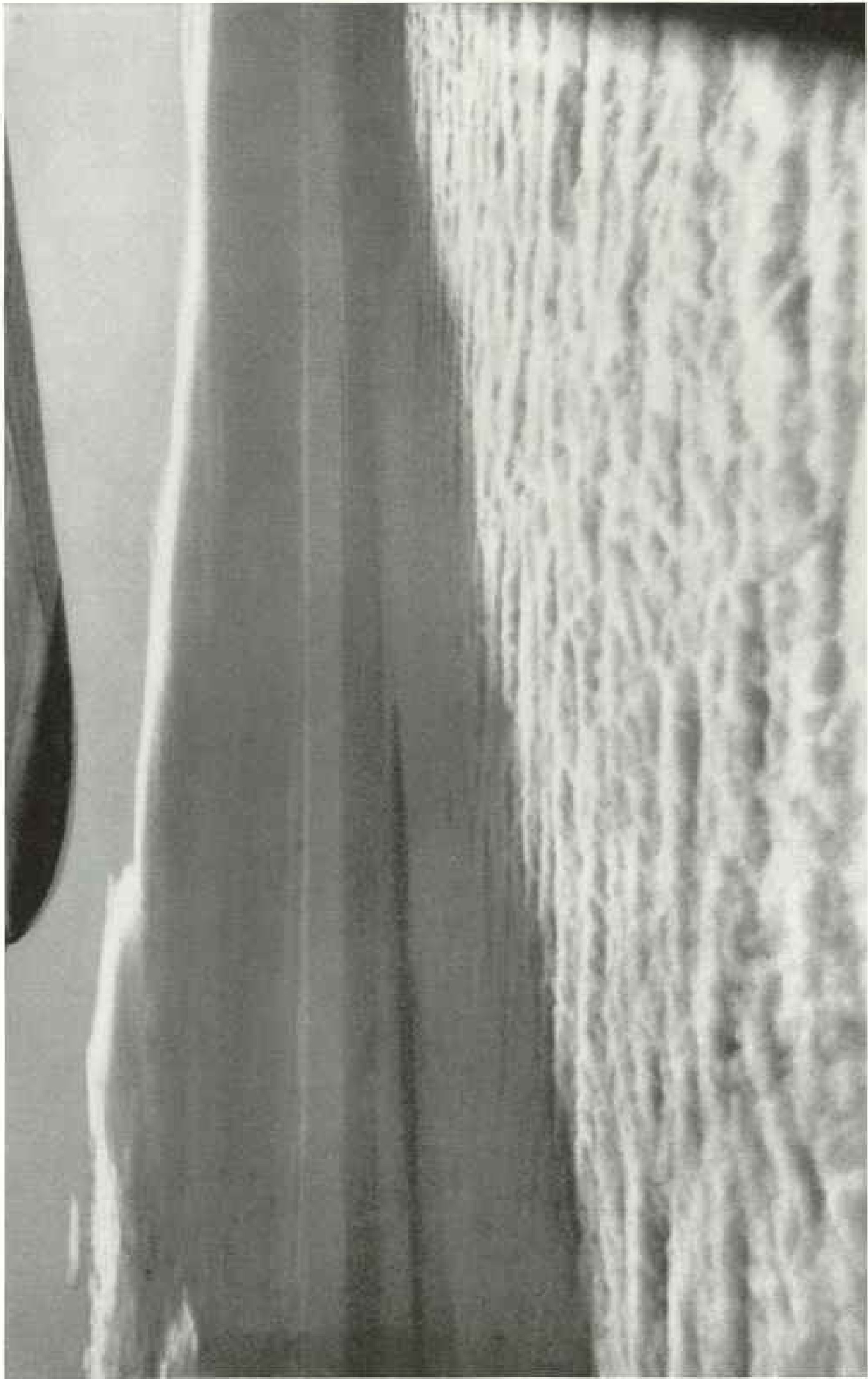
Although not much taller than the string of big fish his companion holds, proud Robin Matthews of Aklavik is probably the youngest white child in the north to be licensed as a trapper. The frozen fish are winter fare for sled dogs. On his feet Robin wears deerskin "mukluks."

the village of Old Crow, on the Porcupine River just over the border in Canada, to load some fuel cached there for us.

Old Crow is reputed to be the coldest spot in Canada. It was 40° below zero the night we spent there.

These flights convinced us that the Russians had not crashed in the mountains, for the peaks were fairly clean of snow and we felt we could have seen any wreckage.

Bad weather held us up until March 10, when we made a flight to 81° 15' north and 115° west, but had to turn back when thick clouds came up. We flew 11 hours and 20 minutes that day.



Photograph by Sir Hubert Wilkes

ONE CLOUD BANK CASTS ITS SHADOW ON ANOTHER AS THE PLANE PLUNGES INTO THE OPEN JAWS OF MERGING FOG LAYERS.

At higher altitudes the aerial explorers several times met this spectacular phenomenon. The upper layer might be a half mile thick and reach above 20,000 feet. The top of the lower layer would rise to about 10,000 feet above the hidden Arctic Ocean. "The upper and lower layers were like the lips of an open mouth into which we would fly only to find that they joined in a hundred miles or so, forming an impenetrable barrier."



Photograph from U. S. Army Signal Corps

SNOWDRIFTS WHICH GATHER IN THE LEE OF HOUSES LAST INTO SUMMER AT POINT BARROW

Arctic Alaska's "capital" is the most northerly settlement in United States territory. The Wilkins expedition stayed at Barrow during December, 1937, and early January, 1938, intending to base there for the winter moonlight flights over the Arctic Ocean. However, huge snowdrifts prevented a take-off with the necessary maximum load, so the flyers returned to Aklavik (page 164). Supply ships and trading schooners reach the village during a few weeks of summer, though even then pack ice may cause long delays. Scattered white buildings include a school, a church, trading stores, and an important radio station of the United States Army Signal Corps.



Photograph from U. S. Army Signal Corps

"FLYING LINDBERGHs" ARE WELCOMED TO POINT BARROW BY ITS LEADING CITIZENS

On their flight to the Orient by way of the American Arctic in 1931, the aviators stopped at this far-north outpost of Alaska and were banqueted on reindeer meat, wild goose, and canned vegetables. A few sprigs of parsley, grown locally with difficulty, decorated the platter in special tribute to the guests. Left to right stand: J. R. Trindle, government schoolteacher; Mrs. Griest; Mrs. Lindbergh; Sergeant Stanley R. Morgan, Signal Corps, U. S. Army, and his daughter Beverly; Colonel Charles A. Lindbergh, and Dr. Griest. Morgan sent the message by Signal Corps radio telling of the fatal airplane crash near here of Wiley Post and Will Rogers on August 15, 1935.

On our previous flights the radio direction-finding equipment, while giving us some indication of direction and position, had not proved entirely dependable. There had been a good deal of interference because of what is known as "night effect," which is a bending of radio beams during the dusk and evening periods.

Since the flight on March 10 was conducted throughout in daylight, there was no "night effect," and positions indicated by a triangulation of the radio bearings corresponded almost exactly with positions estimated by navigation from the plane. We were glad to get this confirmation of our estimate of speed and wind drift, because we had calculated a ground speed of 210 miles per hour, which seemed excessive.

Good weather was predicted as far north as 85° on March 14 in the moonlight period, and on this flight, and on that of March 10, we gathered a very good impression of ice conditions on the Beaufort Sea and farther north. The pack ice was broken at narrow intervals by open leads

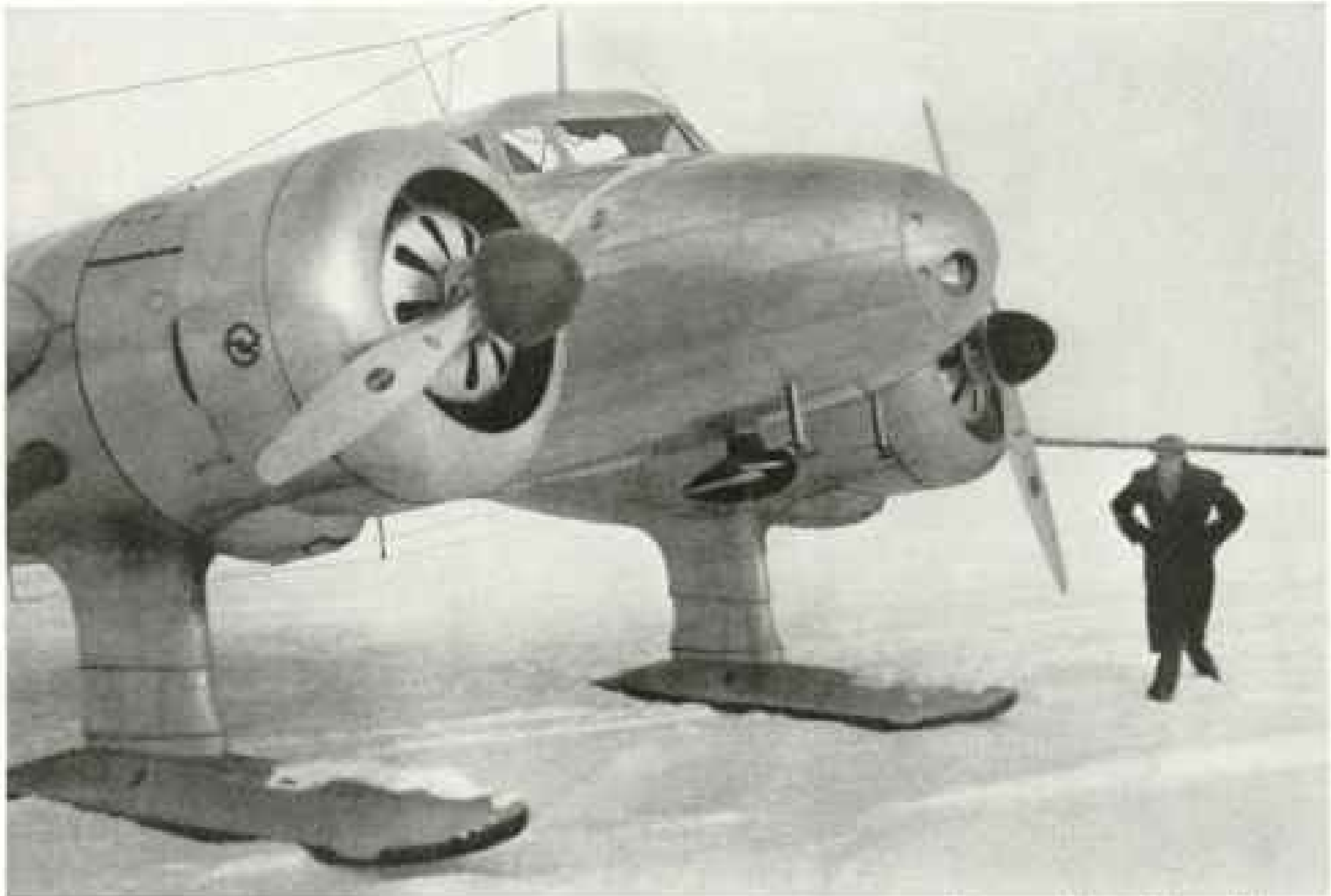
still throwing off rolling clouds of frost smoke, and by leads newly frozen over.

Near the southwest end of Prince Patrick Island we observed a very wide lead running northeast and southwest near the coast. Then, between latitude 81° and 84° and longitude 122° to 127°, we observed an open lead, varying from 20 to 500 yards in width and extending about 150 miles along our course.

Other smaller leads in this area which showed signs of opening and closing frequently were evidence (though it was not conclusive) of land in the vicinity.

We observed examples of paleocrystic ice near latitude 84° and longitude 130°. These "ice islands," formed of ice which has not melted for many years, were from two to three miles in diameter, roughly circular, and about five miles apart.

At first they gave the impression of being land islands, but soon, from the rounded hummocks and the flat-surfaced, fresh-water ice pools between them, and the turned-up edges of pressure ice, I con-



Photograph by Sir Hubert Wilkins

WHEN WINTER CAME, A PLANE EQUIPPED WITH SKIS TOOK UP THE SEARCH

This twin-engine monoplane had a great cruising range, but carried only two men on long flights. Hollick-Kenyon continued as chief pilot. The black devices on the propeller hubs are the de-icers, which were not used. A tank of de-icing fluid which contained a light oil was carried in the cabin and could be pumped through a line to a slinger ring behind each propeller hub. The slinger ring has two spouts through which the de-icing fluid is forced on to the leading edge of the propeller. The bomb-shaped object below the fuselage contains the radio direction-finder loop.

cluded that they were paleocrystic ice.

The fresh-water pools are formed by the melting of the ice, which loses its saltiness with age. I had observed such sections not far from the Alaskan coast during my trek on foot over the Arctic Ocean in 1914-1915.

We continued our northward course until we reached $87^{\circ} 45'$ north and 105° west, and then decided it was time to turn back toward Aklavik. This flight, had we kept on a true northerly course, would have taken us within 100 miles of the Pole. But our purpose was not to reach the North Pole, but rather to search the area between the Pole and the Canadian islands.

On our homeward flight, we were led into some difficulty by increased clouds and wind, and clouds were so thick at Aklavik that we were able to land on the frozen river only with the aid of flares set out for us by Dyne and Cheesman, who had remained behind.

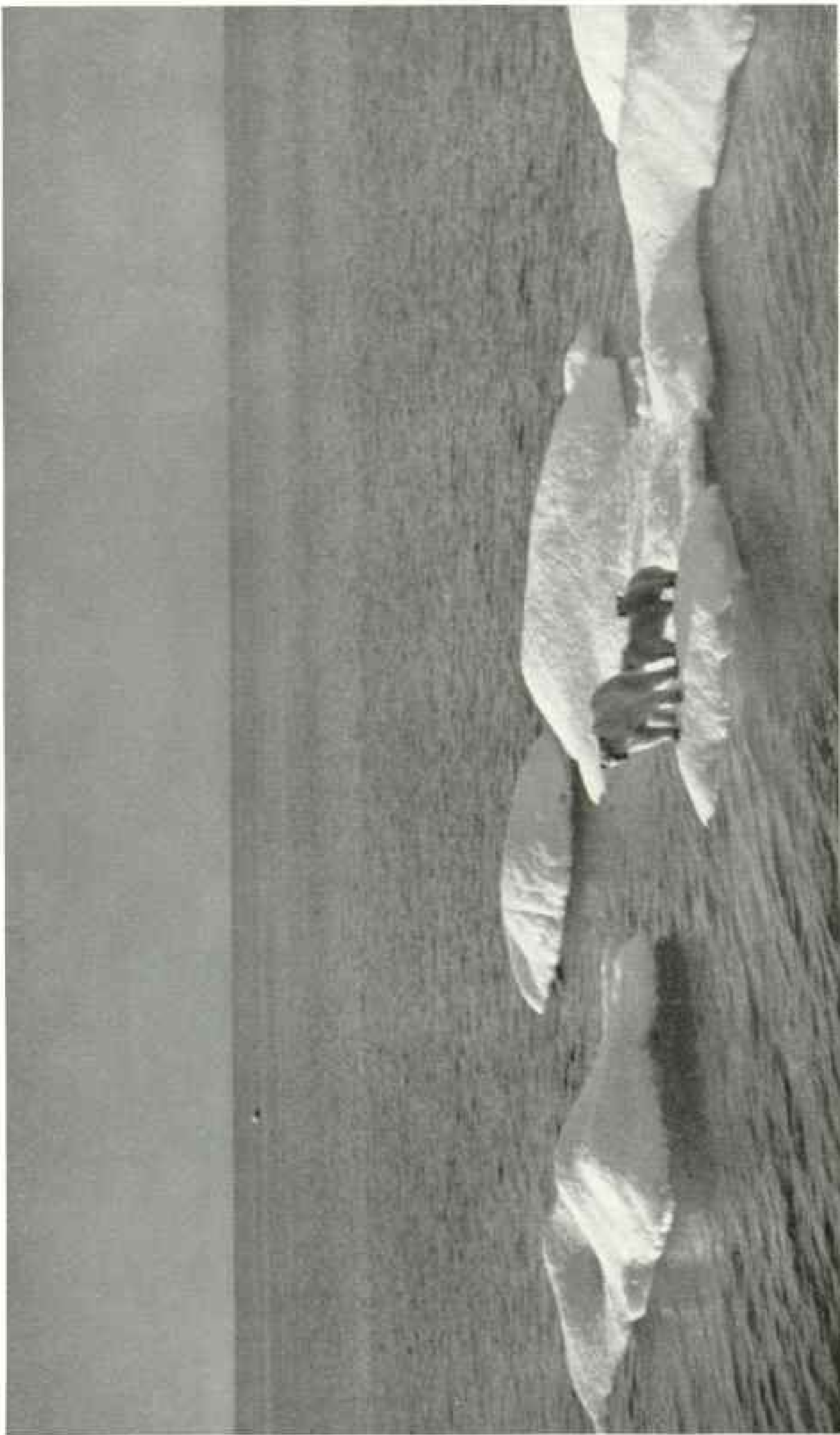
We had spent $19\frac{1}{2}$ hours in flight that day, covering about 3,300 miles, longer than a flight across the Atlantic Ocean. Visibility had been good in the area we

intended to observe. It was the farthest-north and the most satisfactory flight we had made.

We were looking forward to making two more flights over the Arctic before the season for using skis would close, about the end of March. But upon our return from the last long flight, I received a telegram from Ambassador Troyanovsky, of the U. S. S. R., informing me that the Soviet Government had decided to stop all searches from the Alaskan and Canadian coasts. We flew to New York, arriving March 25.

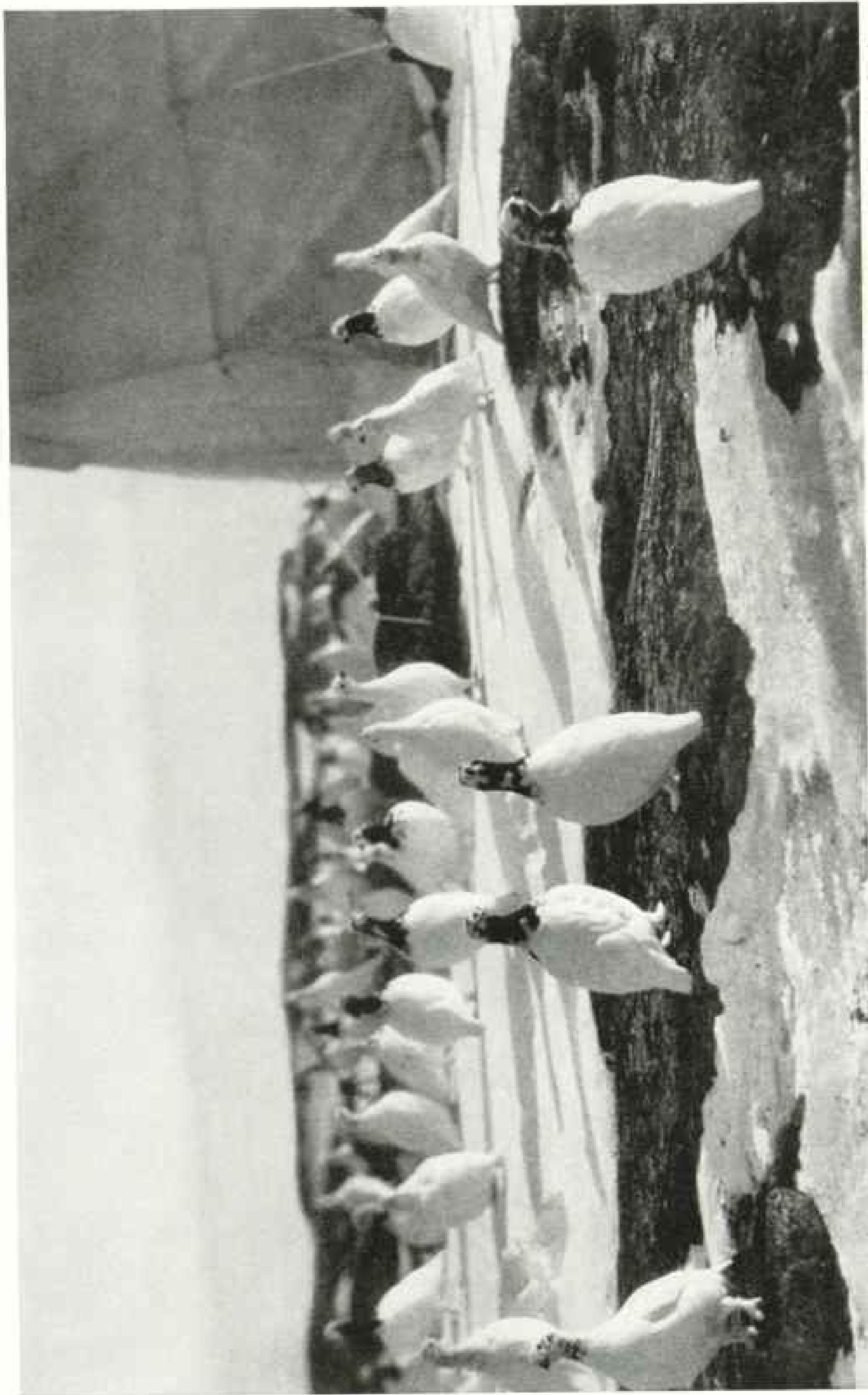
The flights had proved the adequacy of standard aircraft for Arctic operation. Since August 19, 1937, we had actually spent 284 hours 35 minutes in the air, covering approximately 44,400 miles of flying. Of that mileage, some 34,000 miles had been flown north of the Arctic Circle.

Until last August, only three transarctic flights by airplane had been made. One I made in 1928 (map, pages 144-5) and two others were made by the Russians in 1937. But since last August the mileage we had covered over the Arctic was equivalent to



Photograph by Captain C. T. Peckson

READY TO DEFEND HER CUBS WITH FANG AND CLAW, MOTHER POLAR BEAR SNARLS A WARNING TO TWO-LEGGED INVADERS OF HER DOMAIN. With a circumpolar distribution and a reputation for aggressiveness, the big mammal, one of the largest of the bears, swims and dives with agility. Seals form the bulk of its diet. Bristles on the feet facilitate walking on ice. The young are born during the winter in a cavern in the snow.



Photograph courtesy Canadian Department of the Interior

A NATTLY DRESSED DEPUTATION OF PTARMIGAN DROPS BY TO PAY RESPECTS TO A STRANGER IN THEIR LAND

Crowding around a tent in the Northwest Territories, willow ptarmigan demonstrate their feistiness. When caribou are scarce, the inquisitive birds sometimes save natives from starvation. At all seasons these birds match their surroundings, the mixed dark and white plumage of spring and fall blending with the snow-mottled ground.



Photograph by Gerald Brown

AN ARCTIC RODEO IN SILHOUETTE AGAINST THE SEA

Though the dog seems to think it's only fun, roping a reindeer is serious business when the larder gets low. A few domesticated reindeer, introduced from Siberia into Alaska in 1891 by Dr. Sheldon Jackson for the United States Bureau of Education, have increased to vast herds which now provide meat and hides for natives of regions where ruthless hunting has decimated the once-abundant caribou. Recently several thousand of these reindeer were driven along the Arctic coast to a Canadian reserve east of the Mackenzie Delta.

15 flights from one side of the Arctic Ocean across the Pole to the other.

Allowing for clear vision only five miles on either side of the plane, and only 50 per cent of our flying time in clear weather, we actually observed about 170,000 square miles of the Arctic Ocean. Much of the area was observed in winter, a season when it had never been seen before.

We had flown and navigated over the Arctic Ocean in the depth of winter by the aid of moonlight, something never before accomplished. We had found that moonlight flight is safe and possible, but that moonlight flight under a clouded moon is as difficult and dangerous as flying in and over clouds elsewhere.

Our efforts, made possible by the U. S. S. R. and generously assisted by Vilhjalmur Stefansson, president, and by other members of the Explorers Club of New York, could not have been carried out without the co-operation of the Governments of the United States, Canada, Norway, Sweden, and Denmark, which furnished the weather

reports that made it possible for Mr. Beliakov, and for Mr. Vernon and Mr. Thompson, the meteorologists at Fairbanks, Alaska, to give us the excellent forecasts of conditions in the Arctic area.

Neither could we have carried out our plans without the generous co-operation of the Canadian Airways, Ltd., the Mackenzie Air Service, Ltd., the Ethyl Gasoline Corporation, and numerous private individuals.

We regret sincerely that our efforts did not succeed in locating Levanevsky. While I think that there is very little chance for his safety, it seems to me not impossible that he or some of his crew may some day find their way back to civilization.

But even should they not return, their efforts—perhaps more than those of any others—will inspire the development which eventually will open the shortest routes for aerial transportation between the big cities of the Northern Hemisphere.*

* See "The Arctic as an Air Route of the Future," by Vilhjalmur Stefansson, NATIONAL GEOGRAPHIC MAGAZINE, August, 1922.

CZECHOSLOVAKS, YANKEES OF EUROPE

BY JOHN PATRIC

CZECHOSLOVAKIA writhes lizard-like across the map of Central Europe. Fifteen million people occupy an area smaller than Illinois. Three and a quarter million are Germans, most of whom live near the 900-mile frontier that separates Bohemia, Moravia and Silesia from their former overlords, Austria and Germany.

Of the 14 major political parties in Czechoslovakia, four are German. The Sudeten Party, largest numerically, takes its name from a mountain range in northern Bohemia (map, pages 176-7).

Each Czechoslovak political party holds seats in the two-house national legislature in exact proportion to the number of its voters. None has even a near majority.

Unless a citizen is under 21, over 70, sick, or more than 20 miles from the polls on election day, he must vote, pay a fine, or go to jail. Balloting is strictly secret.

Slovakia and Ruthenia, containing about 700,000 Hungarians, were owned for a thousand years by Hungary, where flags droop always at half staff, 20 years after the World War, for lost lands and peoples it hopes some day to regain.

FROM LYNN TO ZLÍN

Though I was to see woodsmen in costume cutting logs into lumber with hand-saws, living in chimneyless houses, and for shoes wearing a single piece of leather tied to each foot with thongs, it was in Zlín that I became convinced that Czechoslovaks are, in effect, the Yankees of Europe. One midwinter day, immediately after my arrival in Czechoslovakia, I went to see the immense Bata shoe factories, industrial symbol of a national era.

Thomas Bata (pronounced Bat-ya), with several of his workmen, went to the United States in 1904, and they all got jobs as shoemakers in Lynn, Massachusetts. Returning to Zlín, he introduced American methods into his little factory. Today there are 61,000 Bata employees scattered over the earth.

As I was waiting for my friendly guide in an office on the top floor of one of the factory buildings, the whole thing—desks, stenographers, telephones, and all—suddenly dropped toward the basement. Unperturbed, everybody went on working.

We stepped out at the ground floor, and rode to the executive offices on an intraplant omnibus, past buildings plastered with such mottoes as:

Hats off to work.
Unambitious wife—a lazy husband.
The world needs 1,000,000,000 pairs of shoes.
Pay cash—don't borrow.
Dogged does it.

J. A. Bata, brother and successor of the founder, was then flying across India, selling shoes. D. Čipera, the general manager, showed me his chief's office, where a clock ticked off the time of a dozen world cities, and where a pad of outline world maps, some six feet across, crayon scribbled, hung behind the executive desk.

TELEPHONE HOOKUP WITH THE WORLD

On the desk stood several telephones, one a loud-speaking instrument, and a microphone connected with a public-address system in factory buildings. Lights flashing under a glass map of the works would indicate which workers were listening.

Annually, 250,000 long-distance telephone calls go through the Bata exchange; there are factories in eight countries, sales offices almost everywhere shoes are worn. Calls to distant cities are flashed on a screen in Bata's office. He may pick up a telephone and join the conversation.

"Over there," Čipera explained, "the new 16-story administration building is going up. This is too small. In the new building, Mr. Bata's office, and mine, will be built in elevator cages so heavy that it will take two sets of the most powerful American machinery to lift each one.

"How does it work? For example, if I must call buyers into conference, I press a button, start my office moving to their floor, continuing my work all the time. When my office gets there, I ring for the buyers to come in.

"If Mr. Bata wants to visit the sales force, he can dictate or telephone as his office goes to them. Good men are hard to get; saving time for those we have is like having more of them."

With a group of employees, whose lunch period is two hours, I ate in the dining room of a large Zlín department store.

After lunch, some workers saw a movie. The largest cinema theater in Central



Photograph courtesy Czechoslovak Legation

PRESIDENT BENEŠ (RIGHT) CONFERS WITH THE "FATHER OF HIS COUNTRY"

Long a leader in the fight for Czechoslovak independence, Thomas Garrigue Masaryk (1850-1937), for nearly 30 years university professor of philosophy at Praha, married an American girl (page 189). When the World War broke out, he fled to Paris, organized his exiled compatriots, and in 1918 came to America. He wrote Czechoslovakia's Declaration of Independence in Washington, D. C., and became his country's first President. Eduard Beneš, his Foreign Minister, now is President.

Europe stood near the factory gates where even J. A. Bata punches in like the humblest apprentice (pages 175, 190). Though admissions run as high as 50 cents or more in Praha, here all seats were 10 cents. Only four years old, the theater building was already too small, and plans for a new one were being drawn.

"One low price" is a principle applied to every Bata enterprise. Best rooms and bath in the new Zlín hotel cost 80 cents.

That night I had dinner with Bata's safety director. He had been a workman earning \$5 a week (equal in Zlín, though not in Czechoslovakia generally, to about \$20 in the United States) when he won a "safety first" contest and a new position.

RIDICULE FEARED MORE THAN INJURY

Though shoe machinery is run by 24,000 self-contained electric motors instead of exposed line shafts and pulleys, careless men were often hurt. My host made a lifelike dummy. When a workman is injured now, the dummy is bandaged like the victim and hung near factory gates for workers

to see. It is labeled, perhaps: "I'm Jan Sloupa. I tried to fix a riveter without cutting the power. Look at me now!"

Because men seem to fear ridicule more than injury, the idea works.

The safety director's six-room brick house, with garden, built-in garage, and telephone, rented for \$1.60 a week from the company. When he was earning less, he lived in a smaller house, modern also, where weekly rent was 50 cents.

After dinner we saw a night session of the Bata college, its physical plant the equal of many a small college in America.

Non-employees who live in Zlín, or who come here to study, pay a small fee. Anyone is welcome. Employees pay for courses that have no bearing on their jobs; the company pays for those that do.

The next morning was dark, damp, and snowy. The home of Thomas Bata's widow stood in wintry isolation in a park at the end of an icy street. A wealthy woman, she remains in the city her husband built. She lives in a house well-furnished now, though "bare for many years," she told me,



Photograph from John Patrie

"HOLD OUT; YIELD TO NOBODY," READS A SIGN ON THE PRESIDENT'S STAND

President Eduard Benes (in white), visiting the shoemaking town of Zlín (page 173), addresses a crowd from a stand beside the Bata motion picture theater. Beneath the fighting motto is the coat of arms of Czechoslovakia, with two double-tailed Czech lions holding a shield composed of the coats of arms of its historic lands. The double cross represents Slovakia; the bear, Sub-Carpathian Russia, or Ruthenia; the checkered eagle, Moravia; the lion, Bohemia; the black eagle with the crescent moon on its breast, Silesia; and the lowest three the old Bohemian crown lands of Těšín, Opava, and Ratibor. On the cinema wall a map of the country shows its principal waterways and urges their commercial development.

laughing, "because whenever I wanted a picture or a bookcase, Thomas would mention someone in the factory who operated an obsolete machine."

Mrs. Bata was flying to Praha; she invited me to accompany her.

BY PLANE TO PRAHA

Early that murky afternoon I went to the busy airport. The three motors of a giant British-built plane were idling, warm and ready, despite the weather, to lift us over the white hills of Moravia to Praha. Near us, like chicks, stood a fleet of the Bata-built airplanes.

We flew over wooded hills and cultivated valleys. This country, despite vast, uninhabited forest and mountain lands, is, next to Germany, the most densely settled in Central Europe. That is why Czechoslovakia exports manufactures and imports food.

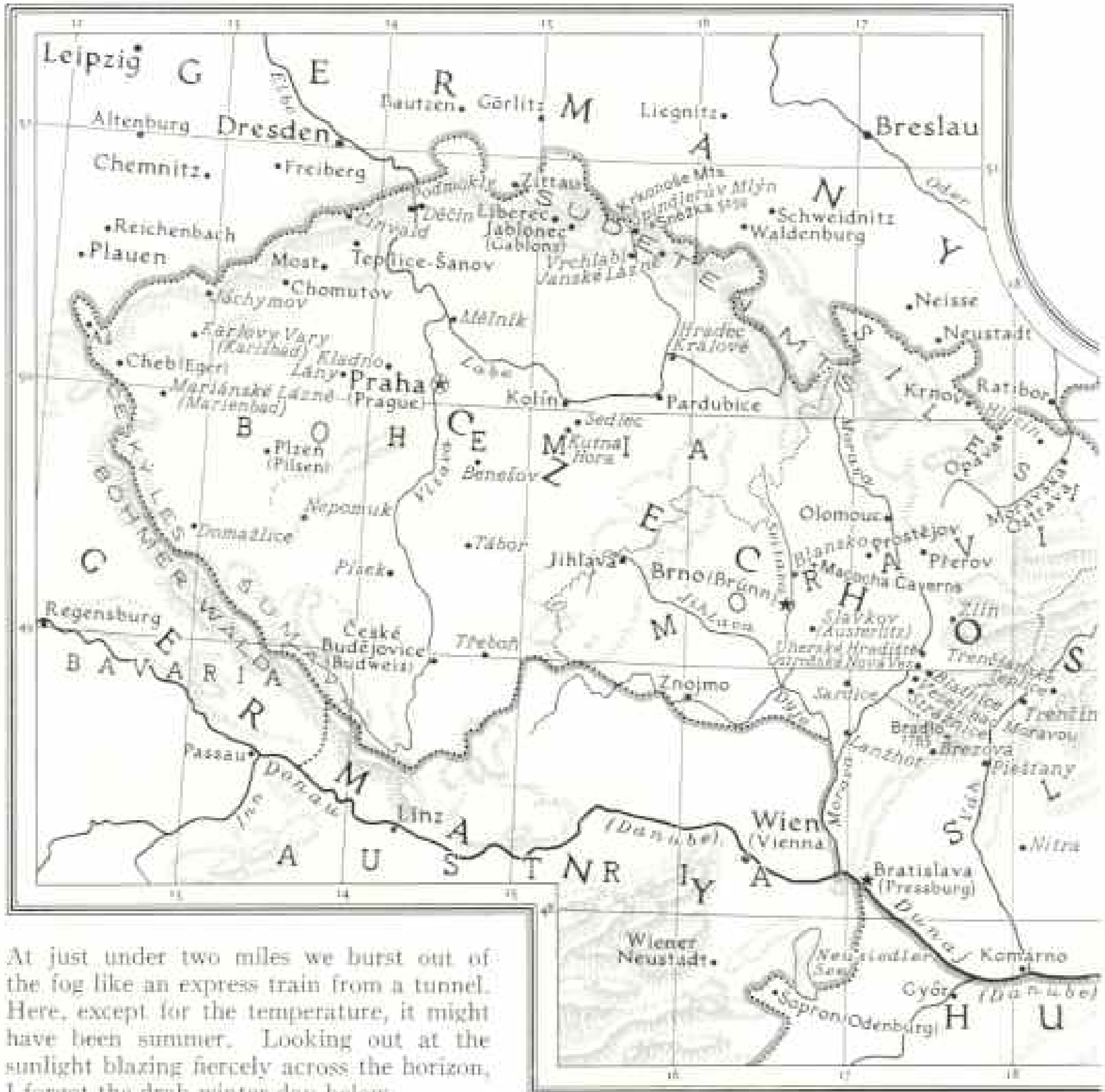
When the Nation gained its freedom, this old factory district of Austria-Hun-

gary lost many markets behind tariff walls that subdivide the former empire today.

As we sped over tile roofs, I fancied I could smell the smoke of fagot fires, drifting upward from chimneys of snug, thick-walled houses (Plate VI), where women even then were busy with churns and knitting. I could see files of geese in snowy streets, and wellheads and strawstacks in the yards. I could even see the chickens that perch on warm manure piles when days are cold and spiritless and there are only snow and ice to scratch in.

Now a freshening wind flattened the blue smoke plumes that had curled so lazily from the chimneys. Our ceiling lowered; sky and storm closed down. Snow whipped past cabin windows. Houses, fields, and trees were blotted out. We were flying blind and began to climb.

At a mile of altitude it was much colder; my breath froze on the cabin window. At 7,000 feet Mrs. Bata tossed me a fur robe,



At just under two miles we burst out of the fog like an express train from a tunnel. Here, except for the temperature, it might have been summer. Looking out at the sunlight blazing fiercely across the horizon, I forgot the drab winter day below.

A V-shaped fleet of fighting aircraft crossed our course, high above us. Had we been an invading bomber, we could have hidden in the billowy fog below us.

Glimpsing flying buttresses of its church of Santa Barbara, I recognized Kutná Hora. Reading of that place, I had been reminded of a ghost silver town in Nevada.

Rich mines and a mint had made it a center of art and architecture in the Middle Ages, when it was second city in a great nation of that time. It was also the second seat of the kings of Bohemia. Bitter history was enacted there 500 years ago, when silver miners in religious zeal tossed hundreds of dissenters down their deepest shafts.

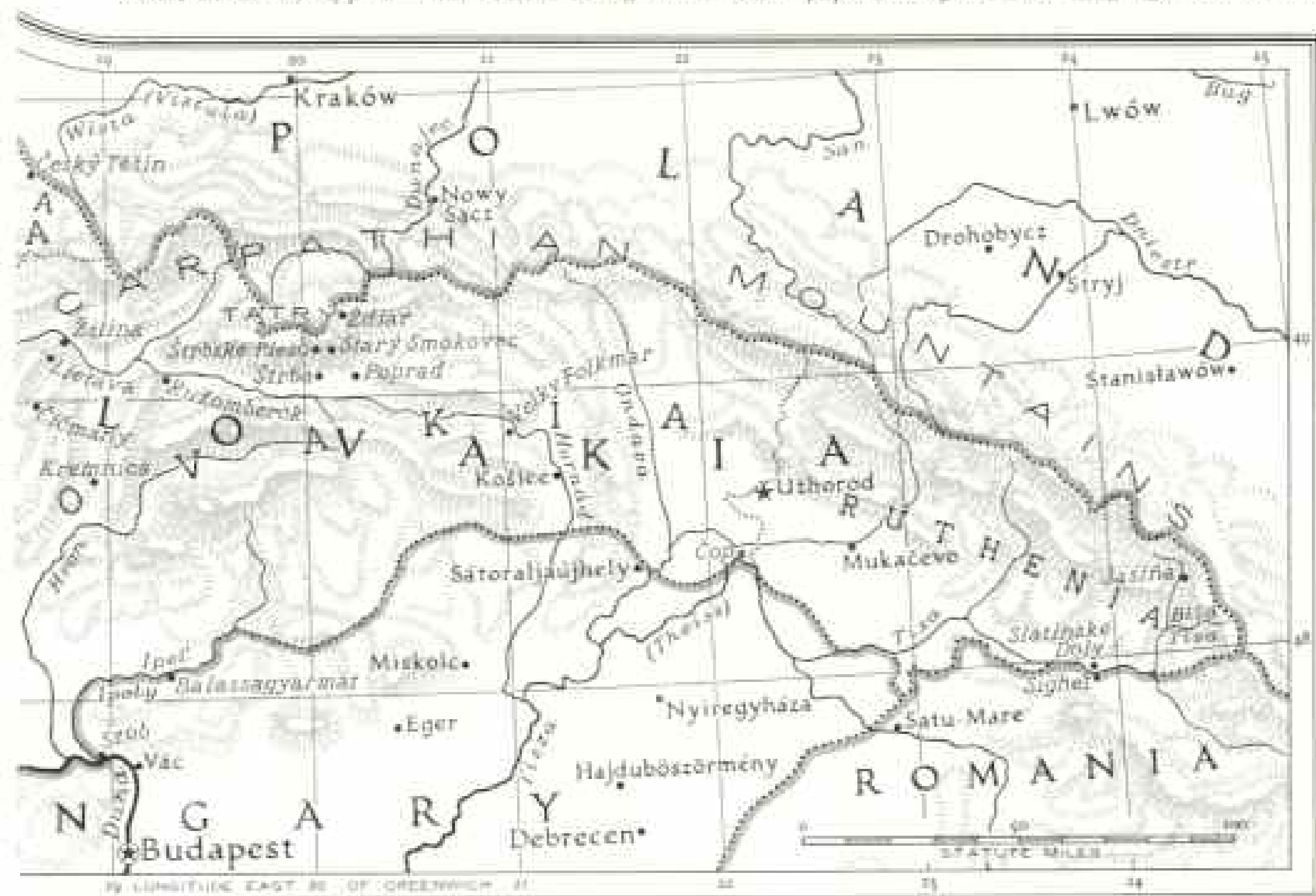
Scarcely more than a village now, Kutná Hora mints money no longer; coins of the Republic are struck in Kremnica and come to Kutná Hora in travelers' pockets.

A GHOULISH MASTERPIECE

Most visited shrine today, perhaps, is the charnel house of a Cistercian abbey in the adjoining village of Sedlec, built of human bones from chapels to chandeliers. In 1518 a plague provided 30,000 skeletons to start the masterpiece of ghoulish art. War became its patron after that; there are skulls cleft by the sword, smashed by the mace, and drilled by bullets. Meticulous monks, who sorted bones for size and shape, made

WESTERN CZECHOSLOVAKIA IS A SLAVIC PENINSULA IN A SEA OF GERMAN PEOPLES.

The elongated Republic, its government patterned after that of the United States, lies in the very center of Europe, almost surrounded by mountains. From industrial areas in the west it stretches for 600 miles eastward to a region of primeval forests and primitive farms. Its formation, with the help of the Allies after the World War, was the realization of a long-lived dream of restoration. The Kingdom of Bohemia, larger than the present province, was old and still powerful when Shakespeare laid part of his play, *The Winter's Tale*, on mythical deserts near its nonexistent seacoast. The Czechs, an ancient Slavic race, have lived in what is now central Bohemia and Moravia for nearly 10 centuries. Around their frontiers are Germans. The year the Pilgrims landed from the *Mayflower* in New England, Czechs lost their freedom. When they regained it three centuries later, on October 28, 1918, the Franz Josef railway station in old Prague was renamed for Woodrow Wilson. Today the Sudeten Germans appear often in newspaper headlines; their name is derived from the Sudeten Mountains in northern Bohemia and Silesia. Slovakia and Ruthenia, the eastern provinces, were parts of Hungary for 1,000 years. Though dominated today by Slovaks and Ruthenians, they also contain Czechs, Jews, Poles, Germans, Gypsies—and 700,000 Hungarians. Some paper money uses five languages on one bill.



Drawn by Newman Barnstead and Ralph E. McAtee

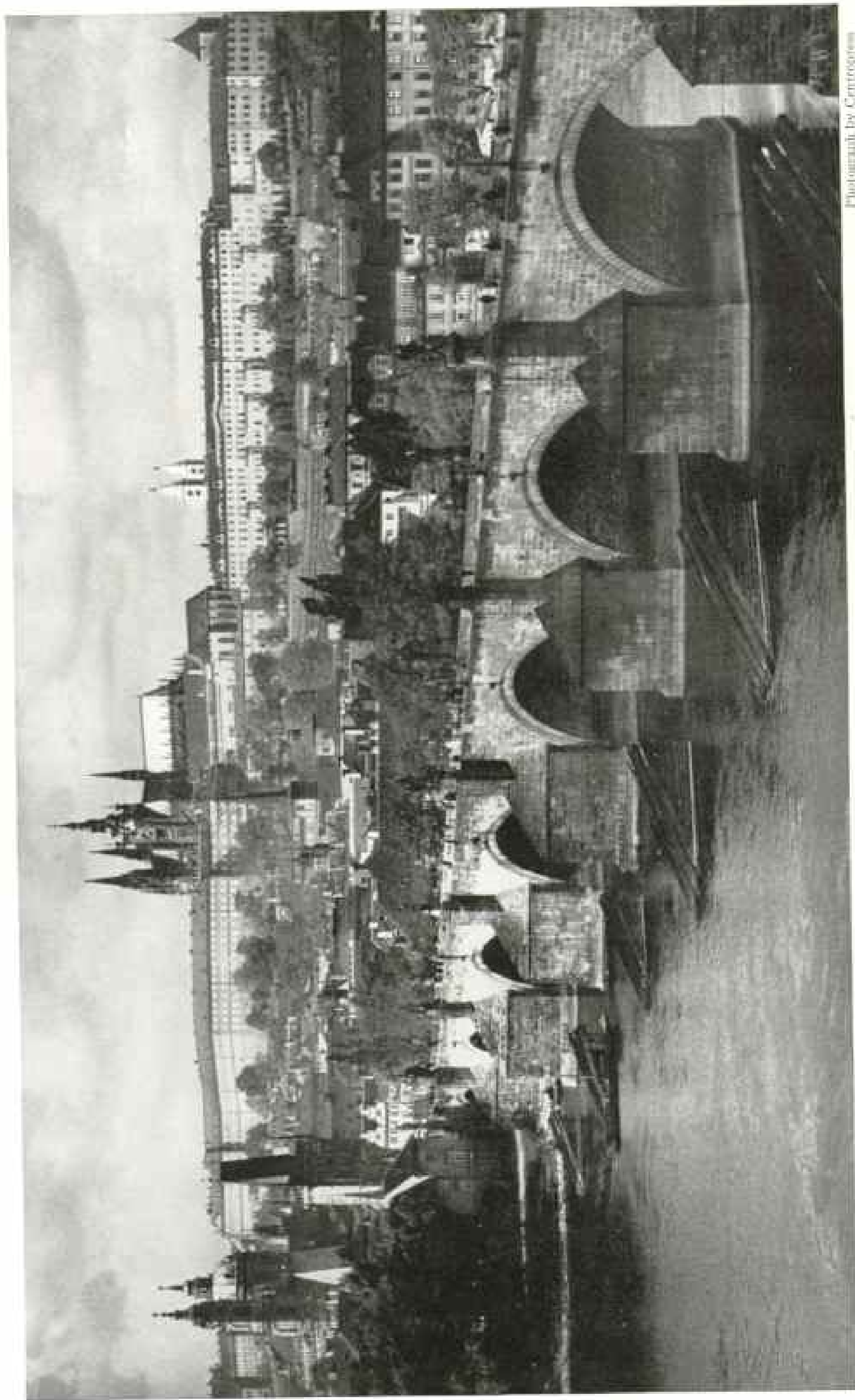
ingenious use of misshapen ones where unusual patterns required them.

To let me glimpse Praha from the air that winter evening, our pilot swung his ship in a circle before landing near the city. Street lights were already burning; their beams shot skyward through thin, low-lying fog. A hundred towers, sharp-tipped and delicate, pierced and silhouetted themselves against the misty veil that lay so lightly white over old Prague—a fairytale in stone (Plate I).

Far below us the Vltava River meandered through the town beneath thick ice (Plate II). On Hradčany, a hill above it, stood the Castle of Praha (page 178). The

Bohemian prince-saint who is "Good King Wenceslaus" to English carol singers founded St. Vitus more than a thousand years ago. Hradčany epitomizes the stormy story of Bohemia, for in every historic Czech drama some scenes were here.

Below the castle, across the river, is "Old Town." Its medieval houses and masonry pinnacles are preserved in the heart of a changing city that is twice its prewar size. Semicircling Old Town is a shopping district. Here a few new and many remodeled buildings are sprinkled among structures that, except for their shop-lined arcades, resemble the older parts of many American cities.



Photograph by Centropress

"THE WHITE HOUSE OF CZECHOSLOVAKIA," WITH SCORES OF DESERTED ROOMS, REACHES FOR BLOCKS ACROSS THE HORIZON

The Castle of Praha once was the residence of Bohemian kings and noblemen. St. Vitus Cathedral rises from the immense courtyard within it. Today the extreme left wing is occupied by Edouard Beněš, President of the Czechoslovak Republic. The Chief Executive's guards still wear the uniforms of Russian, French, and Italian armies in the World War, under whose banners patriotic legion fought to liberate their country. The Ministry of Foreign Affairs maintains some offices in the old castle, but many of its old-fashioned ornate chambers are closed and locked. Hradčany is the name of the entire hill, and thus of the Executive Mansion. In the foreground is Charles Bridge, lined with statues of saints (Plate I and page 225). Log jetties protect the piers of the 600-year-old span from ice jams in the spring.



Photograph by W. Robert Moore

GAIETY AND BUSINESS IN PRAGUE CENTER ABOUT WENCESLAUS SQUARE, NAMED FOR THE PATRON SAINT OF BOHEMIA

A statue of Good King Wenceslaus, of whom English carolers sing at Christmas (page 177), faces down the square. Less than half a mile long, the street, called Vítězslavské náměstí, is the finest in the Republic. It is a favored location for hotels, automat cafeterias, coffeehouses and stores. Movie theaters are usually built in boulevards.

Fifteen minutes later I was sitting in the coffeehouse of a Bata shoe department store in Wenceslaus Square (page 179), drinking coffee-and-milk with thick whipped cream, eating hot jelly doughnuts, thawing, and thanking my hostess.

At the Prague English Club I met George, who knew Bohemian history, knew his city, and spoke my language well. He walked with me one cold evening across Old Town. Some narrow streets were wider than the strip of dull sky above them, for lower floors of the adjoining houses receded like Andy Gump's chin.

Beneath upper stories in one arcade of shops we paused to look at a hardware store window filled with low-priced gas masks. All citizens of Praha are required by recent regulations to keep them on hand.

We continued along wider streets, between palaces of the past. Imposing façades of some were frescoed: outlines of elaborate pictures had been scratched deeply, long ago, into the wet plaster.

Above some portals remain the name plates of medieval times—easily recognizable statuettes. "The Sign of the Golden Angel" glitters protectingly over the door of what is now a restaurant. At the Sign of the White Swan is a bakery. Near by are the Saint and the Dragon, the Madonna, and the Three Cranes.

Presently we came to Old Town Square, with its Týn Church and astronomical clock (page 206 and Plate VIII). Here 27 Bohemian leaders were executed in 1621 by victorious Hapsburgs whose rule was to continue for three centuries.

A QUEEN WAS TOO FRIVOLOUS

"Perhaps reformers went too far," George remarked. "The wife of the last ruler of Bohemia was unpopular partly because she had no settled hours for meals or prayers, and because she wore low-necked dresses."

We walked across Charles Bridge, between the ranks of cold stone saints, and continued our cold journey toward Malá Strana, an old section below Hradčany that is called "Little Town." Noblemen's palaces there have become foreign legations. The German Legation was guarded by police.

Our goal was a 700-year-old basement restaurant. Wenceslaus IV, they say, used to come down the path through the woods from Hradčany with a lantern, sit by a

fireplace there and sip a drink called mead, or honey beer.

By our corner table was a little sign: "Here meets the Felix Table Society," with a picture of a comic-strip cat.

George explained an old Bohemian custom. "As a rule, we don't invite friends to our homes. We see them in restaurants or coffeehouses. Little groups, calling themselves 'table societies,' meet regularly, often for years, in a certain restaurant. One is gathering now; maybe it's the Pop-eye the Sailor Society."

A TABLE SOCIETY MEETING

Singly and by twos came members, all fortyish, until 20 men and women had gathered around one long table. They ordered beer. Sometimes a "chill remover," a polished metal gadget shaped like a short candle, was filled with boiling water and hung inside the stein.

Two men debated across the table. "They're arguing politics," George said. "The big fellow disapproves of the administration. He thinks it represents so much compromise between so many parties that no legislation of real importance is ever passed. He seems to be in the minority."

There was singing as steins were drained and filled again. From the street came an old man, a box slung from his shoulders. He shook snowflakes from his whiskers.

"Sardinkář!" shouted a diner.

He came to us at last, the sardine seller, displaying tantalizing fish filets, and pickles made of little onions, turnips, cucumbers, and fine white cauliflower. For ten cents he gave me samples, plucked carefully from jars with his tongs.

Every night he visits twenty little inns, he said. Proprietors welcome him; he revives drooping thirst. Salty fish he buys; his wife makes the pickles. Cauliflower, he told us, was most difficult to preserve.

"Can you earn much?" asked George.

"It's a bad night," said the sardinkář, proudly, "when I don't make 30 crowns." That is a little more than a dollar.

Though political arguments do not concern Czechoslovak police, crime does. At central headquarters of criminal investigation a few days later, I was shown a comprehensive record that lists everyone.

"It has uses other than criminal," the director said. "A woman may locate a lost sweetheart, or a man can find the fellow who borrowed 50 crowns and left town.

CZECHOSLOVAKIAN CYCLORAMA

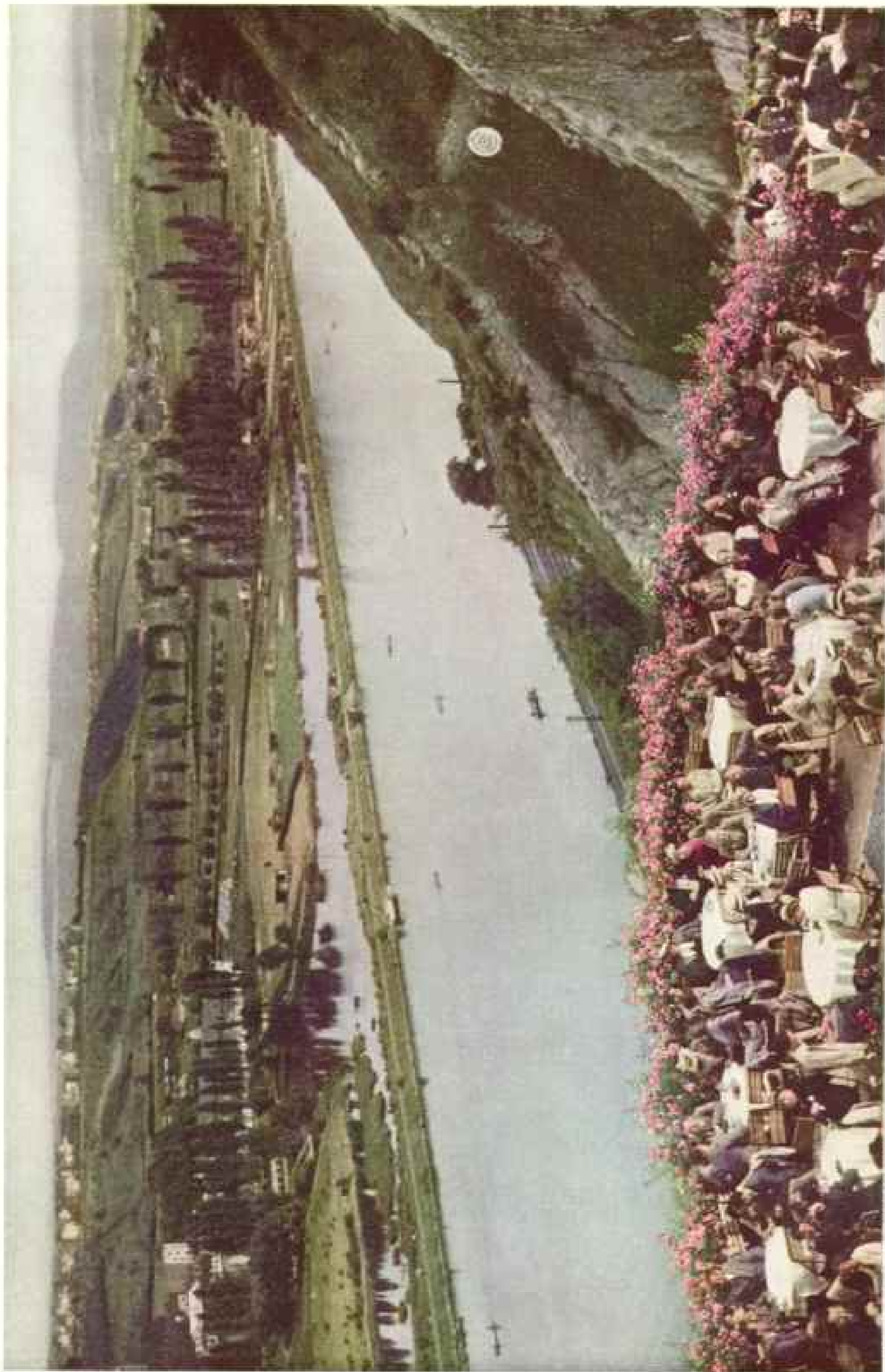


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Finlay Photograph by W. Robert Meyer

AN ALFRESCO MUSEUM OF HOLY STATUARY LINES CHARLES BRIDGE IN PRAHA

"Hundred-spired, golden Prague," often called "Rome of the North," owes much of its surviving medieval sculpture to pious King Charles IV of Bohemia, who lived 600 years ago. The Bohemian kingdom lost its freedom about three centuries later, at the time the Pilgrims landed in America. The next year, heads and hands of Czech patriots, impaled on spikes, were displayed as a grim warning above this tower gateway. After 300 years as a subject people, Czechs, along with Slovaks, Germans, and Ruthenians, were incorporated in the Republic of Czechoslovakia, formed as a result of the World War. Praha today is twice its prewar size; many of its newer streets and business buildings resemble those of the United States.



© National Geographic Society

SEDE-WHEELERS PLAYING THE VLTAVA, BRING HOLIDAY CROWDS FROM PRAHA TO THE ROSE-FRINGED TERRACES OF BARRANDOV.

This outdoor cafe has a swimming pool and, for rainy weather, an indoor restaurant. The double-track railway links Praha with Píseč, home of Pilsener beer and the immense Škoda munitions works. North of Praha, the river joins the commerce-laden Labe (Elbe in German).

Photo Photograph by W. Robert Moore



© National Geographic Society.

A SMILING GIANT IS ADVERTISING, NOT PICKETING

Many styles, at the Rekord Store," reads a sign carried in Uberské Hradiště. Beneath the paper-smith's lace and stuffed skirt walks a man all children envy.*



Finlay Photographs by W. Robert Moore

FOLK COSTUMES ARE NOT KEPT IN GRANDMA'S ATTIC TRUNK

Softly stuffed with down, leather beds are piled with pillows in the parlors, for display and for special guests to use like quilts. Braided ringlets of the Lanzhot girl's hairdress represent the work of almost two hours.



Finlay Photograph by W. Robert Moore

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YOUNG WIVES OF SARDICH COME TO TOWN IN EMBROIDERED STOCKINGS, PIERCED BOOTS, AND STUFFED SLEEVES



© National Geographic Society

POTTERY REFLECTS A NATION'S LOVE OF COLOR

Two city girls, examining Czechoslovak porcelain Scotties, dress more simply than their country cousins. Merchandise is sold from portable shops like this in the market place in Praha (Plate I).



Finley Photographs by W. Robert Moore

"WATCH THE CAULIFLOWER, SIS; I'M GOING TO MASS"

Trekking from the farm with baskets and produce carts, and dressed in Sunday finery, country folk near Dornazhne combine marketing with churchgoing, thus saving a trip to town (Plate X XIV).



© National Geographic Society

CLOSE TO THE LAND AND THE CHURCH, CZECHOSLOVAK FARMERS GENERALLY LIVE IN VILLAGES, RATHER IN THEIR PARCHES

Strips of hillside fields about Velky Folkmár are owned by frugal, neighborly husbandmen, whose barns and storerooms are part of their neat, whitewashed houses (Plate X). In the distance a motor road winds into the foothills, toward the High Tatras of Slovakia. Schoolgirls, resting after a climb on a summer afternoon, will soon be old enough to work in the fields with their fathers.

Finlay Photograph by W. Robert Moore



© National Geographic Society

Finlay Photograph by W. Robert Murray

MEMBERS OF THE CATHOLIC PARTY MARCH IN CHEREŠSKÉ BRADISTĚ; THE TOWN NAME MEANS "LITTLE HUNGARIAN CASTLE."



© National Geographic Society

Finlay Photograph by W. Robert Moore

THE OLD TOWN CLOCK TELLS TIME, THE SEASONS, AND PHASES OF THE MOON

Built before America was discovered, the astronomical instrument on the Old Town Hall in Praha still ticks off months and minutes with fair accuracy. On the hour a cock crows; upper windows fly open; Christ and his Apostles file solemnly past. Figures beside the dials become animated: Vanity looks at his mirror and Avarice clutches a moneybag. Then Death, holding an hourglass, tolls the passing of another 60 minutes. Legend says the builder was blinded to keep him from making a duplicate clock for a rival city. Old at last, and dying, the blind man was allowed to revisit the tower. With a sledge hammer he smashed the mechanism; for years it remained a wreck.

Without giving us his reason, any citizen may ask us to locate anyone."

Student detectives may study a museum of past crimes and the methods of solution. "Usually it's the same sordid story," the director remarked, "though occasionally there's an amusing criminal, like the carpenter who wasn't afraid of ghosts.

"He got reduced rent for staying in a house after frightened fellow tenants moved when they kept hearing strange tappings at night. Trying to lease the house cheaply, he aroused suspicion. We found this little wooden drop hammer in the garret. It worked with a hidden string.

"Because tobacco is a government monopoly, we watch for illicit cigarettes. One man bought cheap, strong smoking tobacco, mixed it with autumn leaves, made cigarettes and sold them in counterfeit packages. We seized his machine."

One day I was lunching with the editor of a Chicago Czech daily, who was visiting in Praha, and with a diplomat from the Foreign Office. We ordered plum dumplings.

ROAST GOOSE AND PLUM DUMPLINGS

The waiter brought greasy pellets of dough as big as ping-pong balls, with dishes of melted butter, spiced sugar, and grated cheese. The diplomat halved a dumpling and the plum within it, then dipped each half in butter and sprinkled cheese and sugar over both pasty, plum-lined hemispheres. The result was surprisingly good. Roast goose, plum dumplings, and beer are specialties of the country.

That afternoon I drove with the editor through farm and frosty forest to Kladno, coal mining town west of Praha. "These are beautiful roads in spring," he said, "when trees are blooming." Combining fruitfulness with shade, apple and pear trees are planted along Bohemian highways and leased to provide funds for road repair.

Our Kladno destination was a cottage on a narrow street, where was born a boy who became mayor of Chicago and died in 1933 by a bullet intended for President-elect Roosevelt (page 193).

We examined the humble house. An old woman is paid by the town of Kladno to care for the shrine. Everybody remembers Anton Joseph Čermák. "I was with him once," the editor said, "when he made a speech, in Czech with an American accent, here in the town square. He knew how little money the kids had; so he bought a

hundred dollars' worth of five-crown pieces—more than 500—and gave them away."

Returning, we paused to visit a country castle at Lány, near Praha, where lived Thomas Garrigue Masaryk until his recent death. He had been President from the beginning to December, 1935, of the democracy he built. For some years his successor, Eduard Beneš (pages 174, 175), came every week for lunch and advice from his old friend and mentor—wise, liberal, and tolerant, for having lived and loved liberty so long.

INDEPENDENCE BORN IN WASHINGTON

In a hilltop cemetery beyond the village we visited a grave marked by a stone as simple as those around it, except for its bronze lantern for evenings when graves are lighted. There rests Charlotte Garrigue, the American girl Masaryk met in Leipzig and married more than 50 years ago.

Long before the Czechoslovak Republic existed, Charlotte Masaryk gave to her professor husband a love and understanding of the United States. So great was his devotion that he took his wife's maiden name for his middle one.

Masaryk wrote the Czechoslovak Declaration of Independence after a talk with Woodrow Wilson at Washington, D. C., in 1918. He did the actual writing in his rooms on 16th Street, the thoroughfare upon which the headquarters of the National Geographic Society are located.

Constitution Day is celebrated only once every four years, because that document was ratified February 29, 1920.

Next day I chatted with Karel Čapek. His play, *R. U. R.*, gave to the English language the word "robot," from the Czech *rabota*, "to work without pay."

I found him late one evening, characteristically hard at work in a Praha newspaper office. I suggested that he invent an "editorial robot."

"Do Americans still use that word?" he growled, pleased.

"We've given you plenty of slang in exchange," I said.

Čapek laughed. "This country's getting more like the United States every day."

His new play, *The White Plague*, was being discussed everywhere. Seats were sold out for weeks in Praha; I saw the drama from a chair in the aisle.

A fatal disease, attacking only the middle-aged, creeps into an imaginary land



Photograph from John Patric

BATA SHOES ARE SOLD ON EVERY INHABITED CONTINENT

When the noon siren blows, 18,000 Bata shoemakers stream past time clocks at the factory gates; beneath signs that suggest "first of all, we should be properly shod." Near this entrance, when the author visited Zlín, a new 16-story administration building was being erected, with executive offices built in elevators to save time (page 175). Some employees go home for the two-hour lunch period; others flock to the immense dining rooms in the ten-story department store in the background, and see a movie afterward. Hours of employment are from 7 to 12, and 2 to 5.

ruled by a dictator. First dread symptom is sudden loss of feeling in some part of the body. The vibrant-voiced ruler has spurred his people to conquest. Young men train for war; their leader is radiant with courage.

The plot hinges about a shabby doctor who discovers a cure for the White Plague. He keeps his secret, cures humble sufferers, but refuses to help munitions makers and ambitious bureaucrats.

FROZEN RIVER A BUSY PLACE

In winter people cross the Vltava on the ice. There is always activity; men with shoes wrapped in gunny sacks stand on boards and fish hopefully through holes. Others harvest ice cakes. Some skate to

calliope music. Boys coast across the river from steep slopes beside it.

If I became cold, I could sit in a riverside coffeehouse as long as I liked. These cafes acquire the character—businesslike, urbane, or gay—of their clientele. In them students work, journalists write, business men close deals. Patrons play chess, checkers, or cards. Many read papers and magazines from the periodical library each coffeehouse maintains.

Most movies in Praha are in large cellars beneath store and office buildings. Patrons descend to the balcony. The closer to the screen the cheaper the seats. All seats for each performance are reserved. Latecomers are few; they may not see part of the next show without new tickets.



Photograph by J. J. Jeníček

GIRLS LOVE THE SOLDIERS, AND SOLDIERS LOVE THEIR BEER

Bivouacked in border towns bright with costumed lasses, the conscripted Czechoslovak Army is ready for what troubled times may bring, especially if it's Pilsner in a frosty, battered mug.

One corporation owns and rents to producers the film studios where Czech pictures are made on a high sunny hill near Praha. Anny Ondra, Czech star, wife of Max Schmeling, was working on the set at the time of my visit. One of her two leading men spoke German, the other Czech. She was fluent in both. Each scene was recorded twice, in German and Czech.

THE MOUNTAINS OF A GIANT

Because it was winter, I did not go to Karlovy Vary, the old spa called "Karlshad" by the Austrians, nor to near-by Jáchymov, long called "Joachimsthal," where bathing waters are radioactive, and where radium is produced from uranium ore. Joachimsthal silver once was minted into thalers, forebears of the dollar.*

Instead, I went to the Krkonoše, called Riesen Gebirge, or Giant Mountains, by

the Germans, not for their mile of altitude, but for Krakonoš, a giant in Czech folklore, whose kingdom they are. Krakonoš, they say, likes to stop millwheels, climb into tired travelers' packs, or change himself into a stump beside a muddy road and vanish when someone sits on him. He punishes injustice, rewards virtue, and hates misers. Because a princess once tricked him into counting beets while she ran off with a rival, he is still a bachelor.

On a sunny morning I climbed a ski trail that zigzagged up a forested mountainside. The trail crossed a steep slide with rounded sides and banked curves. It seemed a quick, if arduous, way to the mountain top. Watchfully, lest I be struck by a toboggan, I climbed for nearly an

* See "Geography of Money," by William Atherton Du Puy, NATIONAL GEOGRAPHIC MAGAZINE, December, 1927.



Photograph from Vojtěch Kuban.

IN PERFECT UNISON, 16,000 SOKOLS DRILL AS COLUMNS OF 500 IN A PACKED PRAHA STADIUM

If liberty were threatened, the nonmilitaristic Sokol could mobilize most of its 400,000 members. Inspired by the Italian struggle for independence at that time, the movement was organized in 1862 to promote discipline, strength, and national solidarity when Czechoslovaks were subject peoples.



Photograph by W. Robert Moore

"I AM GLAD IT WAS ME INSTEAD OF YOU"

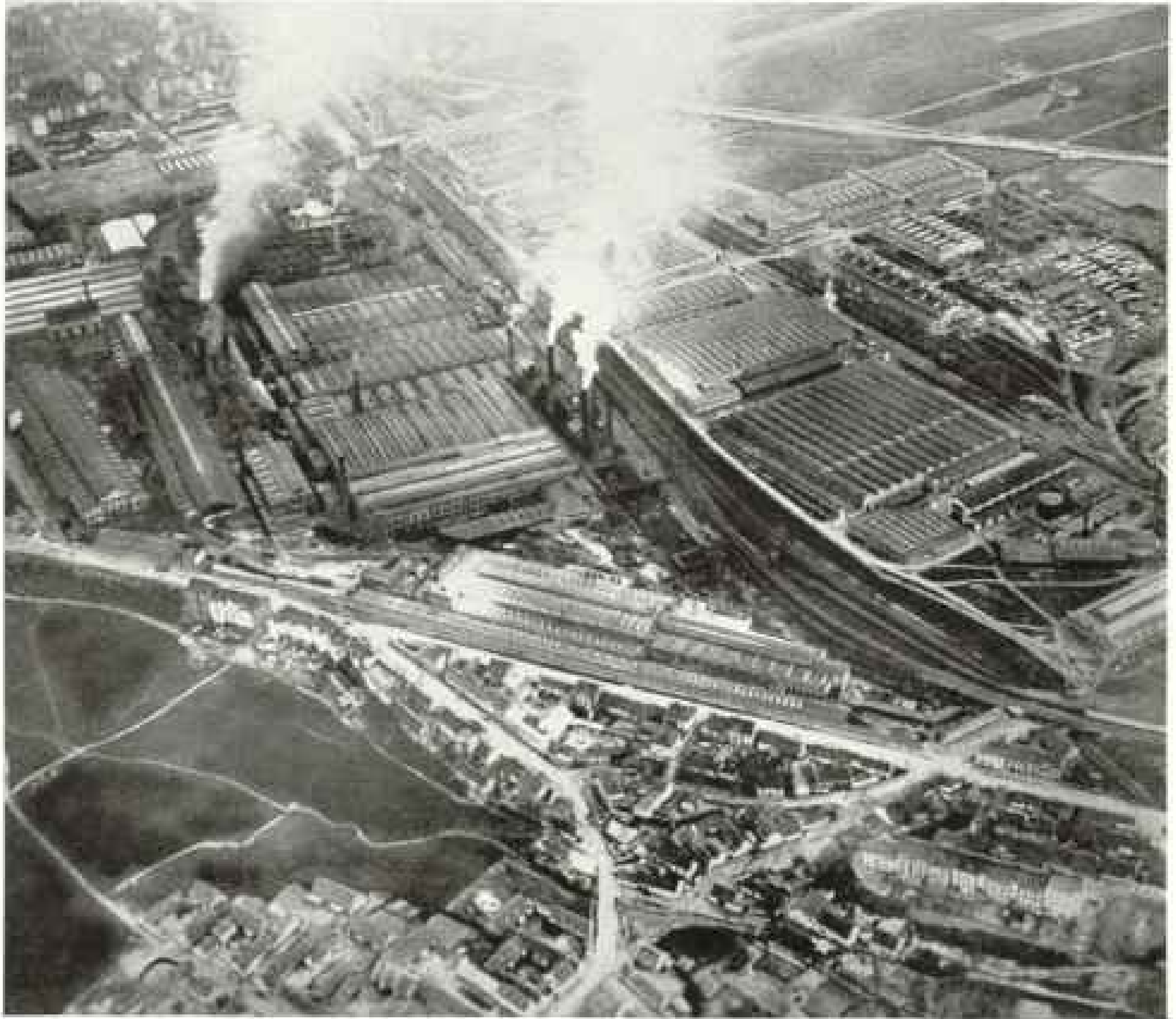
So spoke Anton J. Cermik to Franklin D. Roosevelt when the Mayor of Chicago lay fatally wounded in Miami, Florida, in 1933, by a bullet intended for the President-elect of the United States. A bronze plaque, gift of Chicago's Spartan Athletic Club, marks Cermik's birthplace in Kladno (page 149).



Photograph by John Paric

ICICLES AT MACOCHA GROW FAT AND UPSIDE DOWN

Water, seeping through the limestone ceiling of a cavern in the Moravian Karst (page 135), remains liquid even in winter because of the warmth of the earth. Falling in drops, the water chills in the cold air, then freezes as it strikes the ground, slowly building up stalagmites of ice that will melt before summer.



Photograph by Arne

BEHIND THE CZECHOSLOVAK ARMY IS THE GIGANTIC ŠKODA FACTORY

Foreign customers must be friends or allies of Czechoslovakia to obtain a government permit to patronize the munitions works at Píseň. Romania and Yugoslavia, fellow members of the defensive alliance, the Little Entente, are large buyers. So is China. Specializing in heavy guns, the plant likewise manufactures motorcars, tractors, railroad equipment, ships' propellers, and machinery.

hour, almost grateful for the shade of snow-laden evergreens.

At the lip of a level bench I looked backward. In Špindlerův Mlýn, tiny and far away, sleighs stood in a row by the hitching post near the river. Skiers plodded up the main street as children on sleds sped down. Sledgeloads of logs moved slowly along the river, destined for the chugging gang saw of a hungry little lumbermill.

RIDING THE LOGS

There was a shout behind me; I leaped aside for three sliding logs, butt ends lashed to a sledge. Speed slackened here. Without thinking, I climbed aboard. Braced on a high-backed sled, steering with long handles, stood a woodsman, his eyes on the sunken ribbon of snow trail winding breath-

lessly down the mountain. He did not see me.

We gathered speed. I clung, scared now, to the bark of the limber, dragging end of the top log. We whisked through shade and sunshine, zipped past trees and under frozen boughs. Powdery snow stung my face. On sharp curves I was whipped through snowdrifts. We rose over humps; as sled and driver thudded to the trail again, my end of the logs sprang skyward. Soon the slope became gentler, our speed slower. We glided to a smooth halt at a loading platform by the town.

The woodsman leaped from his sled, brushing wind tears from his eyes. He turned, saw me, snow-covered, tottering unsteadily, and said things in Czech.

Ascent of Schneekoppe, or Sněžka, was



Photograph by Jiří Jandáček

FRIENDLY CURTAINS OF SMOKE, NOT POISON GAS, FALL ON ADVANCING INFANTRY

Tanks lead a practice charge across rugged terrain. Czechoslovakia's irregular frontier cannot be defended by battleships. It is too long for a complete chain of subterranean forts such as France has built on her German border. The exposed democracy has relied on pacts with France and Russia, membership in the Little Entente, a conscripted army, a crack air force, and the Škoda works (p. 194).

easier. By aerial railway I floated from Janské Lázně over the trees to a high mountain tableland where frosty inns rent skis for 20 cents a day.

Novices may progress, if they can, from rolling mountain meadows to steep, difficult slopes lined with brown-coned evergreens that bow like green-robed patriarchs with icicles on white beards.

A CRUISE IN A DISAPPEARING RIVER

From the Krkonoše I went south by train across the continental divide to Brno, second city in Czechoslovakia, capital of Moravia, and then to Blansko and the near-by Macocha Caverns.

Like something Poe had imagined, Macocha Abyss, some 400 feet deep, is a dread sinkhole in the forest, shaped like

an hourglass (page 193). For centuries it defied descent. At its bottom is a sandy meadow with two little lakes. The Punkva, a disappearing river, roars into one, flows gently to the other; then it vanishes, gurgling.

From a near-by canyon we entered tunnels blasted by dynamite. On the surface above us were the forests, farms, and icy ponds of that snowy, long-inhabited, rugged limestone plateau, the Moravian Karst. There prehistoric man had trapped and cooked the woolly mammoth (page 205).

The enchanted caverns through which we were clambering could have been a buried castle, complete with noble halls and dismal dungeons. Translucent stalactites, long, slender as pencils, curtained some

sparkling chambers. In others were tiny pools, fountains, and rivulets where albino crawfish have lost the sight they no longer need. Water, dripping from one cavern entrance, formed no icicles overhead: a forest of ice stalagmites grew upward from the floor (page 193).

At last we crossed the bottom of the abyss, entered another tunnel, and reached the Punkva River where it surges upward beside a nether-world mountain. There we boarded a boat, the *Styx*. Sometimes we paddled, sometimes we pushed against stalagmites. Below us, frigid water was 60 feet deep. Suddenly, with an oar, the boatman threw an electric switch. Lights beneath the green water illumined it so brilliantly that the river seemed to glow.

At last, through misty spray, we saw a waterfall by torchlight, crashing down the cavern wall. In some leafy hollow, hidden in the forest above, an ice-covered stream had vanished, and here had joined its river. Through the Svitava, Morava, and the Danube it would reach the Black Sea.

There came a dull dawn as the buried river bore us onward; we emerged through a low, narrow cleft from a wide-mouthed cavern facing a mountain valley. To a miniature dock we tied the *Styx*.

Down the frozen valley, over its stony bed, the Punkva raced happily, its gloomy, subterranean journey ended. At Skalní Mlýn, a tavern by an old water mill, I ate thin, hot pancakes and jam with one of the engineers who, in 1933, had helped to open the Punkva to "navigation." I asked him why the river was so long unknown.

LOWERING AN UNDERGROUND STREAM

"There are so many 'siphons,'" he said, "that, until we lowered the river, no boat could enter. In 1747, Emperor Franz I of Austria, husband of Maria Theresa, sent Nagel, his court mathematician, to explore these caves. Nagel fixed a lighted candle to the tail of a goose and sent it hissing off into the darkness; he discovered little.

"Dr. Karl Absolon, college professor, lowered himself into the Abyss of Ma-cocha, and I explored the river in a deep-sea diving suit. With its underground course charted, we drove an aqueduct through solid rock for a third of a mile to drain off water from the river, lower it, and make it navigable."

Back to Brno, we drove down the valleys of little rivers, across snowy, wooded hills.

We passed countrywomen returning from the forests with loads of dry fagots that dwarfed them. One little boy drove a dog-cart loaded with a big sow (page 224).

We paused at Austerlitz, now called Slavkov, scene of one of Napoleon's greatest victories. "We still find relics here," a farmer said. "Plows turn up teeth, bits of bone, and buttons from uniforms. Sometimes there is even a crucifix or a little shoe from a Russian pony."

Gypsy villages are common in this region. Near Brno I saw an abandoned clay pit where a hundred Gypsies live in a score of one-room huts. In almost every tiny home some one lay sick. Birth rate and death rate alike are high.

GYPSIES HAVE NO WORDS FOR MANY BIBLE TERMS OR FOR TIME

In Brno there lives a professor whose hobby is little-known languages. He had been translating the *Acts of the Apostles* into the Romany tongue.

"Trying to translate 'Savior,'" the linguist told me, "I found no Gypsy word for 'save' or 'help.' So I call Jesus Sastip-naskro, 'the Healthgiver.' 'Sincerity' and 'simplicity' cannot be translated literally; I use 'open heart' and 'childlike heart.'

"Gypsies are easterners, without words for time. It means nothing to them. There's no word for 'straight' and none for 'honest.' Something bright and new they cannot call 'clean'; it is simply 'beautiful.'

"Words of possession and the verb 'to have' in all its forms are missing. If a Gypsy steals something, he never calls it 'his.' It has simply existed; someone else was using it. Now he has it."

The linguist gave me the address in Brno of a place called "Ivka," where a Czech graduate of Vassar conducted an English conversation club. Ivka, I discovered, was the Czech pronunciation of "Y. W. C. A." The clerk, observing that I spoke no Czech, said in simple German that the Vassar alumna was attending a lecture. It was nearly over; I might wait.

I wandered into the lecture room and sat down just as a movie flickered to an end and lights revealed a little audience of women. When the lecturer saw me, she scolded sharply in Czech. The audience looked annoyed. A young woman approached me, and explained in English that this had been an intimate lecture, "for women only."

CZECHOSLOVAKIAN CYCLORAMA



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Finlay Photograph by W. Robert Moore

"IT TAKES HALF AN HOUR TO DRESS; MY SLEEVES ARE STUFFED WITH PAPER"

Remarked the innkeeper's daughter, who wears aprons all week, when she appeared in her holiday dress. The NATIONAL GEOGRAPHIC photographer stayed at Ostrožská Nová Ves in the hotel of her father, who is a local leader of one of the many political organizations of democratic Czechoslovakia. This Sunday, his family and 300 followers in costume, he dressed up for a parade (Plate VII).



Finlay Photograph by W. Robert Moore

FLYING BACK TO THE HOMETLAND HE FOUGHT TO LIBERATE, GENERAL ŠTEFÁNIK CRASHED TO HIS DEATH NEAR HERE

Not far away, on the Hill of Bradlo, is an imposing monument to the national hero, killed almost 20 years ago. The legions he commanded, units in the Allied armies, were made up of patriotic Czechs and Slovaks. Sweeping land-reform laws divided large estates of noblemen and made landowners of farmers who cultivate the narrow fields. Wheat, barley, and oats are ripening, almost ready for harvesters from Brezová, the village below.

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FAR FROM HOME WANDERS THE CZECH BAGPIPER

In winter this pair lives in Veselí nad Moravou; in summer they follow the festivals. When father squeezes the goatskin with his elbow, the big bass horn booms forth behind him. As he plays folk tunes with his fingers on the smaller horn, his daughter collects contributions.



Finlay Photographs by W. Robert Moore

A STITCH IN TIME DRIES TEARS

People gather from miles around to the hill church of St. Anthony, near Uherské Hradiště. Some walk; some come in wagons; others pedal bicycles—an amusing sight when riders are multi-peticoated girls who wear pleated skirts ballooning in the wind.



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Finlay Photograph by W. Robert Moore

A VENERABLE GATEWAY LINKS BRATISLAVA WITH ITS VARIED PAST

Once this port on the Danube served as capital of Hungary; now it is the rapidly growing provincial capital of Slovakia. Czechs, Slovaks, Jews, Germans, and Hungarians tread old cobblestones of St. Michael's Street, dodging buses that burn charcoal instead of gasoline. If they break the laws and go to jail, it is to a modern building built partly of glass bricks. If they need medicine, they may seek out the Sign of the Red Scorpion, where an apothecary shop just beyond St. Michael's gateway has been operating continuously since 1310.

CZECHOSLOVAKIAN CYCLORAMA



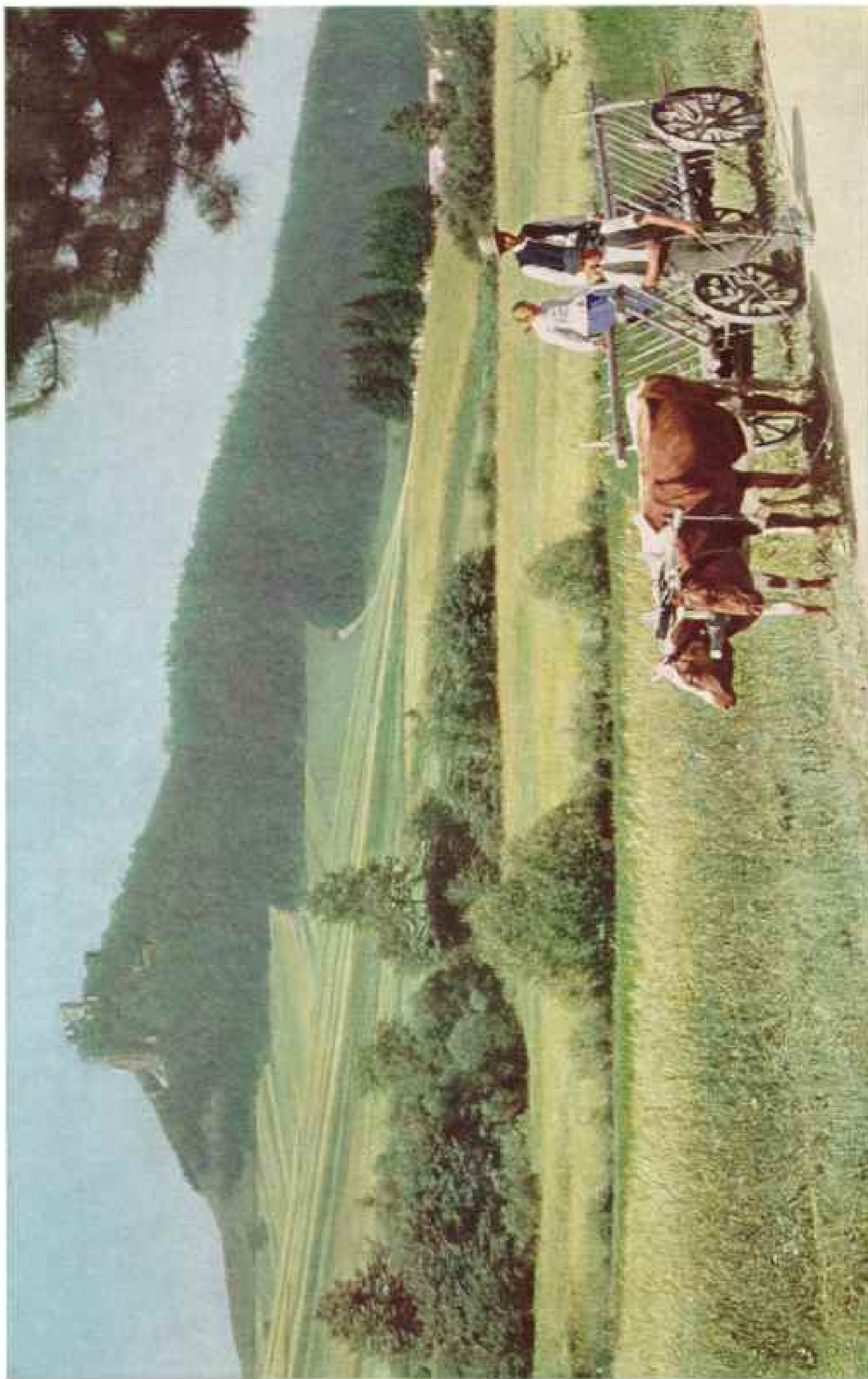
WHEN GRANDMA WALKS TO CHURCH, SHE WEARS CAREFULLY WRINKLED BOOTS. A matron rests on the way to Svatý Antoniček. The basket lunch may be supplemented by large, red, heart-shaped cookies or fresh cherries sold in the churchyard to pilgrims who picnic near by.



© National Geographic Society

Friday Photographs by W. Robert Moore

NOT EVERY HOLIDAY PILGRIM CAN KNEEL IN THE CHURCH ON HOLY MOUNTAIN. So great are summer crowds at the shrine of St. Anthony (Svatý Antoniček) that many of the pious must worship out of doors. Collection boxes affixed to trees receive their offerings.



© National Geographic Society

Finlay Photograph by W. Robert Moore.
MANY A RUINED CASTLE, HIGH ON A CARPATHIAN CRAG, STANDS IN MEDIEVAL MAJESTY ABOVE THE VALLEY OF THE VÁH

This ruin is Lietava, near Žilina, on a tributary of the river. Slovak peasants, driving to market in their oxcarts through fertile mountain valleys, tell their children of the prankster Jamošík, legendary hero of the region, who robbed landed nobility and fed the poor. Once, when geuntletolk had assembled for a castle banquet, the robber knight arrived with his band, pretending to be strolling players with a drama about Jamošík in their repertoire. As their realistic acting was enthraling the guests, bandits and village folk quietly ate the feast.



Finland Photograph by W. Robert Moore

© National Geographic Society

WHEN NEEDLES ARE USED AS BRUSHES, EASTER EGG PATTERNS MAY BE AS DELICATE AS FINE LACE.

Tinted wax, in old spoons fixed to wooden blocks, is melted by alcohol flames. Dipping their needles into the hot liquid, women of Ostrovska Nová Ves draw complicated patterns directly on the shells. Other villagers paint designs with colorless paraffin, then dip the eggs in dye, which stains only the untreated surfaces. Bright and elaborate folk dress, flowers painted on furniture, hand-worked tablecloths, and calcimined cottage walls typify household industry in rural Moravia.



© National Geographic Society

Filmy Photograph by W. Robert Moore

LAZY GIRLS CAN NEVER WEAR LACE AND SLEEVES LIKE THESE!

After many hours at her ironing board she goes, not to a dance, but to church. Her maidenly industry is admired by young men of Blatnice—but only from a distance, lest her hundred pleats be wrinkled. Citizens in democratic Czechoslovakia dress much like Americans, and even farm folk have given up traditional festival costumes in densely populated, industrialized Bohemia. In less urban Moravia, fuzzy jackets and bright-colored skirts, hand-worked collars, and starched, puffy sleeves are usual features of the holiday wardrobe of a countrywoman.

Later, she became my interpreter. We climbed snowy streets to the high fortress of Špilberk (page 207), and looked upon the chimneys of textile mills that employ so many of the population. Below us was the University, established in 1919 and named for Masaryk. There, too, was the Supreme Court of Czechoslovakia.

Dr. Absolon, who made the Punkva a wonder of Europe, maintains a library, laboratory, and office in a moldy old building facing Kraut Market, a medieval square of Brno. When we found him, he was measuring with calipers the skull of a mammoth hunter in a musty room piled high with bones, papers, and fallen plaster.

"I'm busy," he growled. "Why can't people let me alone? Go see my museum!"

We did, at the Brno fairgrounds, though it took special permission to enter in winter. Moravian caverns were such excellent home sites for cave dwellers that excavations in their earthen floors have revealed changing artifacts of many different ages of humanity.

Some domestic and hunting scenes have been reconstructed in the museum. One hairy family sits about a fire in which mammoth bones ooze marrow juice.

Small sinkholes in the Moravian Karst provided means for weaponless man to gain food in the dim beginnings of his life in Central Europe. He covered the holes with saplings, twigs, earth, and grass; the giant woolly elephants fell through. Then he crushed their skulls by dropping rocks on them.

"We know that," said Dr. Absolon, later, "because most skulls we find are smashed as only a rock could do it."

AND "SWING" WAS BORN!

"Here, I believe," the scientist said, "are the oldest musical instruments in existence." From a cigar box he brought seven or eight little bones, wrapped in velvet, averaging the size of a chicken drumstick. Each was broken off at a different length.

He laid them in a row on his desk. Then he picked them up, one at a time, and blew into them like whistles. His hands moved faster and faster as he laid down one bone and took up another. At last he was playing a wild and savage tune.

"Perhaps tens of thousands of years ago, long before history's dawn, some cave man with a strange sense of music played these instruments, as fur-clad hunters crouched

by a fire, listening. Old at last, or more likely wounded and dying, he laid them by, and I found them."

From a dusty window I gazed down upon the Kraut Market (page 208), now a tiny city with streets, alleys, policemen, and hundreds of little "stores" that literally would fold by mid-afternoon and leave the vast square to vagrant snowflakes, lone pedestrians, winter dusk, and the rubbish man.

ICE DUMPED, LIKE COAL, INTO CELLARS

Horse-drawn wagons, piled high with river and pond ice, halted at one side of the square to dump their loads through chutes into municipal ice cellars beneath the Kraut Market. Ice harvesting is a big winter industry in Czechoslovakia, despite increasing use of American mechanical refrigerators. Broken ice is dumped like coal into householders' cellars.

"On warm evenings, when I was a student," remarked Dr. Absolon, looking out of the window, "I used sometimes to see a little girl playing in the square. Often she sat by the monument and sang to her dolls. She was a pretty child; her voice was sweet.

"Once in awhile I wished that she were grown up, walking with me. Years later, she became a famous singer."

"What was her name?"

"Jedlička. The family lives across the square."

"Jedlička?"

"Maria Jeritza, now."

At the Jedlička apartment, that afternoon, Jeritza's older sister invited us in. The largest grand piano I had ever seen dwarfed the massive, hand-carved furniture of the big room. Near it hung Jeritza's portrait, lifelike and beautiful. There had long been singing in this room. Jeritza's sisters, who look like her, sing here still.

"Isn't that Jeritza's daughter?" I asked, observing a photograph of the opera star with a young girl. "There's a strong resemblance."

"That's my daughter!" replied our hostess, proudly. "We all look a little alike. She's in Hollywood now, with Maria, studying. We think she'll be a success."

MENDEL WORKED IN A MONASTERY

In Brno, where the strange problems of heredity puzzled Johann Gregor Mendel, an Augustinian monk, I saw his laboratory, his microscopes, and old foolscap pages



Photograph from John Patrik

JOHN HUSS STANDS SPOTLIGHTED BEFORE THE CHURCH OF "OUR LADY AT THE FENCE"

Striking landmark of Praha is Týn Church, built more than 500 years ago. Its name comes from the old Czech word for the fence or stockade that stood here in medieval times when a smaller edifice occupied the site. In Old Town Square rises a memorial to the religious reformer. His death at the stake at Constance in 1415 started the bitter Hussite wars that interrupted the completion of Týn Church for half a century.

filled with calculations based on his experiments with hybrid peas. His conclusions are known today as "Mendel's law." Although the scientist died more than 50 years ago, his thermometer remains where he fastened it, outside his study window in the monastery.

The instrument stood just at freezing as I walked down the brick path that ran beside his long, narrow garden. Monastery walls shaded it from the afternoon light. Now, through a half inch of snow that lay upon it, a few pansies thrust their determined way.

"We planted sweet peas here, as Mendel did," said the monk who guided me, "but we can't make them grow."

On a spring-like March morning snow was melting as I rode southward from Brno on a high-speed streamlined train to Bratislava (Plate XII). Despite the rapid growth and progress of that city, much is unchanged. A few people still live in cubbyhole cellars under Castle Hill.

A drugstore, founded in 1310, still operates at the Sign of the Red Scorpion. Some drugs used in prescriptions today are kept in jars bought when the store was young.

East of Bratislava is the valley of the Váh. First broad and fertile, it narrows



Photograph by W. Robert Moore

STRETCHED ON THE BACK, INNOCENT MEN "CONFESSED"

In the Middle Ages despotic rulers employed many ingenious implements to force secrets from unwilling lips. In Špilberk Castle in Brno, now a military post of the Czechoslovak Army, torture chambers occupied dungeon rooms built in a disused moat. Today a wooden dummy (held up by a temporary crosspiece) demonstrates a rack that was found there, long ago. The prisoner's wrists were bound to an upper rung. A rope, tied to his shackled feet, was attached to a powerful windlass by which the victim could be stretched until his joints were pulled apart.

between Carpathian ridges as the swift river flows past isolated, lofty crags where medieval castles show jagged lines of broken battlements against the sky (Plate XIV).

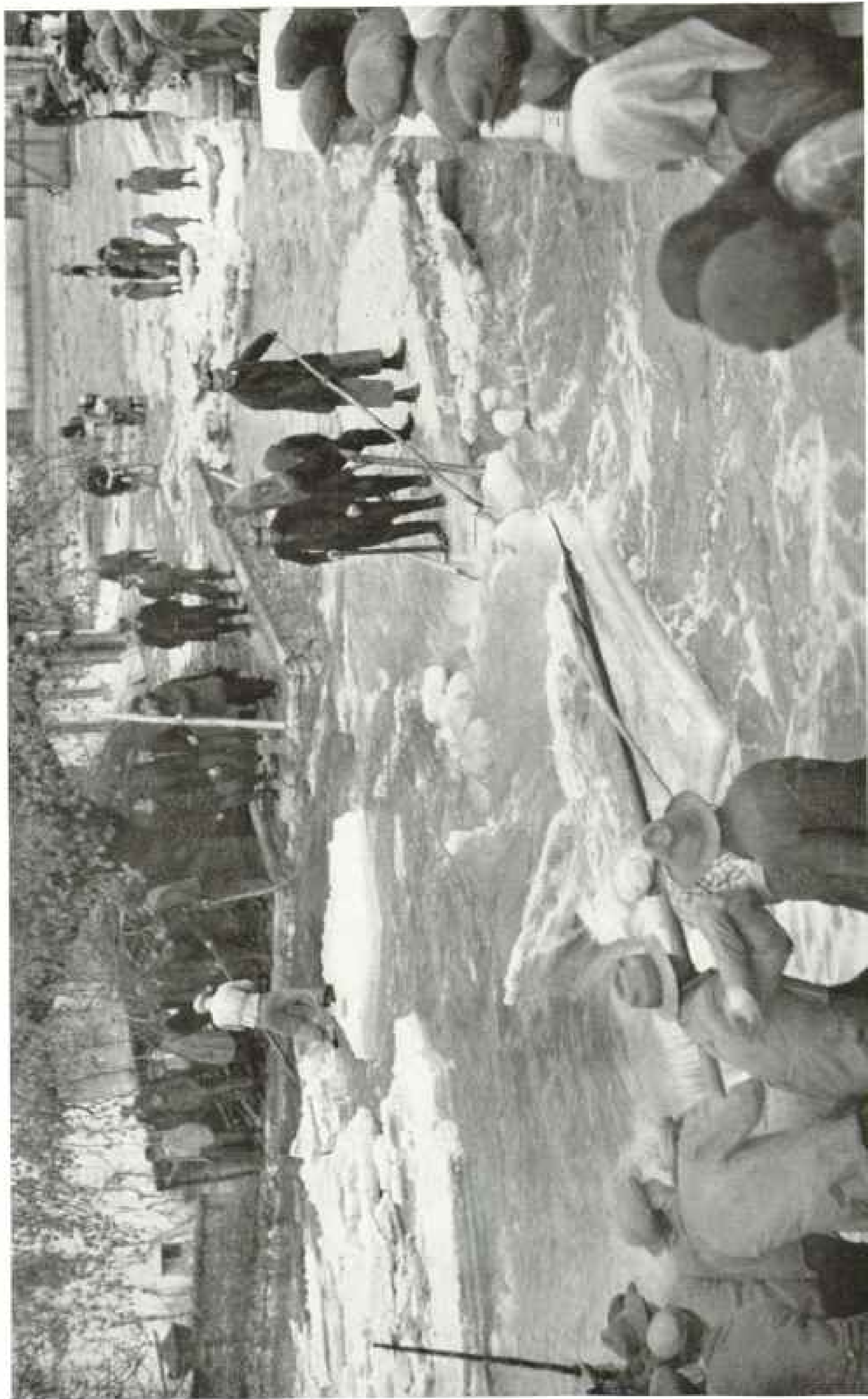
In one such ruin in the wooded Carpathian Mountains, above a valley farmed by Czechs and Slovaks, the opening scenes of the weird novel *Dracula* were laid. Bram Stoker based his story upon superstitions of the country folk that long-dead masters of some old castles returned by



Photograph by W. Robert Moore

HUNGARY HUNDREDS THROUGH THE KRAUT MARKET BELOW MARTA JERITZA'S WINDOW IN BRNO

When the Moravian opera singer returns to her home town, she visits her music-loving sisters, whose spacious, balconied apartment overlooks the public square (page 205).
By mid-afternoon all evidence of commercial activity disappears, and the market, swept clean, becomes a promenade.



Photograph by John Parke.

WHEN TORRENTS FROM THE TATRAS ARE CHOKED WITH FLOATING ICE, ITS JAMES FLOOD VILLAGES AND HALT TRAINS

Half an hour before this photograph was taken, huge blocks wedged tightly against a railroad bridge near Poprad. Housewives worked frantically, building mud dams higher and higher in their doorways to keep out rising water. Settling swiftly to work with axes, picks, and pike poles, helmeted firemen and their helpers soon loosened the jam, and now the water recedes. An instant later, the big cake to the right broke away. Three of the four occupants leaped to safety. One was carried under the bridge, and downstream toward the Váh River. He was soon able to grasp an overhanging tree limb and scramble ashore.



"AFTER THEIR BATHS IN VOLCANIC MUD, GRAYBEARDS FEEL LIKE BOYS"

So they say in Pišťany (page 211), where hot volcanic ooze is scooped from the bottom of a cold river. The author took such a bath. After a playful, perspiring half hour in the slippery mud, it was troweled over him thoroughly. Then, shrouded in oilcloth and sheets, he was put on a shelf to cool gradually before a shower and rubdown completed his "rejuvenation."



Photographs from John Patric

A HUMAN GLOWWORM STANDS IN A CAVERN CARVED FROM SALT

The torchbearer seems insignificant, on a ledge in the left center. A mining engineer at Slatinské Doly estimated that if the enormous Cathedral of St. Vitus were placed on the floor of one room, its tower tips would lack 30 feet of reaching the roof (page 212).



Photograph by Ferdinand Bucina

WITH OAR SWEEPS AHEAD, NOT ASTERN, RAFTSMEN KEEP TO THE CHANNEL.

Though lumber is still sometimes sawed by hand in the mountains of eastern Czechoslovakia, much timber is assembled in rafts and floated down the Biła Tisa River to steam sawmills. Where the stream is narrow and twisting, with gravel bars and jetties, the trip is exciting and dangerous.

night as vampires to prey upon the living.

Trade-mark of Piešťany Spa is a bronzed athlete with bulging biceps, breaking a crutch over his bent knee. I went there for a bath in black volcanic mud. In its largest hotel I rented a royally furnished room that had once been occupied by Wilhelm Hohenzollern, German emperor.

My balcony overlooked a foggy valley and the swollen, ice-choked Váh. On a clear day, they said, I could see the castle where Elizabeth Báthory, in search of her youth,

had murdered scores of young women centuries ago to bathe in their blood.

In a fast, air-cooled, rear-engined Tatra car, made in Czechoslovakia, a friendly Chicago Czech took me from the spa, Trenčianske Teplice, to Trenčín.

There we saw an inscription, chiseled into the base of a cliff, describing ancient Roman occupation.

High above it, long impregnable, but ruined now, Trenčín Castle frowns over the valley it guarded so long. Six hundred years ago, when the castle was already old,

its bold owner seized and ruled all Slovakia and part of Moravia.

We climbed upward through melting snow and muddy rivulets. Within the outer walls, below the castle, is a windowless dungeon. Through a small hole in the roof, a culprit condemned to more than the swift flash of the headsman's ax he begged for, was lowered, with a loaf of bread and a jug of water. Then this single aperture was bricked shut.

We were shown a broad, deep well. "Once," the guide related, "the lord of Trenčín, fighting the Turks, captured and brought a girl here. Her Turkish sweetheart, with a few retainers, came under a flag of truce to buy her release.

"'We'll keep her,' said the lord, 'until you get water from this rock!'

"Taking the discouraging refusal literally, the Turk bought rock drills and with his followers began a well. After seven years he struck water at some 200 feet; and the lord of Trenčín kept his promise."

A CZECHOSLOVAK NATIONAL PARK

Still following the Váh, I continued next day to Žilina, then eastward, watching the floe-filled raging river as it piled pieces of its winter prison high against trees and fences. Late at night, in the rain, I changed from train to bus at Štrba.

At this gateway to the Czechoslovak National Park, the High Tatras (Tatry) rise sharply from the plain, like the Grand Tetons in Wyoming, through fir and beech forests, stunted spruce, alpine meadows, and barren rock-strewn slopes, to the snow fields at their crests.

Lynx and bear are almost wiped out; chamois and eagle share the solitude beside sixscore mountain lakes.

The bus to Štrbské Pleso climbed slowly for miles through the forest, then broke through the frozen crust of the snow that covered the twisting mountain road. For two hours we waited, stalled. Air became colder as night wore on, and rain turned to snow.

At last, muffled by thick-falling flakes, sleighbells echoed cheerily down the mountain. Wrapped in fur robes, bus passengers were bundled into a two-horse open sleigh. Upward through the night we rode, and tinkled to a halt in a blaze of light from a mountain hotel.

By rainy daylight the inn looked forlorn beside its misty lake. Trails became slush;

thick fog hid the mountains. I departed by electric train, skirting the Tatra slopes past Starý Smokovec. We waited in one village while an ice jam was broken by firemen with pike poles (page 209).

Užhorod, east of Košice, on a branch line of the railway north of Čop, is the capital of Ruthenia. Officially called Podkarpatská Rus, or Sub-Carpathian Russia, it is the smallest, most primitive, least inhabited of the four provinces.

A medley of peoples lives peaceably in Užhorod. Sturdy Little Russians are tough as their wiry ponies. There are Jews who dress in funereal gabardine and wear curbs for sideburns (page 222). Industrious Poles have come from the north. There are German business men and carefree Gypsies. There are handsome Hungarians who remain despite the new regime, and ambitious Czechs and Slovaks who have come because of it. There is a sprinkling of other races.

A young Gypsy was buying a new violin, for about a dollar, from a storekeeper who spoke his Romany tongue.

"I sell goods," the merchant said to me, "in eight languages."

Between Čop and Jasina, Czechoslovak trains "go abroad" for a few miles. At Sighet, in Romania, I took an international local to a Ruthenian salt-mining town.

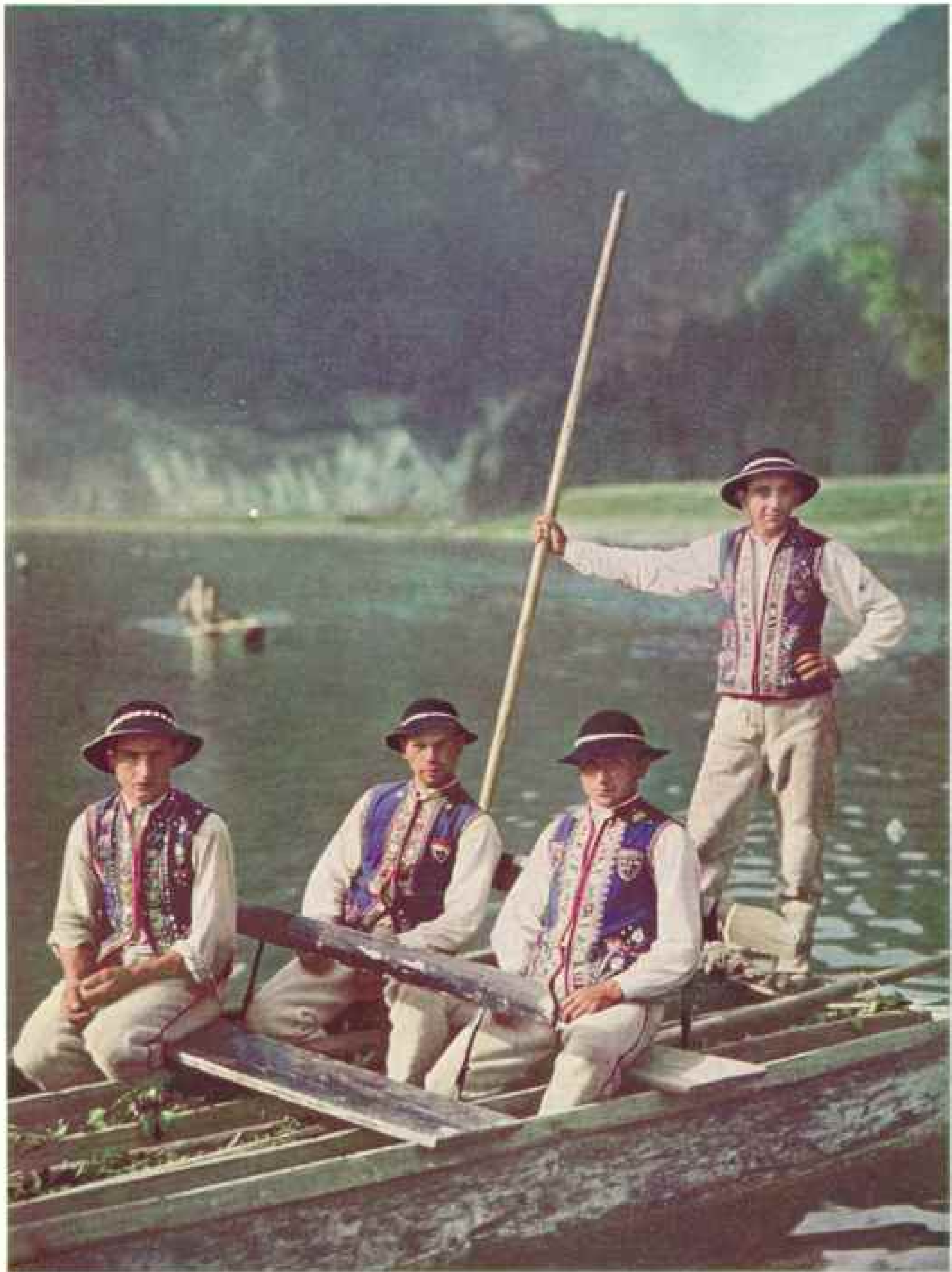
BREATHLESS GRANDEUR OF A SALT MINE

If the Great Salt Lake were poured into Jacksons Hole, Wyoming, evaporated, and slid under the next county; if a shaft with a fast elevator were sunk through solid salt; and if, since 1777, men had carved crystal columns, vaulted roofs, nave, transept, chapels, and cloister garth, the breathless grandeur of that subterranean cathedral would be the prospect of the excavated stopes of the salt mine at Slatinské Doly.

On a little wooden catwalk anchored to the roof, I stood with the chief engineer. Below us yawned a gulf so profound that workers loading salt blocks looked as small as mice (page 210). Crystalline walls reflected twinkling lights. Around us, like the roar of a far-off waterfall, rumbled the echoes of pneumatic chisels, cutting this titanic temple vaster still.

At the end of the Ruthenian tail, a few minutes by train from Poland and farther east than Greece, lies Jasina. Most Hucul folk (Plates XX and XXIII) here live in floorless mud cottages without chimneys. Smoke filters through the thatched roofs,

CZECHOSLOVAKIAN CYCLORAMA



© National Geographic Society

Finlay Photograph by W. Robert Moore

DUNAJEC BOATMEN FERRY PASSENGERS TO POLAND IN LOG CANOES LASHED TOGETHER

Most of the long, ragged border between Czechoslovakia and Poland is a mountain divide. Here, northeast of the High Tatras, the frontier is the Dunajec River, much used for floating logs to market. Poles and Slovaks, in the costume of their calling, carry international passengers for a few coppers in their catamaran dugouts. Farmers of the neighborhood, who often own land in both countries, carry simple identification cards and may cross the border at will.



© National Geographic Society

Friday Photograph by W. Robert Moore

AFTER DESTRUCTION BY FIRE IN 1921, VILLAGE HOUSES WERE REBUILT OF DOVETAILED LOGS IN THE OLD-TIME MANNER

Business as well as sentiment lay behind the preservation of local traditions in Čičmany. While the men, in their fancy shirts, are lumbering or farming, the women sell blouses, tablecloths, and other fancywork to visitors. House decorations are similar to the cross-stitch designs,



© National Geographic Society

MEN SWING THEIR SCYTHES AS WOMEN TIE THE SHEAVES

Gleaners, gathering loose and scattered stalks of wheat in their aprons, rarely miss a single ear. Even gypsies may be found working on this tenant-operated Kolice farm, once an old Hungarian estate.



Fisher Photographs by W. Robert Moore

"LITTLE RUSSIANS" MUST STAND TO WORSHIP HERE

Unpainted wooden churches of the Huculs in Ruthenia contain no seats. This one, near Jasina, appears weather-beaten and austere to the traveler; inside, it is lavishly decorated and hung with sacred paintings.



© National Geographic Society

Field Photograph by W. Robert Moore

OUTSIDE THEIR CHURCH, HUCULS KISS THE CROSS

After standing reverently in their picture-adorned temples (Plate XIX) during the long Mass, the pious pause in the Jasiña churchyard to say prayers, or to place flowers on the Crucifix. Huculs are strong, tall, and highly intelligent, despite the rude simplicity of their lives. Though they are Ruthenes, they are proud of their Russian origin and language, and avoid intermarriage with other races so numerous in Ruthenia. Hemmed in by barriers of Carpathian mountains, this little-known tribe has maintained the purity of its blood, and its racial character for uncounted generations.

CZECHOSLOVAKIAN CYCLORAMA



JOVIAL AND FRIENDLY HUCULS SMILE AT PASSERS-BY IN JASIŇA

At the eastern tip of Czechoslovakia folk dress shows few signs of vanishing. Factory shoes compete with pointed moccasins, made of one piece of leather and tied to the feet with thongs.

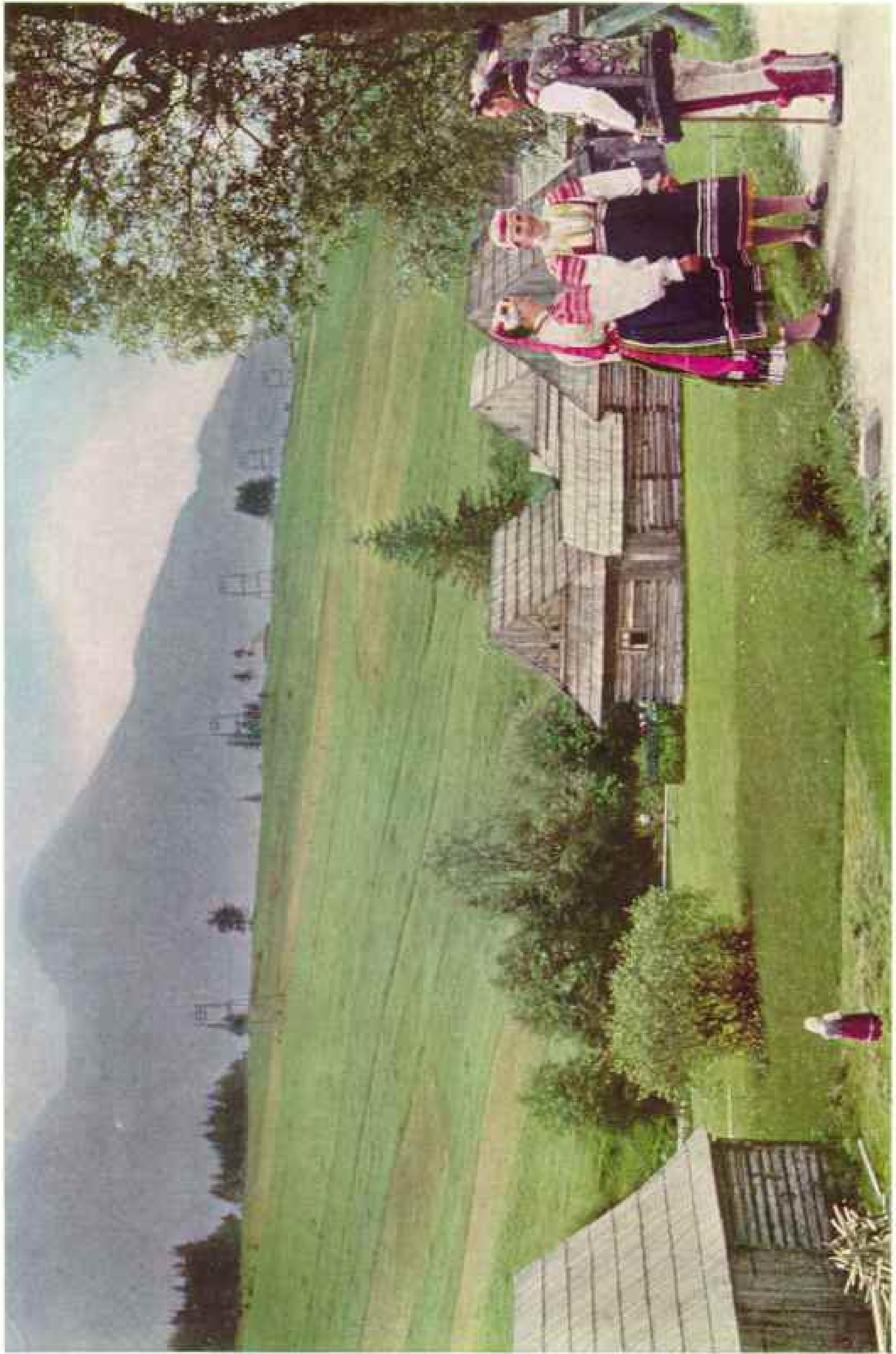


© National Geographic Society

Field Photographs by W. Robert Moore

"PORK" MEANS ONE THING IN AMERICAN POLITICS, ANOTHER IN CZECHOSLOVAKIA

Members of one political party, parading in Uherské Hradiště, carry pork-on-sabers, often used as wedding gift symbols. These campaigners hope really to "bring home the bacon" on election day.



© National Geographic Society

Parlay Photograph by W. Robert Moore

EVEN WHERE HOUSES HAVE NO CHIMNEYS, MODERN AERIAL TRAMS CARRY ORE AND LIMESTONE IN THE TATRAS

Smoke from wood stoves, escaping through the roofs, seeps between shingles and through attic ventilators, giving the log cottages of Zafiar a "house afire" look on winter days. The friendly villager, with the pipe, led the photographer to a shepherds' camp in the distant hills, where sheep milk is made into huge cheeses. Hospitably, the herders fed their visitors—on sheep cheese, curds, and whey.



© National Geographic Society

SHEEPSKIN COATS ARE REVERSIBLE: LEATHER SIDE OUT IN DRY WEATHER, WOOLLY SIDE OUT WHEN IT RAINS

Fifty Photograph by W. Reihert Moore

After the breakup of a parade in Jasiña, participants pause to chat. There has been a shower; some still carry umbrellas and wear their coats inside out. High-heeled slippers contrast with the rest of the apparel of the woman at the right, and with the pointed moccasins of her companion (Plate XXI). Immediately after the World War, America sent food to the starving Ruthenes. "I helped distribute it," a woman said. "We gave them cocoa. They didn't know it was food. We found them mixing it with water to paint base strips around their whitewashed houses."



© National Geographic Society

Field Photograph by W. Robert Moore

CHURCHES ARE THE SOCIAL CENTERS OF CZECHOSLOVAK VILLAGES

Relaxing after services (Plate V), groups gossip in a cobble square of Domažlice, one of the few communities in Bohemia where folk costumes survive. The women will also do their weekly marketing and perhaps shop for red dress material while in town. The old frontier village is on a road to Bavaria, not far from the German border.

making them appear to be burning. Here Bata sells few shoes; farmers and herdsmen prefer to tie soft, thick leather around each foot.

Snow still lay deep, for winters are cold and long. Logs skidded down icy slides from the mountain slopes. Some were being ripped into lumber, as I have seen it done in China, by one man standing beneath, and another, above, dragging a handsaw. Some logs would be rafted down the Tisa after the ice went out (page 211).

Oxen hauled other sledgeloads to an anachronistic steam sawmill that could saw more lumber in a day than a hundred men. One old-timer said it "threw too many men out of work"; he hoped it would burn.

SLEEPING IN A HAUNTED CASTLE

From frozen Carpathians I returned to Bohemia. An old ambition was to be gratified: after weeks of trying, I had obtained permission to sleep in a haunted castle, alone in all its 70 rooms except for one lady, Perchta von Rosenberg.

A sudden spring rain welcomed me to Třeboň, a town still so medieval that all its entrances are through long arches at street level, under tall, thick-walled "gateway" buildings. Třeboň Castle, dominating the town today, is partly modernized and is occupied by its owner only in the summer. It was held by the Rosenberg family until Petr Vok, last of his line, died in 1611. Finally it passed to the Schwarzenbergs.

Strange beliefs persist, as they do in the Carpathians, among country folk who live among moors and fens of this land of lakes. To thwart ghouls, they say, Schwarzenbergs are buried at night, in secret. "I've heard of a big cellar," one farmer told me, "where dead Schwarzenbergs sit around a long table, like a family reunion in life."

There is a legend of the White Lady, Perchta von Rosenberg, whose deep love for a family enemy caused her death in 1468. For more than a century the White Lady stalked labyrinthine castle corridors so quietly that she disturbed no one. When Petr Vok lay ill and dying, she is said to have come out of the shadows to nurse the last Rosenberg.

"You will sleep," a caretaker told me, "where the White Lady slept five centuries ago. She has often been seen there. No harm comes if she wears white gloves. But if her gloves are black, beware!"

He led me by lanternlight through the

rain, across a wet courtyard where leafless trees howled in the night wind. He pushed a giant key into a ponderous old lock; there was a click like a hammer on iron, and he swung open a timbered door that rasped on its hinges.

Our footsteps sounded hollow and sepulchral on the flagstone floor. The air was cold and clammy; spring warmth had not yet penetrated this chill pile of stone. My room was warm. A fire had been burning for days in a blue-tile stove shaped like a giant stocking cap, tassel and all. Furniture was old and blue, like curtains, bedspread, and the flowers on the washbowl.

The caretaker showed me how to bolt the door, and departed. His bunch of iron keys tinkled out of hearing. Through the rain-blurred windowpane, I saw his light, bobbing across the courtyard and down the lane. For added cheerfulness I lighted a candle beside the four-poster bed, turned down the royally crested sheets, and examined my room.

HIDDEN KNOB TO A SECRET DOOR

Its strong bolts reassured me. Then I studied a strange wallpaper design, and felt its velvety texture. My hand ran over a hidden knob, and before me opened a door into a chill room that was quite bare. Other passages, and perhaps other secret doors, led from it. Fearfully I braced an armchair against that mysterious portal.

Apprehensive, I left my bedside candle burning. My head sank so deeply into the soft, thick pillows that I could not see the candle flame, only its light on the wall. I closed my eyes for a moment, then opened them, lingering in a halfway station on the road to sleep.

But I *was* asleep, dreaming horribly. A gigantic black vampire, big as a man, whipped across the room; then, as sinister and silent as Count Dracula himself, it swept back again. I had half expected to see the White Lady, but I had not been warned of this dark flying phantom. I slid under the covers of the big bed.

When I awakened, sunlight was streaming in. I sat up and looked about. Beside the extinguished candle lay a giant moth, burned to death. I had seen its shadow on the wall as it flew around the candle.

I went back to Praha for an appointment, arranged days ahead, with Dr. Eduard Beneš, President of Czechoslovakia. The intervening time was busy.



Photograph by W. Robert Moore

ORTHODOX JEWS IN RUTHENIA WEAR CURLY SIDEBURNS

Like other peoples in far-eastern Czechoslovakia, Jewish inhabitants cling to the ways of their fathers, who wear black gabardine, and usually beards. Entering a synagogue one cold day to listen to the cantor, the author automatically removed his hat, and was reminded that the custom was to wear it.

That night I registered, by leaving my passport for the police, in a weather-beaten old hotel near the station, planning to seek better quarters next day. I was astonished to find thick carpets, new furnishings, soft mattress, hot and cold water, plenty of lights. A thick feather bed served for quilts. Reading lamp, easy chair, desk, and lounge were made of tubular chromium-plated steel. Across the hall was a clean, modern shower bath.

Beside the hotel a cleaning and pressing shop used American-type equipment, but was unaccustomed to pressing coat

sleeves. I found one automat cafeteria where the coffee was even better than in fashionable restaurants. The place I preferred was always crowded. Most items were a crown (three and a half cents). Oranges and grapefruit were squeezed without charge on a California-made electric juicer.

There are chain stores called "fixed price" because there is no bargaining. Prices begin at half a crown, less than two cents. Arrangement and choice of merchandise reminded me of ten-cent stores at home.

At the Old Town Hall I studied coats of arms of medieval guilds: a bobbed-haired girl is the barbers' sign; and Adam and Eve the potters'—because they, too, were clay. At the astronom-

ical clock I watched the Twelve Apostles pass its windows as a skeleton tolled the time (Plate VIII).

In Alchemists' Street, or Golden Lane, I visited the tiniest houses in Praha, where art-loving, melancholy Rudolph II, short of money, hopefully provided shelter, crucibles, and scrap metal for medieval experimenters called alchemists.

Some old streets I saw, with heavy gates at their ends, were locked at night. The library of Strahov Monastery, old before Gutenberg printed books, contains many aged charts of the Kingdom of Bohemia.

Cartographic masterpiece was a leather globe, 12 or 14 feet in circumference. The shores of California, an island, were carefully indented with harbors that were named. Chesapeake Bay was marked "Cheespiook Sinus."

A Jewish guide took me to a medieval synagogue and Jewish cemetery. "My ancestors are here," he said, placing a ritual pebble on a weathered tombstone.

"They lived in the Ghetto," he continued, "when such names as Judah ben Abraham, meaning 'Judah the son of Abraham,' predominated. 'Levi' and 'Katz' meant 'priests.' Cohens were 'high priests.' When it was decreed that Jews must have family names, priests used their titles. Others took names of noble protectors, like Schwarzenberg, Lichtenstein, or Rosenberg. Grafting officials charged high fees for pretty names such as Rosenblum, meaning 'Bloom of the Rose,' or 'Perlmutter,' 'Mother of Pearl.' Poor or stubborn people got uncomplimentary names."

AN INTERVIEW WITH DR. BENEŠ

Next day came my appointment with the Chief Executive. My taxi driver crossed Charles Bridge, drove up the hill of Hradčany and into the courtyard of the regal old Castle of Praha.



Photograph by John Pustic

SOME BRATISLAVA BUSES BURN CHARCOAL INSTEAD OF GASOLINE

Fuel is poured into a rear tank, and a fire built underneath. Then the lid is clamped down, depriving the fire of draft and preventing complete combustion. Unburned gas, passing through filters to remove charcoal dust, is drawn by a supercharger into an automobile engine. The gas explodes much like gasoline vapor. Knocking and slow pickup result, but operating costs are low.

When Dr. Beneš rose from his desk to greet me, his laugh was deep and throaty, as if most of it remained inside. In the course of the interview, I mentioned that I had found in Czechoslovakia many rules making it excessively hard to start a new business or to engage in a new trade.

"Many laws, taxes, and regulations were imposed by our conquerors, and have been in effect for centuries," the President replied.

"We are changing them as rapidly as we can. Masaryk said that no strong central



Photograph by John Patrie

TO MARKET NEAR AUSTERLITZ GOES A FAT PIG IN A DOGCART

The little wagon, strongly constructed, will carry a hog weighing several hundred pounds. A rope net keeps the porker from jumping out. On uphill roads in the region of Slavkov, Czech name for the scene of Napoleon's victory, the boy pulls beside his dog. Snow is deep, the work is hard. Both were glad of a rest on this dark winter day.



Photograph by Contrastes

THE BRIDE'S FEET WILL BE FIRST TO MAR HER HEARTS AND FLOWERS

White sand, poured in a tiny stream from a hole in a bag, is used to design a carpet for a wedding procession on the Moravian road to matrimony. No cleaning will be required afterward when traffic is resumed on the damp earthen street, for the sand will be scattered and the pattern obliterated.

government had ever succeeded; we are giving more home rule, not less, to political subdivisions. Recently we relinquished much federal control of schools. Our Supreme Court, divorced from politics, preserves our democracy."

"Some writers," I said, "fear that this Republic will fall apart. Your peoples are so diverse—Czechs, Slovaks, Germans, Hungarians, Russians, Jews, Gypsies, and Poles. Slovakia and Bohemia are more different than some nations!"

RACES WELDED BY NATIONAL UNITY

The President leaned over his desk, talking rapidly in English. "You found Moravia and Bohemia rather alike, didn't you? Sixty years ago Moravia was as different from Bohemia as Slovakia is now. In sixty years more you won't see much difference among the three. Czechs and Slovaks are racially the same people.

"Jews, free as in England or the United States, are no problem here. Every country in Europe has Gypsies. Poles are only one-half of one percent of our population. Little Russians joined us at their own request.

"The American problem is assimilation. Ours is not. We won't attempt to make Czechs of our German millions, or Slovaks of our 700,000 Hungarians. Germans may remain Germans, and Hungarians may remain Hungarians always, with their own schools, languages, and newspapers—free citizens of a democracy, enjoying equal rights with all of us.

"Austria tried for centuries to Germanize the Czechs, and failed. Hungary sought for a thousand years to Magyarize the Slovaks, and failed, too. We won't make their mistake!

"THEY READ WHAT THEY PLEASE"

"Our people are educated. They read what they please, and think deeply into political questions. They do not exist for their government; their government exists for them. We do not fear a demagogue here; no skillful spellbinder could last in politics—not in Czechoslovakia."

I was impressed by this man who had become one of the most remarkable of living statesmen, and by something else he said: "Czechoslovakia is a democracy, conscious that it stands in Central Europe like a lighthouse high on a cliff, with the waves crashing on it from all sides."



Photograph by Walter Boscharff

A MONUMENT TO A MAN WHO WOULD NOT TELL!

John of Nepomuk was thrown to his death in the Vltava from Charles Bridge in Praha because he withheld from King Wenceslaus IV the confessions of his wife. The holy man is now patron saint of bridges. Each May 16 a pilgrimage is made to the spot where he was cast into the river and his statue now stands.

BIRDS OF THE HIGH SEAS

Albatrosses and Petrels; Gannets, Man-o'-war-birds, and Tropic-birds*

BY ROBERT CUSHMAN MURPHY

Curator of Oceanic Birds, American Museum of Natural History

"They . . . that do business in great waters" (Psalm 107:23)

BIRDS of only a few groups inhabit the high seas. Over the vast, far, oceanic reaches of a world surfaced mainly with water, the winged wanderers are likely to belong within one of three or four comprehensive orders.

THE "TUBE-NOSED" SWIMMERS

Among pelagic birds the Procellariiformes, or members of the order of albatrosses and petrels, stand first. They are present in all salt waters from the Arctic basin to the uttermost shores of the south polar continent, including even such land-encompassed bodies as the Mediterranean Sea and the Gulf of California.

They belong to the marine environment more fully than any other birds, for, like sea turtles and fur seals, many of them come ashore only for reproduction, remaining at other seasons permanently in the wastes of waters, and even shying away from coasts so thoroughly that they may scarcely sight land other than their annual breeding stations.

Not all of these creatures are far-roaming, but some of them make yearly migrations that are among the longest known.

More and more it has become evident that each kind of these birds, like organisms living beneath the surface, is specialized in one way or another for particular types of ocean water.

The curved expanse of the sea is not "boundless," as tradition holds. On the contrary, it is rather sharply divided by lines of temperature, wind belts, zones of varying rainfall and evaporation, and other agencies, into regions of different physico-chemical characteristics, respectively inhabited by different types of the surface life which constitutes bird "pasturage."

SARGASSO A "WATERY DESERT"

Thus the famed Sargasso Sea, and corresponding areas in the central parts of other oceans, are watery "deserts." The

underlying depths may be rich in life, but the surface is warm and hence poor in oxygen, extremely salty because the water has been long exposed to the evaporating influence of sun and trade wind, and deficient in nutrient chemicals because of the great distance from land and the bounty of rivers.

In such centers, moreover, the highly saline and dense surface waters tend continually to sink, thus preventing decomposition products held in "cold storage" far below from rising to the upper layers.

On the other hand, the encircling ocean-current regions, particularly those close to continental coasts, are constantly or periodically enriched by the phenomenon known as "upwelling." Whenever a current diverges from a shore line, under the influence of a land breeze or for any other reason, the surface water removed must be replaced from below.

OCEAN "PASTURAGE" ZONES

The ascending masses are cool, usually rich in oxygen, and almost invariably teeming with food products such as stored nitrates and phosphates, plant cells living and dead, and small animals such as copepod crustaceans which, by being eaten themselves, carry on the marine "key industry" of converting microscopic pasturage into fish, sea birds, and gigantic whales.

For such reasons the boundaries between the ranges of sea birds are no less definite than those formed on the continents by such more obvious barriers as mountain crests,

* This is the seventeenth article, with paintings by Major Allan Brooks, in the important Geographic series by outstanding authorities on the bird families of the United States and Canada. The entire series is now available in the National Geographic Society's two-volume *Book of Birds*, together with other notable articles, full-color portraits of 950 birds, 633 "bird biographies," and more than 230 photographs and bird migration maps. \$5.00 postpaid in United States and Canada. \$5.50 elsewhere.



Photograph by Claude C. Matlack

SOARING LIKE A GLIDER, A MAN-O'-WAR-BIRD FEEDS FROM THE HAND

Despite fearsome size and appearance, the "frigate bird" (Plate VIII) becomes a tame beggar around ports. Captain Charles Thompson is proffering a welcome morsel of fish at Hood Island, Galápagos. Often the bird plunges menacingly at a swift booby which has just caught a fish. The frightened booby drops the prize and the "pirate" swoops down to snatch it up before it falls back into the sea (page 228).

deserts, forested lowlands, or wide rivers. In other words, the entire face of the ocean is "zonal" no less than the land.

EVEN MIGRANTS NOT "FREE"

Since many birds are highly specialized in their food habits (some kinds get practically all their subsistence from a single type of organism, such as squids), it is easy to understand how in the age-long course of evolution certain petrels have become conditioned to restricted oceanic areas, from which they never voluntarily stray.

Food chains may not, of course, offer the whole explanation, for even among species that travel during their nonbreeding season across successive belts of highly varying climate, it appears that the route and rate are by no means haphazard.

Illustrative examples are offered by three common Southern Hemisphere birds that enter the North Atlantic during our sum-

mer. These are Wilson's petrel, which nests on many Antarctic islands, the sooty shearwater, which comes from the subantarctic continental islets of the Cape Horn neighborhood, and the greater shearwater, the only known breeding grounds of which are at the extremely isolated Tristan da Cunha group in the middle of the South Atlantic (Plates II and III).

PETRELS FOLLOW REGULAR CYCLE

All three of these petrels follow a cycle that seems to be as regular as most other phenomena operated by the cosmic clockwork. Their seasons and stages are not exactly the same, but they all appear to cross very rapidly the broad band of tropical water, which is relatively poor in food resources. Once in the Northern Hemisphere, all three species pass up the American side of the Atlantic, skirting the extensive Sargasso area.



Photograph by George Shiras, 3d

"THOU ART ALL WINGS," CRIED WALT WHITMAN, CONTEMPLATING A "FRIGATE BIRD!"

When fast-flying man-o'-war-birds (Plate VIII) swoop down on the treetops along the Mexican coast, boobies and other sea-fowl make a quick getaway. Wings, from tip to tip, often measure seven feet, yet the body of the ocean rover weighs only three and a half pounds. The inflated red throat sac of the alighting male resembles a toy balloon (page 227).

The greater shearwater is the first to reach our latitudes in spring, perhaps because it has the shortest journey from its place of origin. By early June the vanguard reaches Davis Strait and Greenland waters, but prior to August there are no records for the eastern North Atlantic.

By mid-September the hordes have spread out so that they are generally distributed all along the cooler parallels between North America and Europe. Later, the southward migration is concentrated largely in the eastern Atlantic, with huge flocks reported off the westernmost extension of Africa.

The sooty shearwater puts in a slightly more tardy appearance, but it is likewise much commoner on the American than the European side of the Atlantic until late August. At all times it seems distinctly scarcer in mid-ocean than the greater shearwater. It is more a bird of the "offshore" zone of continental shelf and fishing banks than of the deep pelagic reaches.

Finally, the tiny Wilson's petrel follows

much the same Atlantic circuit as its larger cousins, but goes the sooty shearwater one better by becoming an "inshore" visitor, plying its investigative way into every bay and cove between southern New England and Newfoundland. The ornithologist is astonished to see no trace in these littoral waters of Leach's petrel, which at the time is nesting by hundreds of thousands on the local grassy or spruce-grown islands. But all the while Wilson's petrel, from the other end of the world, is flitting everywhere!

ODDITIES OF DISTRIBUTION

Just why the Wilson's petrels check their northward movement at about latitude 50° north is another mystery of the ocean. They come from icy Antarctic waters; yet they do not penetrate the similarly cold regions of the north. Instead, they swing eastward and southward just before reaching districts particularly rich in food that would seem to be best suited to their needs.

Possibly the competition of abundant Leach's petrels preëmpts the more north-

erly waters. The rareness of Wilson's petrel in the temperate North Pacific, where there are so many other kinds of Mother Carey's chickens, would lend weight to such a theory (page 234).

The orderliness of the grand-scale rotary movements is well confirmed by scattered information relating to petrels of the South Atlantic and several parts of the Pacific.

The facts offer not only an indication of the rigid control exercised by oceanographic and meteorological conditions over birds of the sea, but they also go far toward suggesting an explanatory mechanism for the marvelous precision with which these seeming waifs of the great waters find their way back, at the appointed time, to the bourns whence they started.

"Homing," in such migratory examples, might be defined as a fixed circulation, the track of which is largely determined by successive climatic effects upon the birds throughout their journey.

Much remains to be learned about the extent to which cycles or vagaries of weather affect the annual routine of the migrants. The summer of 1937 offered striking suggestions as to the possibilities for research in this obscure field. For three months the greater part of the North Atlantic, according to all oceanographic records, displayed abnormally high surface temperatures which, in turn, produced curious effects upon oceanic life. One of these was a very extraordinary shoreward movement of several kinds of petrels all along eastern North America.

No precedent is known for the observed abundance of the birds during that season in Hampton Roads and the bays to northward, Long Island Sound, and the littoral waters of New England and the Maritime Provinces of Canada.

"GREEN PASTURES OF PETRELDOM"

About 115 species or other distinct kinds of albatrosses and petrels are known, a list considerably swelled by additional geographic forms. In general, the bigger the ocean, the more kinds, for which reason the nearly landless belt of the Southern or "water" Hemisphere, from the Roaring Forties to the polar edge of the pack ice, supplies the true green pastures of "petreldom."

The North Pacific is next best endowed, and is the only part of the Northern Hemisphere rejoicing in native albatrosses. Of the 21 forms of petrel-like birds in Major

Brooks' accompanying paintings, nine are to be found only on the Pacific side of America. These are the short-tailed and black-footed albatrosses, the pink-footed, slender-billed, and black-vented shearwaters, the black, fork-tailed, ashy, and least petrels. The Socorro petrel might be added, except that it is probably only a subspecies of Leach's petrel.

The exclusively Atlantic species in the plates number only four: namely, Cory's and greater shearwaters, the black-capped petrel, and the Old World storm petrel.

SEVEN BIRDS OF TWO OCEANS

The following seven are common to the two oceans, though not all of them are to be encountered along both coasts of North America: fulmar, sooty and Audubon's shearwaters, Leach's and Wilson's petrels, the Cape pigeon, and Bulwer's petrel.

Despite their abundance and universal distribution, the petrels and their allies occupy an increasingly precarious position in the modern world. Islands once afforded them the safety of perfect isolation, but man and his domestic and parasitic animals have turned security into special vulnerability and still constitute a hazard which has already caused immeasurable destruction. Several species are supposed to have become extinct and others are seriously threatened.

Seventeenth-century French accounts of the nocturnal raids upon the breeding grounds of the West Indian black-capped petrels, or *diablotins*, as the colonists called them, make entertaining but rueful reading for the modern generations deprived of the opportunity of meeting these birds alive.

Small petrels are in jeopardy wherever cats, dogs, or hogs have been introduced, and house rats have probably wiped out practically all such birds at many nesting stations, including the main island of Tristan da Cunha. The other two islands of this group are happily still free from the curse.

It is exciting to speculate that for millions of years, perhaps, the Laysan and black-footed albatrosses were "cocks of the roost" at the tiny but sufficient nesting grounds of Wake and Midway Islands, in the Pacific. Then, in the 18th and 19th centuries, came explorers and whalers, in sailing vessels months or years from home, to make occasional forays for fresh eggs. But today passengers in unruffled and immaculate



Photograph by Herbert G. Pouling

"A GOOD SOUTH WIND SPRUNG UP BEHIND; THE ALBATROSS DID FOLLOW"

Like the bird of good omen in Coleridge's *Ancient Mariner*, these black-browed albatrosses followed in the wake of the *Terra Nova*, bearing the Scott-South Polar Expedition into Antarctic seas in 1910. Unlike the wretched sailor of the poem, who wantonly shot the albatross (Plate I) and thus brought dire tragedy to his vessel, the polar explorers regaled the sea gliders with food. Nevertheless, the expedition had a tragic end. Captain Scott and four of his companions, pushing southward by sledge, reached the pole on January 18, 1912, only to find that Amundsen had preceded them by a month. On the long trek back to the ship all of the heroic group perished.



© Niall Rankin

MASTER OF THE AIR IS THE GANNET, OR SOLAN GOOSE, OUT SPOTTING FOR FOOD

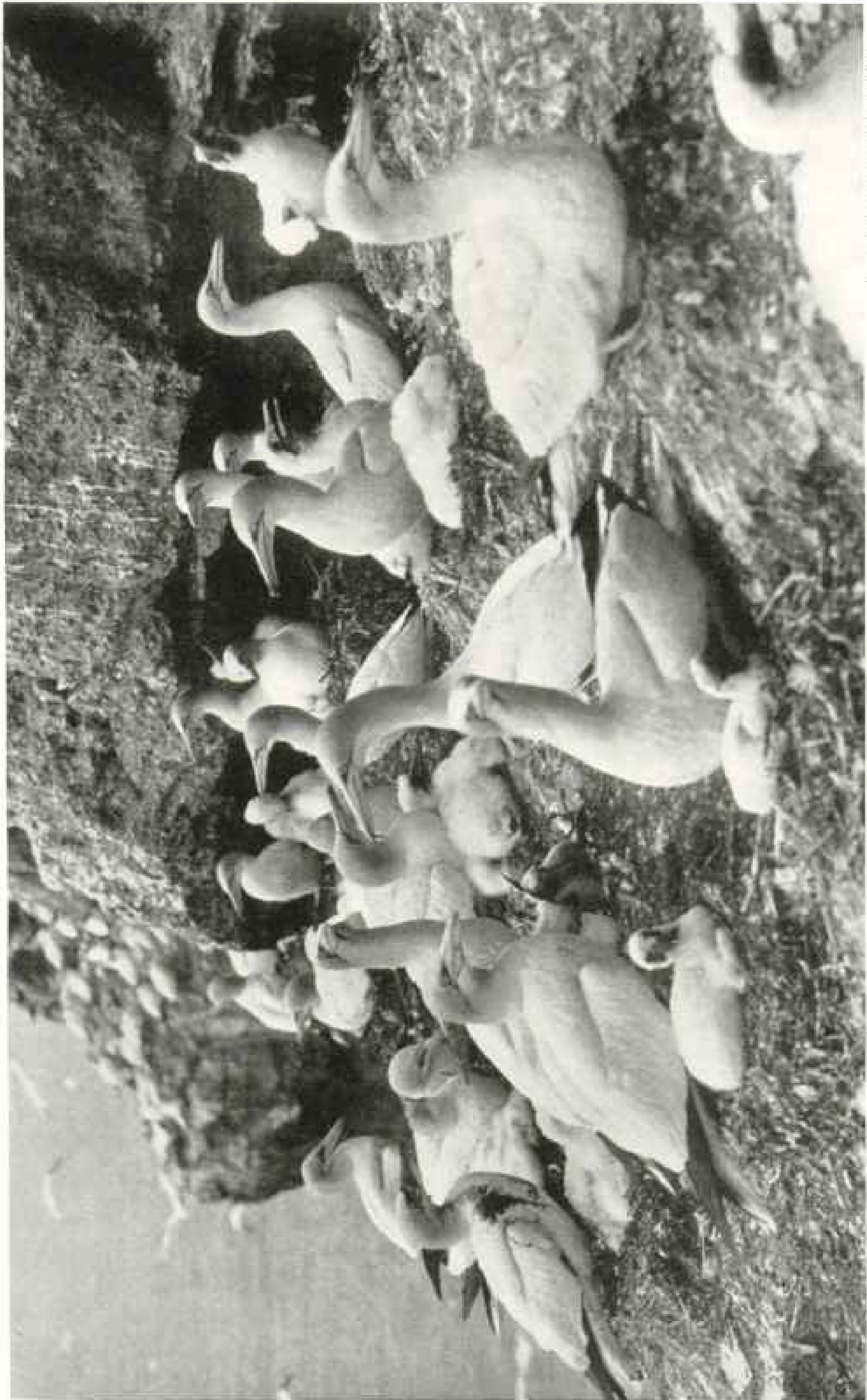
Endowed with remarkable powers of flight, these birds sometimes wing over the water for 200 miles, searching for fish. With piercing eye the gannet (Plate VI) locates a herring or pilchard and plunges swiftly into the sea to grasp its prey, making the spray shoot up ten feet. Air-cushioning pockets within the bird's respiratory system keep it from injury when it violently strikes the water.



© Shell Rankin

LIKE A HUGE SQUADRON OF BOMBERS, HUNDREDS OF GANNETS SOAR OVERHEAD IN THE TETHY OF A HIGH WIND

Wings and feet work in perfect unison to keep the gannets (Plate VI) on an even keel as they give an exhibition of their superb flying skill over Bass Rock, off the east coast of Scotland. Fully extended wings supply the supporting surface and the tails are employed as elevators, regulating altitude.



Photographs by H. Armstrong Roberts

25 GABBLING FAMILIES CROWD INTO A ONE-LEDGE APARTMENT: GANNETS NEVER HEARD OF SLUM-CLEARANCE PROJECTS!

Driven from one breeding site after another by wanton exploitation, gannets now are protected in a safe nesting home on Bonaventure Island, off the Gaspé Peninsula, in the Gulf of St. Lawrence. In such inaccessible cliff rookeries thousands rear their young in saute-like nests of seaweed.

clothes step calmly out of the China Clippers, walk right among the amazing—and doubtless amazed—albatrosses, and watch to their hearts' content some of the most astonishing performances known in the whole field of bird behavior!

These albatrosses are, of course, fully protected from undue interference at the seaplane stations. Furthermore, their dancing and "singing" are so extremely entertaining that they can hardly fail to awaken a sympathetic interest which may redound to the ultimate welfare of their relatives all over the seven seas.

THE GREATEST SIZE RANGE AMONG BIRDS

The Procellariiformes are an ancient and primitive group, doubtless more abundant, and certainly more widespread, during former geologic ages. We know from fossils that there were once albatrosses in the North Atlantic.

All the species share many common traits, in both anatomy and behavior. All, for instance, possess tubular nostrils, and all are so strictly maritime that no one has yet succeeded in keeping them long alive in captivity, whereas penguins, cormorants, gulls, and other oceanic fowl have lived for years in suitable aviaries.

In at least one respect, however, the petrel-like birds exhibit unique diversity: namely, in size range. In no other feathered group is there a discrepancy in bulk equal to that between a storm petrel, scarcely larger than a swallow, and the wandering albatross, which attains a wingspread of 11 feet 4 inches (not 17 feet, as some encyclopedias allege!)

The birds of the order fall into four families, of which one comprises the albatrosses, a second the more varied aggregation of medium-sized petrels, fulmars, and shearwaters, a third the little storm, Leach's, and Wilson's petrels, and a fourth, the peculiar diving petrels, which are birds of auklike form confined wholly to the Southern Hemisphere.

Since certain species are closely woven into the lore of all human seafarers, a few words on the English group names may be of interest.

"Albatross" proves to have had an especially checkered career. The root of the word is Arabic and refers to the bucket on a water wheel. In its Moorish-Spanish form, *alcatraz*, it was applied to the pelican, which has a "bucket" in its pouch. Subse-

quently, the Spanish and Portuguese mariners bestowed some form of the name upon the *largest* sea fowl of any particular region—sometimes a frigate bird or booby, sometimes one of the wide-winged creatures upon which the corruption "albatross" eventually became fixed.

"Petrel" is no less interesting. According to a pretty legend, it arose from the fact that the bird, like Saint Peter, "walks upon the water." But both the current form of the word and the explanation are alike very young, dating only from a yarn by Dampier published in 1705.

Earlier English usage, as in Flawes's *Voyage to Nova Zembla* (1676), employed the spelling "pitteral." I suspect, therefore, that the term was derived either from the chattering voices of the sea sprites or from the fact that they "pitter-patter" on the surface of the sea, and that the link with Saint Peter was an afterthought.

"Mother Carey's chicken" may, however, have a medieval religious origin. The name of this vague demigoddess—no doubt the wife of Davy Jones—has been traced by some to prayers addressed by storm-tossed Mediterranean sailors to the Virgin, the *mater cara*, or "dear mother."

THE "OAR-FOOTED" SWIMMERS

Broadly similar in history and specialization to the Procellariiformes is another ancient and widely distributed group of waterfowl, characterized by having all four toes of the foot connected by a common web. In modern scientific parlance they are known as the Pelecaniformes. They comprise the tropic-birds, pelicans, gannets, cormorants, snakebirds, and man-o'-war-birds.

This assemblage is far more diversified than the petrel-like birds; it includes not merely several families but nearly as many distinct suborders. The structural difference between a tropic-bird and a man-o'-war-bird, for instance, is incomparably greater than that between an albatross and a Mother Carey's chicken.

Not all of the Pelecaniformes are oceanic; certain cormorants and pelicans have become birds of interior continental waterways. At the other extreme, the tropic-birds are nearly as pelagic as the petrels. The gannets and boobies, too, are at least strictly maritime and seem for the most part to be repelled by continental coasts.

The man-o'-war-birds are in a sense su-



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PUTTING ON THE BRAKES!

So great was the speed of the gannet as it swept toward the ledge that it seemed the bird would smash against the rocks. Instead, bringing wings and feet well forward, it checked momentum and alighted safely. In a flash it had offered maximum resistance to forward motion, permitting an almost vertical landing. Strikingly illustrated are the gannet's powerful four-toed, webbed feet. The membranes extend to the tips of the toes.

premiely specialized sea fowl, although they are creatures of the atmosphere far more than of the water. They never swim and must roost ashore. They show no repugnance toward land, flying freely from sea to sea over the Isthmus of Panama, or even across high islands such as Cuba.

Although they have established themselves at the most faraway islands throughout the world's warmer oceans, the man-o'-war-birds tend, nevertheless, to be sedentary rather than nomadic. If they are often seen out of sight of land, it should be remembered that the home island may still be within view of the lofty bird.

Records of man-o'-war-birds at a great distance from any land are rare, except as regards individuals transported by hurri-

cans, and in the existence of many distinct species and subspecies at islands or archipelagoes, we see a biological reflection of their penchant for clinging persistently to the vicinity of home and shore.

The decreasing extent to which the several groups of salt-water Pelecaniformes are "tied to the land" is expressed by the following sequence: pelicans, cormorants, man-o'-war-birds, boobies, tropic-birds.

Pelicans practically never lose sight of the coast, and have occupied no remote islands except the Galápagos. Of the other families, only the tropic-birds, which resemble terns except for their long, streaming tail plumes, are to be looked for in the most distant stretches of blue water, unbroken by rock or sand.

Short-tailed Albatross

(*Diomedea albatrus*)

Average Length, Thirty-seven Inches

Swift, wheeling, effortless flight is associated with the very name of albatrosses, and the sighting of these birds at sea is an experience never to be forgotten. The structure of a perfect glider and the subconscious technique of a master pilot are jointly responsible for the supreme result, for no albatross is a highly muscular bird. Its ends are gained by balance, finesse, and economy of energy rather than by main strength.

The adult short-tailed albatross, with its white body, tawny crown, black wings, and narrowly black-tipped tail, is readily distinguishable from any other species of the North Pacific. The immature bird, however, wears a completely dark plumage, and is to be separated from the black-footed albatrosses chiefly by its pinkish bill and feet.

All of this is on the assumption that any short-tailed albatrosses remain to be identified. The bird was familiar along the Alaskan steamship routes until the nineties of the last century, and its bones are abundant in the kitchen middens of the California coastal Indians. But none has been definitely reported from our Pacific waters for a generation.

The decline of Arctic whaling, and other reasons put forward to explain its disappearance are probably specious. It is greatly to be feared that this most impressive and magnificent of all North Pacific ocean fowl has been exterminated by man's wantonness at the Bonin group and other islands toward the Asiatic side of that ocean, which furnished its only breeding grounds.

Black-footed Albatross

(*Diomedea nigripes*)

Average Length, Twenty-eight Inches

The black-footed albatross, or "gooney," which Audubon first made known to science, nests at a relatively large number of islands from the Hawaiian region westward to Japan, and has thus far escaped the probable fate of its larger cousin. It is the common albatross of the California coast, though to be seen chiefly along the edge of the continental shelf rather than inshore.

Like its many relatives in the Southern Hemisphere, this and other North Pacific albatrosses breed at the beginning of the northern winter instead of in our proper springtime. In early November the goonies arrive at Laysan Island, of the Hawaiian sea bird reservation. Once ashore they begin their dancing, a performance for which all albatrosses are famous. In the black-footed species this, however, is more stately and deliberate than the dance of its neighbor, the Laysan albatross.

The friendly black-foots try on occasion to join in the antics of the other albatross, only

to have their ritual thrown out of kilter by a too rapid tempo.]

Although the ceremony just referred to has always been called a "courtship dance," it has now been learned that the birds indulge in similar amenities while they are far away at sea during the nonbreeding season. Furthermore, youthful as well as adult members of the tribe take part in such pastimes. It seems probable that the custom is in the nature of general social community behavior, which at the breeding season becomes heightened and specialized as part of a stimulation necessary for reproduction.

The vocal aspect is as notable as the terpsichorean, for while the ardent albatrosses are posturing and crossing beaks they also groan and gabble and utter muffled, abdominal, bell-like notes. These sounds are hardly to be construed as musical, though they may be accepted by the females of the species as ardent love songs.

Goonies regularly follow ships for refuse tossed overboard, and they are often seen scaling about and feeding well into the night. Their sense of smell may help them in finding the malodorous, long-dead fish sometimes found in their stomachs along with squids, masses of fish eggs, and bits of kelp.

The goonies have only a seven-foot spread of wings, which is considerably smaller than in some of the other species. They seem to have the same expert control over rising air currents, however, for it is a common experience to see them alight far behind a ship at sea for some bit of refuse, and then, rising directly into the wind, without a single stroke but with a rapid pattering of the feet on the water, overtake the vessel and wheel circles about it.

With the establishment of trans-Pacific flying, the goonies are likely to become a much more familiar subject of conversation, for near the seaplane station on Midway Island they go about their dancing and domestic duties more familiarly than the sparrows of our city streets. Here they are associated with Laysan albatrosses, a much friendlier species.

Like other albatrosses, these goonies pass most of the year on the open sea, but arrive at their nesting islands on almost exactly the same day each year. So nearly are they on schedule that men at the Commercial Cable Company at Midway have betting pools based on the exact time they will arrive each year. Once they make their appearance, they assume cocky airs and are not above taking a nip at anybody who passes too close to them. They show absolutely no fear of the parvenu human inhabitants.

The single large white egg, laid on the bare sand, needs constant sheltering to prevent its cooking. Young albatrosses have two coats of down, a light coat at hatching followed almost immediately by a dark curly coat which pushes out the former, just as, in turn, it is pushed out by the incoming juvenile plumage.

WINGS OVER THE BOUNDING MAIN



FLAWLESS FLYERS WHEEL ABOVE THE SHIP'S WAKE

The SHORT-TAILED ALBATROSS (above, adult left, young right) and the more familiar "gooney," or BLACK-ROOFTED ALBATROSS (below, adult right, young left) breed only on certain islands in the central and western North Pacific, but may appear during migration anywhere on the American coast from Alaska to Baja California. A half dozen of the short-tailed species, now extremely rare, were observed in the vicinity of the Aleutian Islands in the summer of 1937.

Cory's Shearwater

(*Puffinus diomedea borealis*)

Average Length, Twenty Inches

Cory's shearwater was described from the shore waters of Cape Cod. It was imagined to have come from the Arctic—hence the name *borealis*—and it remained a bird of mystery until, years afterwards, it was discovered to be the common breeding shearwater of such easterly Atlantic islands as the Azores, Madeira, and the Canaries.

Eggs are laid in April and May. When the young reach the fledging stage they are abandoned, as is the custom among all Procellariiformes, and large numbers of the parents then work westward across the ocean to feed along our temperate shores. In September they sometimes enter New York Bay together with the greater shearwaters, from which they can most easily be distinguished by the uniform brownish appearance of the head and neck. The other species is distinctly "capped," with a sharp line between dark and white plumage.

Greater Shearwater

(*Puffinus gravis*)

Average Length, Twenty Inches

Although first described from Greenland waters, the greater shearwaters all come from far-off Tristan da Cunha.

How such tiny islands can account for the staggering numbers of these birds that seasonally make the North Atlantic "grand tour" would be hard to explain; for to the observer who sees them in seemingly endless procession of huge flocks, they seem numerous enough to cover like a blanket many times the area of the territory from which they come. Possibly their breeding rhythm is not annual; if a large part of the population remained at sea over alternate nesting seasons, a multiple use of the limited grassy areas in which the birds burrow would become possible.

The greater shearwater follows whales and porpoises for excreta or for scraps from their tables. Moving in loose bands, and yet working strictly as individuals, the birds likewise pursue shoals of surface-swimming fishes, as well as the squids that come to the uppermost layers of the ocean on dark days or during the hours of half-light.

North Atlantic cod fishermen formerly took advantage of the great numbers, audacity, and insatiable appetite of the "hagdons," as the shearwaters were called, to use the birds both as food and as bait. They were lured within range by the simple expedient of "chumming up" the Mother Carey's chickens with fish entrails. The small birds quickly attracted the larger, which sailed in, scattered the lesser gluttons, and proceeded to snap up the food. They were then caught on mackerel hooks, and it was not unusual to see as many as 500 hanging from the rigging of a Grand Banker.

Fulmar

(*Fulmarus glacialis*)

Average Length, Nineteen Inches

The "foulmart," that is, the stinking-marten or polecat, has had its name transferred to this pearly sea bird. The reason has to do with the rank, musky oil discharged from the stomach—not only, however, by the fulmar but by every Procellariiform species.

Petrel oil has been exploited by many peoples in as many parts of the world. An old-time visitor to St. Kilda, of the Hebrides, where "the cliffs dissolve into birds" when the fulmars take flight, wrote: "The Kildeans use the oil afforded by the stomach as a catholicon for diseases, especially for any aching of the bones, stitches, etc." Here, too, thousands of fledgling fulmars are collected in August and salted as winter food.

Breeding on precipices from the British Isles northward to Greenland and other arctic lands, and migrating southward beyond the zone of floating ice, the fulmar is perhaps the most familiar ocean bird of the Northern Hemisphere.

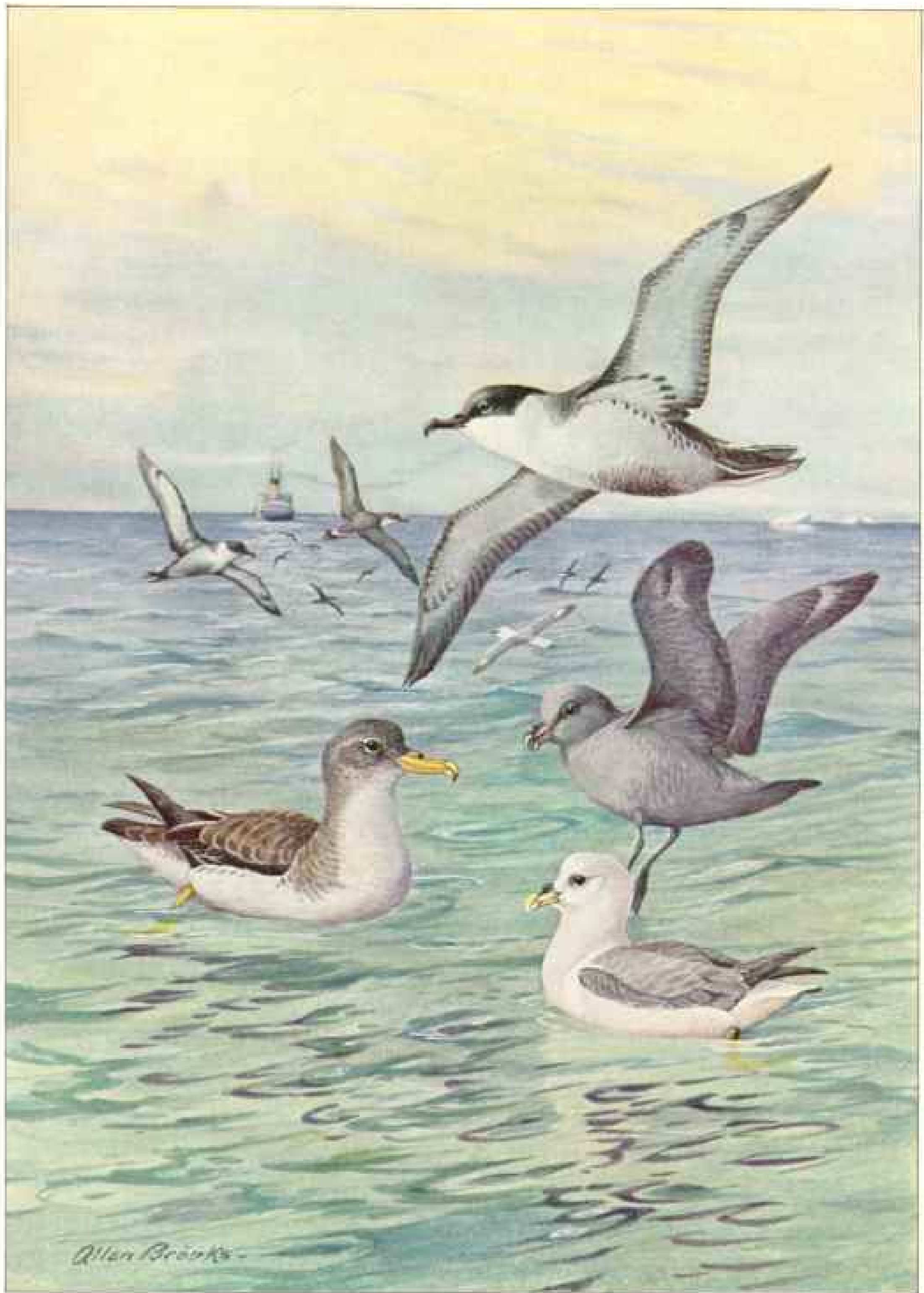
It is the species which leads travelers to believe that "gulls" follow steamers between America and Europe. Its numbers are frequently overpowering; the Dutch whalers of Spitsbergen called fulmars by the same name as the teeming midges of the polar grasslands—*mallempugge*, and Darwin, in the *Origin of Species*, refers to them as the most numerous birds in the world. During recent years or decades there has been a steady southward extension of the fulmar's breeding range in the British Isles.

The fulmar is *par excellence* pelagic. Except at the nesting season, it shies away from all land. When an outbound ship passes off soundings, fulmars often magically appear within a mile or two of the hundred-fathom line. In California, where the coastal shelf is narrow, they more frequently approach the beaches than in eastern North America.

The flight of the fulmar resembles that of albatrosses rather more than that of shearwaters. In ghostly silence the birds glide and scale tirelessly on their stiff, somewhat blunt-looking wings, in which the process of molt and growth can easily be observed from shipboard. That the molt brings no loss of aeronautic efficiency is due to its symmetry and to the fact that the two outermost or leading quills are retained until the inner ones are nearly full grown.

Like many other petrels, the fulmar has two plumage phases, of which the pearl gray is by far the commoner. Dark birds are more numerous in the western part of the North Atlantic than in European waters, but even off the Labrador coast, where most in evidence, they probably make up not more than one in twenty of the whole population.

WINGS OVER THE BOUNDING MAIN



RESTLESS SHEARWATERS USUALLY STAY FAR OFFSHORE

In northern summer they congregate about the Grand Banks off Newfoundland. The only known breeding grounds of the Atlantic GREATER SHEARWATER (upper right) are in the Tristan da Cunha Islands. Together with COVEY'S SHEARWATER (lower left), they sometimes visit New York Bay. The circumpolar FULMAR (lower right, light phase on water, dark above) keeps far out at sea, following ocean liners.

Black-capped Petrel

(*Pterodroma hastata*)

Average Length, Eleven Inches

The black-capped petrel dwells on the Atlantic hurricane track, which is the principal reason why so many examples have been picked up in the interior of the United States and other odd places. Its nesting ground, however, is only on islands of the West Indies, where it was generally exterminated, soon after the introduction of slaves, by being yanked from its mountain burrows for human food. What the black men missed, the introduced mongoose, or one of two kinds of opossums likewise brought from other places, finished.

There is evidence, however, that at least a few of these birds still exist in Haiti, as well as in the little island of Dominica of the Lesser Antilles. Recently, several have been identified in the Gulf Stream.

Two phases apparently once occupied the Antilles, the second being a blackish form usually known as the "Jamaican petrel."

Sooty Shearwater

(*Puffinus griseus*)

Average Length, Seventeen Inches

Here we have a petrel that is unique in being abundant throughout the length of the oceans on both sides of the Americas, from the latitude of Cape Horn northward to sub-arctic fishing grounds. A hundred thousand birds is a low estimate of the number one may see in a day along California shores.

The sooty shearwater breeds in New Zealand, where it is one of the famous "mutton-birds" of Maori feasts, and also in the Magellanic region of South America. Nests near Cape Horn have been found at the New Year season, the single egg lying in a chamber at the end of a long tunnel excavated through wet ground. The sitting birds fight savagely when hauled into the daylight.

One January day, when some 15 miles off the coast of Peru, I sailed through a raft of sooty shearwaters that covered many acres of the ocean. The air was calm, and the birds in the vessel's path flopped to either side, making frequent and frantic dives. I noted that they literally "flew" while submerged.

Audubon's Shearwater

(*Puffinus lherminieri lherminieri*)

Average Length, Twelve Inches

Belonging to a group of cosmopolitan distribution in warm seas, the typical form of Audubon's shearwater inhabits the Caribbean region, with a northern breeding outpost at Bermuda. It is the only small, sharply black and white shearwater of southeastern North American waters.

At certain islands these birds occupy natural cavities in the coral limestone, while at others they burrow in grassy ground or even beneath

the shade of forest trees. The nesting season appears to be nearly continuous. In the West Indies courtship and nest construction have been observed between July and November, eggs between January and May, and newly hatched young between May and July.

At home, these secretive beings are nocturnal and eerie. All night during the nuptial season mournful cries, some of which resemble catcalls, ring out in the free air or come as a muffled chorus from tunnels.

Leach's Petrel

(*Oceanodroma leucorhoa*)

Average Length, Eight Inches

Leach's and Wilson's petrels look substantially alike, yet I have learned to tell them apart instantly, as far as the eye can reach, because their movements are so unlike.

Words can hardly give the key, but the flight of the stormy petrel has been called batlike, that of Wilson's swallowlike, and that of Leach's nightjarlike. The last is springy, bounding and erratic, strongly suggesting a whippoorwill under way. Leach's petrel shows little interest in ships, while its two relatives are notorious wake-foragers.

Leach's petrel nests at islands on both sides of the great northern oceans, from about the latitude of Massachusetts to the Arctic Circle. In winter it migrates as far as the Equator.

Wilson's Petrel

(*Oceanites oceanicus*)

Average Length, Seven Inches

Wilson's petrel, a famous surface-dancer, comes to us in summer from islands east and south of southern South America, some of them beyond the Antarctic Circle.

Life conditions are so severe at the nesting grounds that one often finds frozen chicks and eggs of previous years in the rock crevices where the birds rear their single offspring.

Storm Petrel

(*Hydrobates pelagicus*)

Average Length, Five and One-half Inches

The storm petrel was rather vaguely reported by Audubon from the Grand Banks of Newfoundland. Recently it has been found to be an occasional visitor in spring and autumn to high latitudes off eastern North America. In summer it nests at Old World islets between Iceland and the Mediterranean; in winter it migrates southward as far as the Cape of Good Hope.

Incubation of the egg requires 30 days and the whole term of brooding and feeding, by parents which alternate in the task, about twice as long. Small wonder that some abandoned fledglings fail to take to sea until snow-fall!

Formerly the Faeroe islanders converted storm petrels into candles by drawing wicks through their oily bodies.

WINGS OVER THE BOUNDING MAIN



YOU CAN TELL SOME OF THEM BY THEIR FLIGHT

The flight of the STORM PETREL (lowest figure) has been called batlike, that of the WILSON'S PETREL (yellow-webbed feet) swallowlike, while that of the LEACH'S PETREL (left foreground) suggests a whippoorwill. The rare BLACK-CAPPED PETREL (upper) and AUDUBON'S SHEARWATER (lower right) are inhabitants of the West Indies. The SOOTY SHEARWATER (center) breeds in New Zealand and South America.

Cape Pigeon

(*Daption capensis*)

Average Length, Fourteen Inches

The best known sea bird of the southern oceans, mentioned by all voyagers since the earliest days, might perhaps never reach the North Atlantic were not sailors so fond of hooking it and—sometimes—of letting it go. One ship's crew freed eleven just before making Southampton! In the Pacific, however, the Cape pigeon occasionally crosses the narrow warm-water belt under its own power, to enter the cool California current.

The name of this antarctic petrel is sufficiently explained by its appearance. At home it is almost inconceivably abundant, especially about whaling stations, where the cantankerous birds squabble noisily for blubber scraps. Lincoln Ellsworth and Sir Hubert Wilkins have both found that the rafts of Cape pigeons on the crater harbor of Deception Island constitute the most serious hazard when taking flight in a seaplane or attempting a landing.

Pink-footed Shearwater

(*Puffinus creatopus*)

Average Length, Nineteen Inches

The pink-footed shearwater is so closely related to the Cory's shearwater that it may be regarded as a representative of the same group. Its range comprises the waters along the entire Pacific coast of the Americas, from south-central Chile to Alaska.

The species was described in 1864 from a specimen collected near San Nicolas Island, California, but not until some years later was it discovered that the birthplace and center of origin of the great armadas which come as summer visitors to our coasts is at Robinson Crusoe's Island, the inner member of the Juan Fernandez group. Still later the species has been found to inhabit also Mocha Island, which is farther southward and much nearer the Chilean shore.

At Mas a tierra Island, Juan Fernandez, the pink-footed shearwaters burrow in the steep hillsides from near sea level up through the woods and the fern belt to an altitude of 1,500 feet or more. The burrows fairly honeycomb the ground in certain places near the tops of successive ridges, from which the outgoing birds can most readily take flight. Many penetrate from 5 to 10 feet from the entrance, and in the enlarged nest chamber the single egg lies on a bed of straws and sedges.

During the day the shearwaters remain silent and concealed, but at nightfall they make a terrific noise as they come and go in countless thousands, reminding the observer of the clouds of bats that issue from the mouth of the vast bat cave near Carlsbad, New Mexico. They are true creatures of darkness, for a bright moon will delay their arrival or even cause them to skip a night at home.

Slender-billed Shearwater

(*Puffinus tenuirostris*)

Average Length, Eighteen Inches

This species is confined to the Pacific, breeding chiefly at islands close to southern Australia and reaching the west coast of North America only as a rather rare migrant. In the field it is difficult to distinguish from the slightly larger sooty shearwater. Perhaps the darker wing lining of the present species would make the best distinguishing mark.

The slender-billed shearwater is the "muttonbird" of Bass Strait. A petrel of ancient fame and great economic importance, it is protected by Tasmanian law, but an open season begins on March 20, and the young may be legally taken thereafter until the surviving fledglings leave the breeding grounds in May. About half a million of the chicks were captured and prepared as food in a single season a few years ago. Formerly the adults as well as the young were slaughtered in great numbers for the feathers, oil, and flesh.

The young hatch in January. After dusk there is a rush of adults from the sea. This influx is conducted in silence, but presently the burrowed ground begins to emit extraordinary gurglings, groanings, and laughter as the numberless chicks are receiving their one meal of the day. About 10 o'clock the muffled clamor ceases, while the young are digesting and the adults resting from their labors. Some of the parents come forth to sleep in the open air. At 7:30 a. m. a rising murmur announces the awakening of the rookery, and the old birds scramble like land crabs to the higher ridges of their isle, where they stretch their wings over their backs and launch into the air.

Black-vented Shearwater

(*Puffinus opisthomelas*)

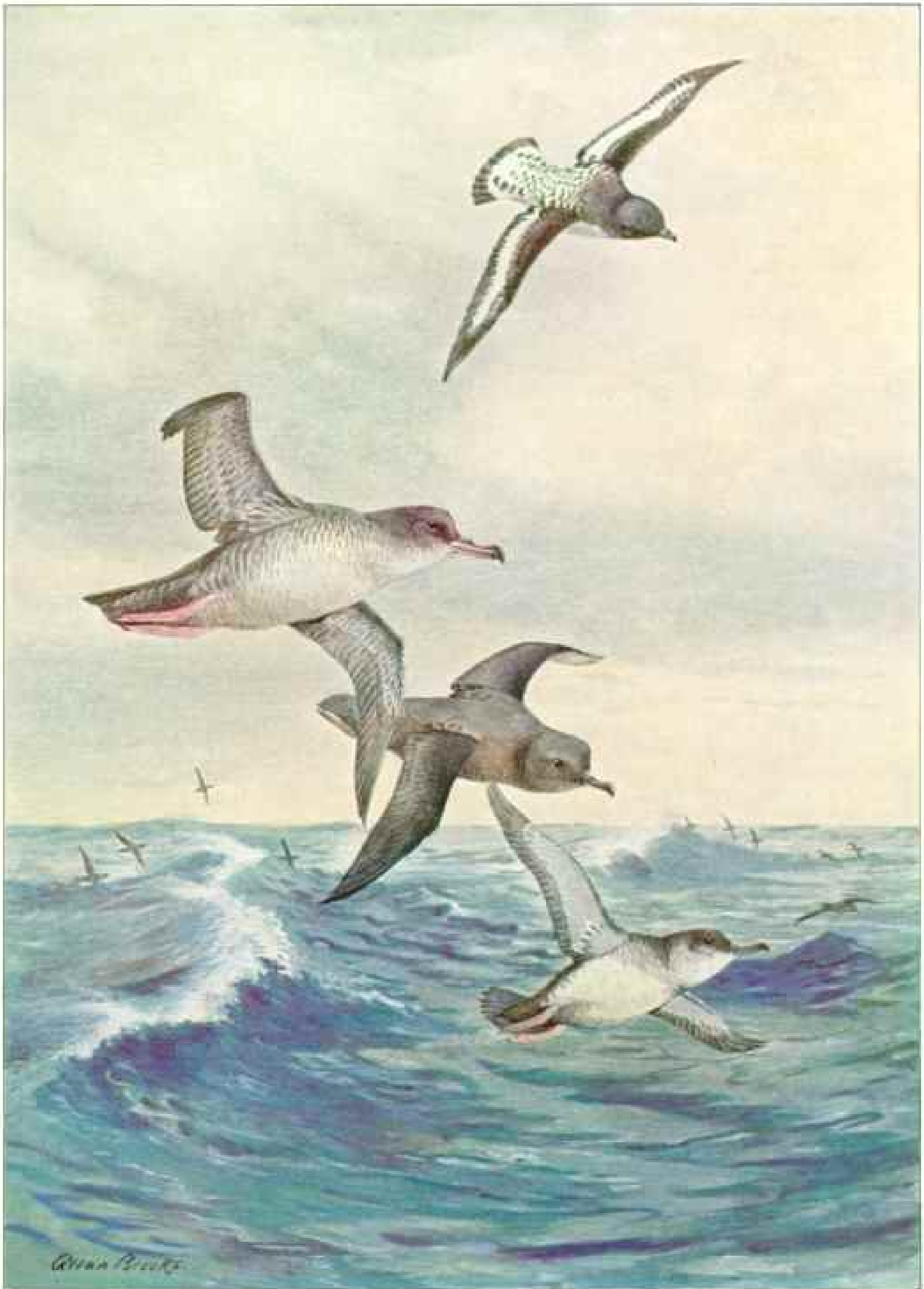
Average Length, Thirteen and One-half Inches

The black-vented shearwater reverses the ordinary direction of migration. It nests on islands off Baja California, and in August passes northward along the Pacific coast of the United States. The return flight is equally conspicuous in early spring.

At Guadalupe Island, south of San Diego and about 160 miles offshore, the black-vented shearwater breeds in burrows or niches, with such sea fowl as auklets and murrelets for neighbors. The love-song is unflatteringly described as a series of wheezes resembling steam escaping through a partly clogged pipe!

This species is in the main a fish-eater, and correlated with this is its indifference toward ship's refuse, which sometimes draws many kinds of petrels into the wake of a vessel. When pursuing their prey, the shearwaters are inclined to describe a circle or an ellipse, which may be either in a horizontal or a vertical plane. In the latter case, a flattened ring of birds rolls along after the moving shoal.

WINGS OVER THE BOUNDING MAIN



A MOTTLED CAPE PIGEON TAGS ALONG ABOVE PACIFIC SHEARWATERS

The CAPE PIGEON, or "pintado petrel" (upper), best known sea bird of southern oceans, rarely visits the North Pacific. Below, left to right, the PINK-FOOTED SHEARWATER, the SLENDER-BILLED SHEARWATER, and the BLACK-VENTED SHEARWATER nest in widely separated areas of the vast ocean and only occasionally mingle on the west coast of the United States in northern summer.

Bulwer's Petrel

(*Bulweria bulweri*)

Average Length, Nine Inches

This petrel claims inclusion in the fauna of North America upon the grounds of a single accidental Greenland record. It has long been famous, however, for an extraordinary type of distribution, for it occurs in the warmer latitudes of the eastern Atlantic and the central and western parts of the Pacific. Between these two widely separated areas of its range there is, so far as known, no connection.

Some ornithologists have supposed that the distribution of Bulwer's petrel antedates the present land connection between North and South America, but this is highly speculative.

Bulwer's petrel stands betwixt the Mother Carey's chickens and the larger petrels. It resembles the former, and yet is more closely related to the latter.

Black Petrel

(*Oceanodroma melania*)

Average Length, Nine Inches

The black petrel nests on Baja Californian islands and, as in the case of the black-vented shearwater, its numbers spread northward to our Pacific coast after the breeding season. However, the black petrels also migrate across the Tropics, for they are well known in Peru. They are exclusively American.

During the winter the black petrels come close to west coast ports to feed upon garbage. They are at times given to "rafting," forming in calm weather dense black patches a hundred yards or more in diameter.

Fork-tailed Petrel

(*Oceanodroma furcata*)

Average Length, Nine Inches

This species is unique in its light-gray plumage, which renders it easily identifiable among the puzzling black or black and white forms that make up the bulk of the family.

The fork-tailed petrel belongs to the northern part of the North Pacific, where it nests on many islands from the Kurile and Commander groups on the Siberian side, across the Aleutian chain and southward in North American coastal waters to northern California. Its range during the nonbreeding season extends to southern California and also northward through Bering Strait into both Asiatic and Alaskan Arctic waters.

The fork-tailed petrel is not narrowly limited as to the nature of its breeding ground. Its burrows have been found on grassy, treeless slopes of the Aleutian Islands, among basaltic rocks at Copper Island of the Commander group, and in the soil under a dense forest of huge firs and hemlocks at St. Lazarus Island, near Sitka, Alaska.

The nesting season comes in June and July. At St. Lazarus the nesting petrels do not

come in from sea until the tail end of the late summer twilight makes the woods gloomy. Thereafter, their calls and the wind from their wings can be heard throughout the hours of darkness. The birds frequently fly against the face of an observer, and they have actually extinguished a campfire by flying into it. They become fewer and quieter, however, at the first sign of dawn, and by sunrise disappear.

Socorro Petrel

(*Oceanodroma socorroensis*)

Average Length, Seven and Three-quarters Inches

Described from near Socorro Island, Mexico, this petrel was saddled with a misnomer, for it nests only at the San Benito and Los Coronados groups.

It closely resembles Leach's petrel, of which, indeed, it is probably only one of the several geographic forms that have developed at distinct breeding stations along the Pacific coast of North America. Most examples are all blackish, but about three per cent have more or less white on the upper tail coverts.

Ashy Petrel

(*Oceanodroma homochroa*)

Average Length, Seven and One-half Inches

The Mother Carey's chickens that visit the Atlantic coast of the United States have white patches above the tail, but along our Pacific shores there are several forms which are dark-rumped and which are extraordinarily difficult to distinguish one from another in the field.

The more closely such birds are observed, the more apparent their individualities become but unfortunately not enough seems yet to have been learned to enable the distinctive traits of the ashy petrel to be put into print. We can say only that it is the smallest of the all-dark species of its genus (*Oceanodroma*), that its range seems to be limited entirely to the cool waters of the California coast, and that its breeding grounds are restricted to the Farallon Islands and to San Miguel and Santa Cruz Islands.

At the Farallons, where this petrel is said to be the last bird to return for nesting in the spring, the sites are mainly between and under stones. The creatures have become so well conditioned to man's presence that they ignore the ear-splitting blasts of the siren, repeated every 45 seconds in foggy weather.

Least Petrel

(*Halocyptena microsoma*)

Average Length, Five and One-half Inches

Breeding at San Benito Island, off Baja California, this species has been collected at 7-3 from Ecuador northward to Point Loma, California. Little has been recorded of its appearance or habits. It nests in midsummer, seeking crevices under slabs of rock, rather than burrowing as do its relatives.

WINGS OVER THE BOUNDING MAIN



"MOTHER CAREY'S CHICKENS" SAILORS CALL THEM

The BUTLER'S PETREL (left center) frequents the eastern Atlantic and the western Pacific. Strictly Pacific species are the other somberly clad little mariners. To the right of the lovely pearl-gray FORK-TAILED PETREL (upper) hovers the BLACK PETREL, one of the few birds that migrate north after the breeding season. Water drips from the feet of the rising SOCOBRO PETREL (lower right). Smallest of the all-dark species is the LEAST PETREL (left foreground), which half faces the pert ASHY PETREL.

Gannet

(*Morus bassana*)

Average Length, Thirty-five Inches

The gannet is the most inspiring inhabitant of the North Atlantic, to which ocean it exclusively belongs, although it has a close relative in South Africa and another in the Australasian region. The magnificent bird is a sort of symbol of the maritime pioneers of our race. In the *Anglo-Saxon Chronicle*, of the 10th century, the ocean itself is called the "Gannet's Bath." The name gannet is of the same origin as "gander," and solan goose, derived from the Scandinavian *havanda* (sea goose), is still current in the British Isles.

The specific name of the gannet (*bassana*) comes from Bass Rock, at the entrance of the Firth of Forth, a historic nesting ground. The bird's stations are by no means numerous, for outside the British Isles it is known to breed today only at islands off Iceland, and at several in the Gulf of St. Lawrence and near Newfoundland. The names "Gannet Ledge" and "Gannet Rock" are reminiscent of a time in which it also covered like snow certain islets nearer the borders of the United States, off Nova Scotia and New Brunswick, but it has now left these localities.

When Jacques Cartier entered the St. Lawrence, he sighted, according to Hakluyt's early translation, "islands . . . as full of birds as any meadow is of grasse, which there do make their nestes; and in the greatest of them there was a great and infinite number of those that wee cal margaulx, that are white and bigger than any geese."

For three centuries the gannets of Bird Rock remained in happy security, so that when Audubon visited the colony in 1833 he rubbed his eyes in amazement at the host of white birds covering the "roof" as well as the ledges of the island. Subsequent ravages of cod fishermen, who used gannet flesh for bait, reduced the population from a hundred thousand or more to less than three thousand. Fortunately, the gannets are now well guarded by the Canadian Government, and their slowly increasing colonies on the ledges of Bonaventure and other islands, where the birds can be seen at close range courting, nesting, and feeding their young, furnish delightful entertainment to tourists visiting the Gaspé region.

Although occasionally seen far from land, the gannet is not a truly pelagic bird. Its distribution is largely regulated by that of herrings, pilchards, and other shoaling fish, which mainly frequent the offshore zone of the continental shelf. On daily feeding excursions its stately and purposeful flight may carry it away, however, a hundred miles or more. Its winter migration takes it southward along our eastern coast as far as Florida and the Gulf of Mexico. On the Old World side of the ocean it ranges to North Africa, but the great

intervening stretches of water between these ranges appear to be without gannets.

The gannet weighs about 7 pounds. It feeds by plunging from high in air and seizing its prey, making the spray shoot up ten feet. Among peculiar structures correlated with such a violent mode of life is its equipment of subcutaneous air cells, which form a cushion against the impact of the bird's streamlined body with the water. This cellular layer is connected with a series of larger air sacs and indirectly with the lungs. So extensive, indeed, is the entire respiratory system of the bird that at least three full inspirations of a man's lungs may be successively blown into the wind-pipe of a freshly killed gannet.

In having this system of air-filled buffers to protect them from the impact of the water, gannets are like the pelicans, whose heavy bodies would likewise suffer in their plunges from on high were it not for similar pneumatic structures.

The gannet's single egg, which is more than three inches long, but exceptionally small-yolked, is pale bluish-white overlaid with limy material, but with no dark spots whatsoever. The nest on the ledge overlooking the sea is usually small and insignificant when the egg is first laid, but it grows larger during the 42 days of incubation. This is because it is a common practice for one bird, upon returning to take its place on the egg, to present its mate with a piece of nesting material, which is ceremoniously tucked into the nest.

When first hatched, young gannets are dull black and nearly as bare and as handsome as short sections of garden hose. Down begins to appear, however, when they are 24 hours old and, within two weeks, they are clothed in a thick covering of white or yellowish down; then they could pass for old-fashioned powder-puffs. Soon, however, their dark juvenile feathers begin to push out the down and by the time they are 12 to 15 weeks old, they are heavier than the adults and clothed in a plumage of dark grayish brown, spangled above with white.

At this age they are abandoned by their parents and, like young petrels, they starve and lose weight for ten days or more before finding their way to the sea, where for a time they lead an exclusively swimming life.

The change to the adult plumage is gradual through successive molts, two-year-old birds having white heads and underparts, but dark backs. Fully adult plumage is not attained until at least the third year. The gannet's eyes, which are brown at first, likewise undergo a change to gray and finally to white when the bird is two years old, though the ring about the eye becomes blue when the youngster is only seven months old.

Despite the fact that gannets are usually classed as surface feeders, they have been captured in nets set as deep as 14 fathoms.

WINGS OVER THE BOUNDING MAIN



ABOVE TRANQUIL SEAS WIDE-WINGED HIGH DIVERS SOAR

The GANNET belongs to the North Atlantic exclusively. Herrings, pilchards, and other fish near shore attract it. Plunging spectacularly from high in the air, it seizes the fish in its bill and often makes spray shoot up ten feet when it strikes. The British Isles and the Gulf of St. Lawrence are the gannets' southern breeding limits. One of its principal American nesting grounds, Bonaventure Island, is a carefully guarded reserve.

Red-footed Booby

(*Sula piscator*)

Average Length, Twenty-nine Inches

Boobies are tropical relatives of the gannets and have the same curious feet, with all four toes connected by webs, that are characteristic of the members of the order of pelicanlike birds. The red-footed species is of cosmopolitan distribution in warm seas, but its presence in any particular district depends upon suitable trees or shrubs for nesting, because, alone in its whole family, it prefers to construct its twig-built platform only in woody vegetation, growing or dead. At certain arid islands a single surviving tree, perhaps supporting a dozen red-footed booby nests, represents the favored local home of the species. When such a tree disappears, the boobies either depart or, if they remain, are driven to nest on the low elevation of clumps of grass.

The red-footed booby is famous for its little understood color phases. Not all adult birds are white; in certain regions a large proportion may be grayish brown, with either a gray or a white tail.

This species feeds upon fish, and probably still more upon squids. It usually flies far beyond the broken water of its own island shores, seeking an area of peaceful ocean swell, where flying fish break the surface, and where squids approach it when the sky darkens.

In flight this booby, particularly birds in the white color phase, resembles its northern cousin, the gannet, giving several quick strokes of the wing followed by a short glide. The birds ordinarily plunge into the sea from a height of thirty feet or more, but they sometimes catch their prey in air when flying fish have been driven from the sea by predators below.

While incubating their single eggs on their flimsy nests of twigs, these boobies are either unsuspecting or stupid and permit themselves to be pushed from the nest, though an occasional individual strikes a cruel blow with his sharp bill. The name booby comes from the Spanish *bobó*, meaning a dunce, and the lethargic behavior and stupid expression of the bird make the name seem appropriate.

White-bellied Booby

(*Sula leucogaster leucogaster*)

Average Length, Thirty Inches

After crossing the greater part of the mysterious, endless ocean, Columbus recorded in his journal a joyful sign—an "alcatraz" had perched upon the *Santa Maria*. In the English version this word is usually rendered "pelican," which is, of course, entirely wrong. Pelicans neither fly far offshore nor alight upon vessels under way. The white-bellied, or brown booby does both. Furthermore, and

unknown to the translator, this particular species is called "alcatraz" in all those parts of the Spanish-Portuguese world where there are no pelicans.

The white-belly is found in most warm oceans. Like other boobies, however, and unlike pelicans and man-o'-war-birds, it never flies across even so narrow a wall between oceans as the Isthmus of Panama. As an effect of the resulting isolation of bird communities, we find the interesting biological fact that the true white-bellied booby is restricted to the Atlantic or Caribbean side, whereas just over the mountains, in the Gulf of Panama, is a quite distinct sub-specific relative called the Colombian booby.

The white-bellied booby is a ground-breeder, making the merest pretense of a nest in a shallow scrape, laying two or three eggs but usually rearing only one chick.

It is a businesslike fisherman, doing much of its plunging just outside the breakers of its home island, varying its altitude according to the depth at which fish are moving, and keeping for its own sustenance whatever the man-o'-war-bird does not subsequently steal.

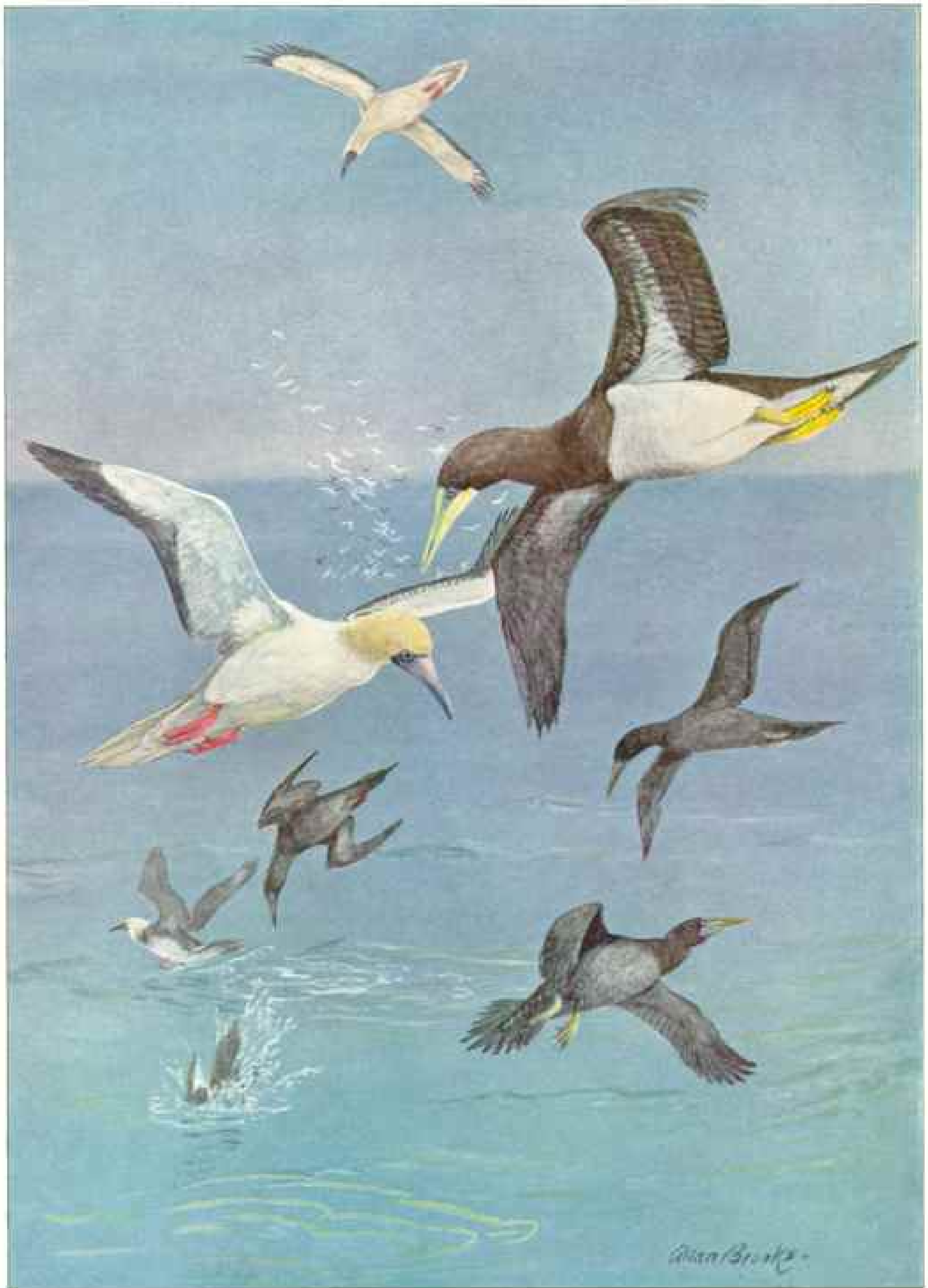
The depredations of the man-o'-war-birds cause the boobies to return to their home island later than most sea birds, even after their enemy has gone to roost. At times, likewise, they do some of their fishing at night.

The eggs of this booby resemble those of other species in being bluish-white and unspotted, but overlaid with a white, chalky deposit. They do show, however, much more variation in size and shape than those of most species. The youngsters when first hatched are naked and have to be carefully sheltered by their parents lest they be cooked outright by the sun. Very soon, however, they become completely covered with pure-white down. Their parents bring back fish in their gullets, if they are successful in evading the man-o'-war-birds, and merely open their mouths and let the little ones help themselves. This is a simple matter for the first course, but when it comes time for dessert a small youngster may almost entirely disappear down its parent's throat for the last tidbit.

The breeding season of the white-bellied booby is apparently more irregular than that of most sea birds, so that fresh eggs and full-grown young are likely to be found from the first of February to the middle of August.

Female boobies are somewhat larger than males, even to their feet, but their plumages are almost identical. First-year birds, however, do not have white underparts, being uniformly grayish brown. On calm days boobies have much more difficulty in flying and in rising from the water than during the most severe storms. At such times they often travel single file, and their measured wing-strokes are almost gull-like.

WINGS OVER THE BOUNDING MAIN



BUSINESSLIKE FISHERMEN OF THE TROPICS

On their breeding-grounds, boobies partly live up to their name, but in power dives for fish their grace excites unqualified admiration. The Red-footed Booby (adults, left center and flying above; young below) is the only member of its family to nest in trees, the others always selecting ledges or flat ground. The White-bellied Booby (right, adult above two young) fishes outside the breakers along its home-island shores.

Man-o'-war-bird

(*Fregata magnificens*)

Average Length, Forty Inches

In many languages much has been stated and sung of the man-o'-war-bird. "Thou art all wings," cried Walt Whitman, with substantial truth. When, however, he placed the same individual at eye in Senegal, at morn in America, the poetic flight vastly exaggerated the choice, if not the ability of the bird.

A seven-foot wing spread to three and a half pounds of weight, speaking in average terms, is a unique relation in the animal world. Together with extraordinary fusing and strengthening of the bones of the shoulder girdle and breast muscles which make up a quarter of the body weight, it gives the man-o'-war-bird unequalled powers of sleepy, floating flight in the light tropical air, as well as of the relentless swift pursuit by means of which it despoils the fast-flying boobies and other sea fowl.

Man-o'-war-birds are expert fishers on their own account, nose-diving with a rush of air from great heights, and deftly seizing prey from the surface which their easily water-soaked plumage never touches. Much of their living is gained, however, by forcing their neighbors to disgorge. Rarely does a fish dropped by a booby reach the water!

There are numerous species and subspecies of man-o'-war-birds, which is indicative of the seldom realized fact that they are not great wanderers. Probably the world's islands have become peopled with them largely through the agency of birds carried at rare intervals by severe tropical storms.

The habits of the several sorts are very similar, and most of them agree with our American bird in the general pattern of coloration. The dark, iridescent male has a throat sac which is red and expansible during the breeding season. It is his love-symbol. He sits and guards the nest with this balloon blown up, while his somewhat larger but more plainly colored mate brings lumber. The two then posture and gabble before each other, but, from beginning to end, the major share of homebuilding, incubation, and guarding of the young seems to fall to the lot of father.

Red-tailed Tropic-bird

(*Phaethon rubricaudus rothschildi*)

Average Length, Eighteen and One-half to Thirty-six Inches; Tail, Three and One-half to Eighteen and One-half Inches

Considered by many to be the handsomest of all the tropic-birds, the red-tailed is by far the rarest near the coast of the United States. Its range is confined entirely to the warmer waters of the Pacific and Indian Oceans, and it is only a straggler off southern California.

The red-tailed tropic-bird has the thinnest and most wiry central tail plumes of all spe-

cies within its family. These were highly prized as ornaments by the Polynesians and other savages of the South Seas, who made them into beaddresses, or even stuck them as ornaments through their noses.

Herman Melville, author of the classic Marquesan tale, *Typee*, describes the chief, Mebevi, as wearing a crest of such plumes upon his noble head. Incidentally, the tropic-birds were not killed in this primitive millinery traffic. During the period of brooding they cling closely to the nest, and it was the custom of the islanders to attract the attention of the sitter's eyes and sharp beak with the left hand, while deftly plucking out the one or two long red tail feathers with the right.

This species differs from other tropic-birds in that it nests on the ground of low islands, instead of seeking lofty niches in cliffs. In keeping with this habit it has considerable agility in rising into flight from a level surface, which it does by scurrying along foot after foot, rapidly beating its wings.

Yellow-billed Tropic-bird

(*Phaethon lepturus catesbyi*)

Average Length, Fifteen and One-half to Thirty-two Inches; Tail, Four to Twenty-one and One-half Inches

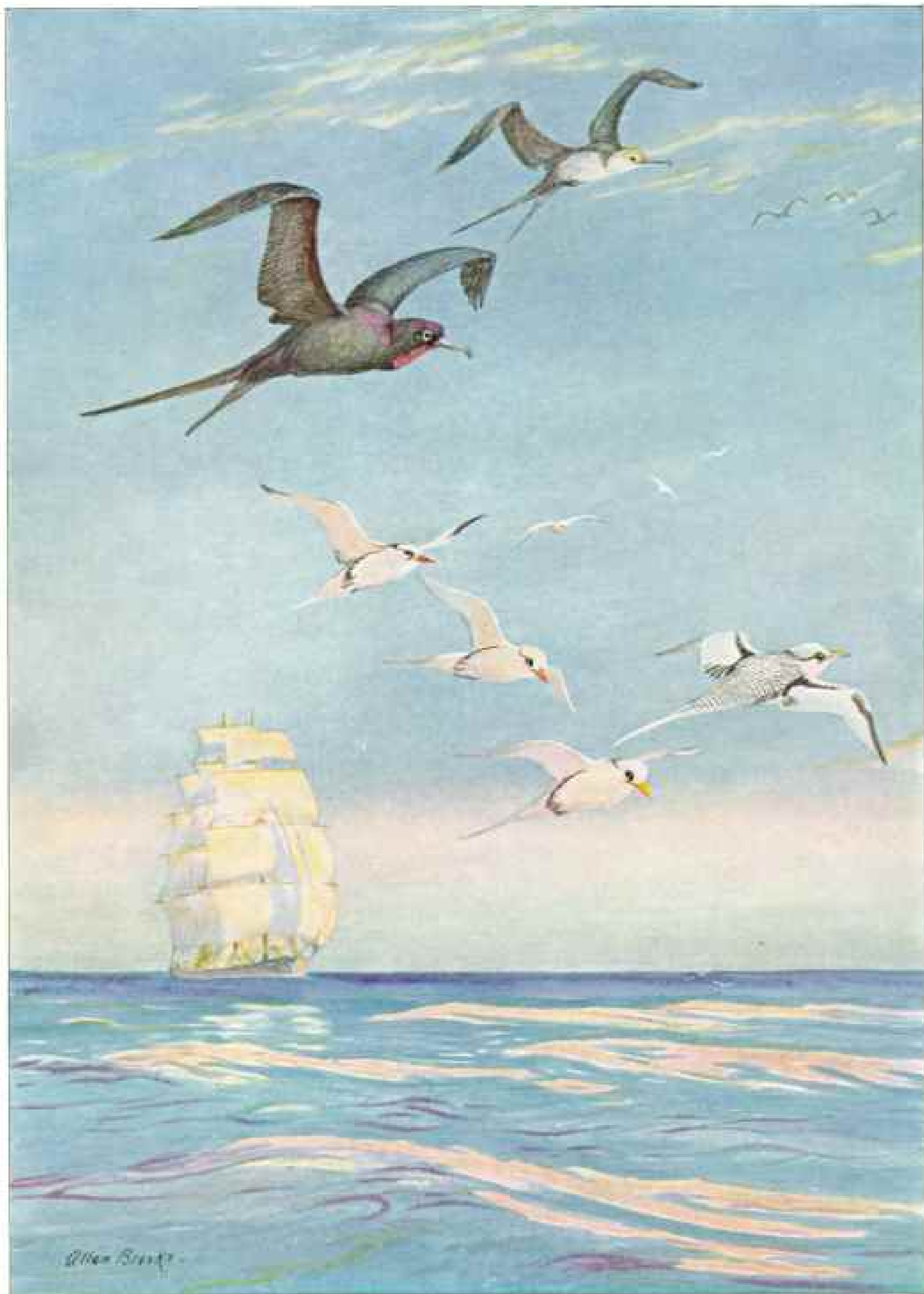
The tropic-birds are extremely ternlike members of the Pelecaniform group, the resemblance extending even to their boldly marked eggs, which are totally unlike those of boobies, pelicans, or man-o'-war-birds.

They are practically as pelagic as the petrels, traveling vast distances in remote seas as soon as the breeding season is over. Even in the heart of the barren Sargasso area one may see the winged comets with their streaming tails, and hear the shrill whistle which has led sailors to call them "boatswain-birds." They feed by hurtling like arrows into the ocean, a fact commemorated by their generic name, which they take from the ill-fated son of Apollo who fell from his badly managed chariot into the deep. Squids appear to make up the bulk of the tropic-birds' diet.

The yellow-billed species—which, incidentally, has a red bill during the breeding season—is found the world over between the Tropics. In the West Indies, and at Bermuda where the bird is known as the "longtail," is a form named by the Russian zoologist, Brandt, in honor of Catesby, who wrote in colonial days a famous book on the birds of Carolina.

The longtails come to Bermuda in April, after their winter wanderings, lay the single egg in cavities of the cliffs, and about three months later abandon their fledglings, which must thereafter rely upon instinct and their own initiative to shift for themselves. It has only recently been learned that such Spartan procedure in the rearing of the young is a trait common to many oceanic birds.

WINGS OVER THE BOUNDING MAIN



RED-THROATED PIRATES SOMETIMES MAKE AN HONEST LIVING

The MAN-O'-WAR-BIRD, or "frigate bird" (upper pair, young above), of tireless flight, steals fish from swift boobies, but is also an expert fisherman on its own. Sailors know these birds as "boatswains" because of their shrill whistles and marlinespike tails. The RED-TAILED TROPIC-BIRD (left center pair, adult below) is a rare straggler off southern California. Ternlike except for its tail plumes is the common West Indian YELLOW-RUMPED TROPIC-BIRD (lower right-hand pair, young with the barred back).

WE LIVE ALONE, AND LIKE IT—ON AN ISLAND

BY R. M. LOCKLEY

With Illustrations from Photographs by the Author and H. Morrey Salmon

THE fascination of an island defies adequate description. Whether it be a tiny islet only a few acres in extent or a large one with lakes and streams does not matter; so long as it is isolated and, preferably, uninhabited, it has an irresistible charm. Yet the island of our dreams is so seldom realized. And, even now, I have to recall the train of events that preceded the realization of my own desire before I can convince myself that I am the lucky citizen of an island.

At an early age my mind was filled with the ambition to possess one for myself. Greedily I read all the books I could find on islands. Although I knew that when I left school I should have to work for a living, this fact—so hopeful is youth—did not appear inconsistent with earning it on a remote island. I felt that, like Thoreau, I would be able to satisfy my simple wants from the produce of my garden, from my skill as hunter and fisherman, and from the milk of my goats.

More than that, I believed, no man with my love of the outdoors could desire. Indeed, it seemed to me that most men live an artificial life in their early years so that at the end they may retire into the country and live naturally, but have by then lost the capacity for doing so.

Agriculture offered more hope to me at 19 years than any other open-air trade. I left school then to found a home on ten acres of land outside Cardiff, Wales. But not for a day in the five years that I worked at my holding did I forget my dream of an island.

At the end of each long summer's day I would take my wheelbarrow, shovel, and pick and continue the self-imposed task of making a pond in one of my fields. The pond had an island, upon which grew a giant oak at least a hundred years old. Around this, at the water's edge, I intended to plant wild flowers and weeds beloved by birds, such as thistle and teasel for their seeds, and thorn and elder for food and covert.

This was but a faint reflection of my real ambition, a real island. I hunted for this during holidays spent on the coast of Wales, where I visited many small islands

during those five years. At last, after finding most of them already occupied, cultivated, and sophisticated, there remained but one, the lonely, almost inaccessible Skokholm. This small island of 250 acres is situated two miles out in the open Atlantic off the Pembrokeshire coast of Wales, between St. Bride's Bay and Milford Haven.*

Fishermen told me that the farm and its fields on this isle were derelict, overrun with heather, bracken, and rabbits. No one had lived there for forty years. This information set me on fire, and I was instantly impatient to cross to the abandoned isle.

But the fishermen were in no hurry to take me and a friendly adviser there. Their mood was dictated by considerations of tide and weather, and there had to be a nice adjustment of these before one might venture on an expedition to Skokholm.

We counseled patience, and were rewarded by a beautiful windless day for the first crossing. Yet the sea was not calm. Strong currents swept us along in a bewildering way, the green-blue water heaving and breaking like a river in flood. It seemed to us landlubbers something of a miracle that the fishermen pulled their little boat to a safe landing.

A BABEL OF BIRD SONGS

We arrived at last at an entrancing natural harbor in the bright-red sandstone cliffs. Nor had one of my dreams anticipated that glorious June day. The gleaming inshore water was alive with sea birds. The broken-up cliffs were strewn with beautiful flowers opened wide to the strong sunlight: sea campion, scurvy grass, primroses, vernal squill, lady's-fingers, mallow, and cowslips.

Higher up, as we landed and moved across the undulating top of the island, there were vivid acres sheeted with thick-stemmed, deep-tinted bluebells and roseate thrift.

As for the birds, the sea had been full of puffins, razor-billed auks, murrets,

* See "A Modern Pilgrim's Map of the British Isles," issued as a supplement to the *NATURAL GEOGRAPHIC MAGAZINE*, June, 1937.



© Ronald M. Lockley

LOBSTER FISHERMEN OF PEMBROKESHIRE ARE A STURDY, SEA-LOVING RACE

European and crested cormorants, and kittiwake gulls. Now the land and the air above it resounded with the cries of hundreds of herring and two kinds of black-backed gulls; oyster-catchers, plover, and smaller birds typical of open country. The babel was sweet music to a lover of birds.

The old dwelling house was some few paces from the landing place (page 256). Built in a whimsical fashion that yet presented the least possible resistance to storms, it was now a patched ruin, no less, in which the birds and the fishermen occasionally sought shelter.

ISLAND "HAUNTED"—BY NIGHT BIRDS

We forced a way in. The beams were hung with the debris, and the floor scattered with the "empties" left by former inhabit-

ants. A rusted muzzle-loader and a family Bible dated 1765 were silent but eloquent reminders of the old days.

That evening, as we sat with the fishermen, gazing into the flames of a huge driftwood fire upon the hearth of the cottage, we tried to reconstruct the lives of the builders and farmers in this lonely isle. I pictured each tenant happily occupied with his garden and farm, enjoying daily contact with the changing colors and moods of earth, sea, and sky.

Musing thus, we were suddenly startled by a loud scream which seemed to come from over the housetop. Turning to the fishermen, my friend and I saw them grinning from ear to ear. More screams followed, eerie and bloodcurdling, and then we tumbled to the cause. The night birds

were coming home to visit their mates in the rabbit burrows!

These shearwaters and petrels make the most astonishing din, and, as they perform only on dark nights, the local belief that the island is haunted by "wee folk" is not surprising (page 276). As naturalists, we scorned the superstition and boldly went forth to look at the noisy birds.

When we got back, after blundering about in the dark and falling into rabbit burrows at this bedlam hour of the night birds, we were glad of a stretch for sleep on the floor beside the fire. The last thing I remembered was the drone of the fishermen telling a wild tale of storm and wreck. But nothing could have persuaded me at the moment that I had not found the island of my dreams.

Immediately on getting home, I set about disposing of my farm. Not an easy problem, this tearing up of roots that had begun to bind me to the prosaic round of livestock breeding, and it had become complicated by the fact that the one woman that mattered had discovered that she would rather marry me than be left behind!

Details of our exit from the mainland need not be given here. A determined effort resulted in a grant, from the owner, of "the right to live in quiet enjoyment and peaceful possession of the island of Skokholm."

I had set foot on the island in June for the first time. It was now October, and I was free to take possession! From the sale of my farm stock I had enough money to make a start. I had bound myself to renovate the island house sufficiently by the end of the following spring to provide a home for my future wife. We were to be married at midsummer; and we were going to live happily ever after!

Fishermen looked askance upon a stranger who, with a lorry loaded with furniture, books, and implements, had arrived to take possession of an island around which already the storms of winter were beating.

When I got down to the coast again, Skokholm was ringed about with a white surf as the heavy seas lifted before the Atlantic gales. The wind roared through the narrow lanes of the mainland, pressing the rich green gorse bushes flat against the stone hedges of this naked Pembrokeshire shore.

But there was a song in my heart, and I leaned gratefully upon the wind as upon a friend's strong arm, while I walked along

the spray-drenched cliffs of the mainland and viewed my inaccessible home. As the storm roared I laid plans, collected stores, interviewed people, and secured two vital things—a good man and a good boat.

FINDING FISHERMAN JOHN

Fisherman John agreed with me to live on the island, which he knew and liked. It was on his fisherman's love of space and freedom, the wind, the sea, and the island, that our friendship was sealed.

I learned to trust John in all matters, and he it was who picked out the most suitable boat for our work. As an inland dweller all my life previously, I knew nothing about boats or the sea.

John proved a daring master to his ignorant disciple. Luckily, my inexperience made me as fearless as he was; yet, looking back now, I realize that the chances and gambles we made with the treacherous winter weather were scarcely justified.

The boat was less than 17 feet long. It had a small auxiliary engine. I remember the number of times we scraped through the narrow sounds with only the backwash of the sea between us and the sharp rocks; how, defeated by a head wind or fierce tide, we were driven back whence we came, or, unluckier still, upon beaches we had never intended to reach; how often the engine failed us, and how often oars were broken in hard struggles to win a passage; how mast and sails were carried away more than once; how in sailing we lay down under a stiff beam wind, the lee rail awash, and water flowing in at each lurch over the current-wracked sea; how the mighty ground swell of the Atlantic never seemed to die; and how, through rough work and scraping against the rocks, the boat became incurably leaky, until each voyage called for many shifts of bailing.

FIRST WINTER THE WILDEST

A storm might last two, five, even ten days, but the calm that followed was the more splendid for the wild weather gone before. During these rare calms I took my possessions to the island. But I could do little else.

Day after day, hoping for better weather, I was forced to delay the moment for tearing down and rebuilding the house, but the gales were renewed unabated. It was bad luck that my first winter there proved to be one of the wildest on record.



RAZOR-BILLED AUKS GREET THE AUTHOR ATOP A SHEER CLIFF ON SKOKHOLM

Scorning nest building, each couple attends one large blotched egg deposited on the ledge. The egg is pointed at one end, so that it rolls around in a circle when blown by the wind and does not fall off the rock. When parents believe their youngster is ready to go to sea, they merrily push it off the cliff. Many fail to survive the tumble (page 272).



Photograph © Ronald M. Lockley

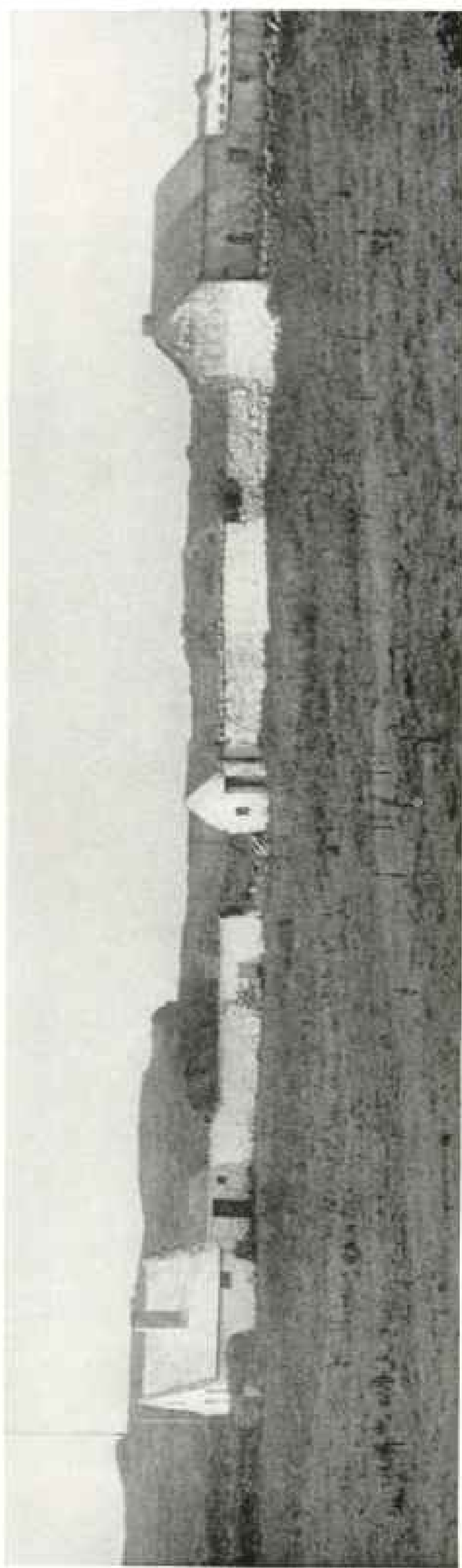
GUESTS RIVAL WONDERLAND ALICE'S DORMOUSE, MAD HATTER, AND MARCH HARE

Ann goes Lewis Carroll's heroine one better as she pours tea for her island companions—a real spiny lobster and young hawk. Her father's boyhood dream of an isle of his own was realized when he found deserted and isolated Skokholm. Here he brought his bride to an 18th-century stone farmhouse, and here Ann was born (page 265).



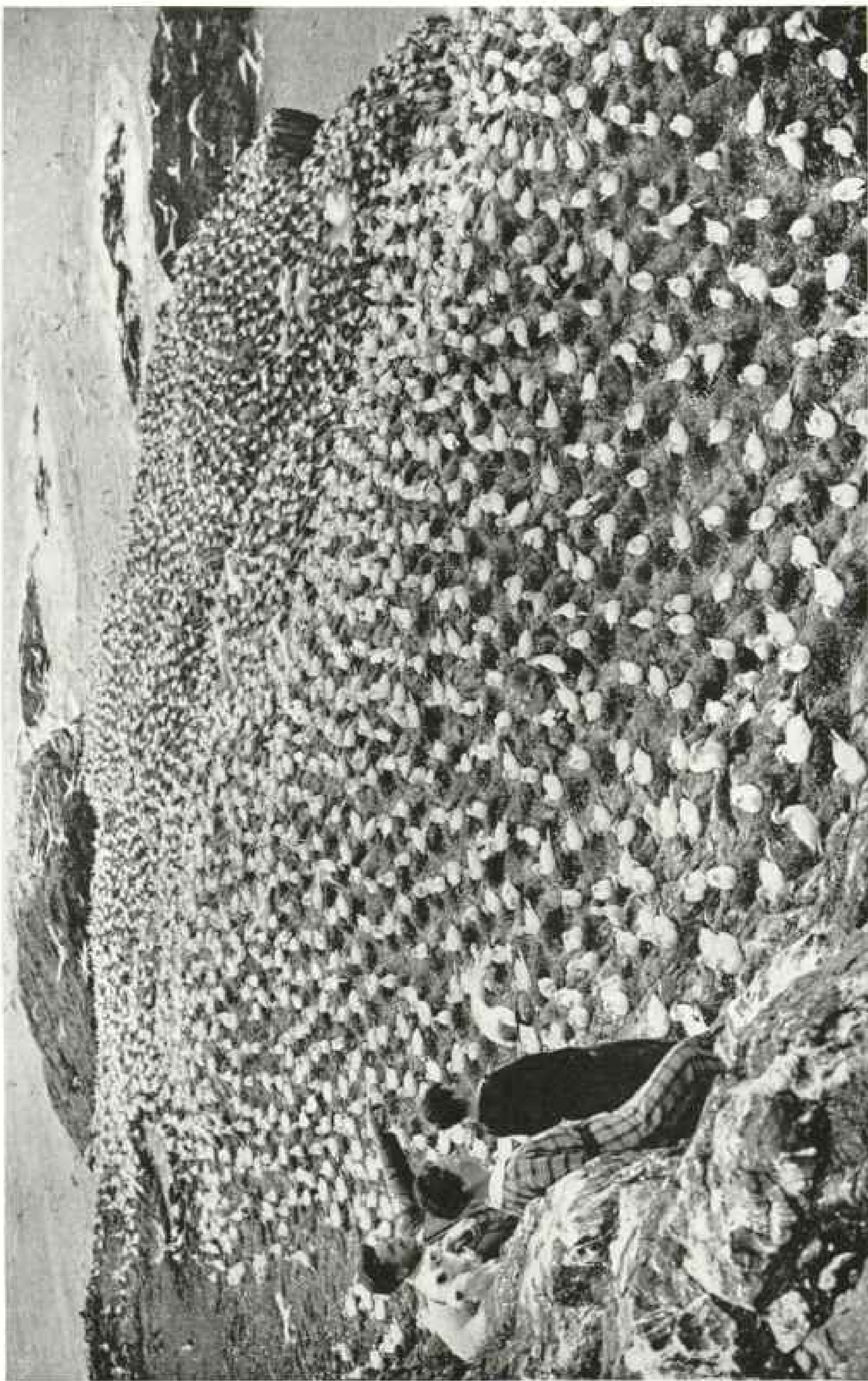
HARRINGERS OF SPRING, MANN SHEARWATERS SKIM OVER THE SEA WAITING FOR NIGHT TO RETURN TO THEIR BREEDING GROUNDS

Through the winter months they have been out of sight of land. With unerring instinct this contingent has returned to Skokholm. One parent may range hundreds of miles from the family burrow for several days during the nesting period, but it is sure to relieve its mate and take up the watch over the single egg (page 267).



VENERABLE STONE FARM BUILDINGS, RESTORED BY THE AUTHOR, MAKE HABITABLE HIS "DREAM ISLAND"

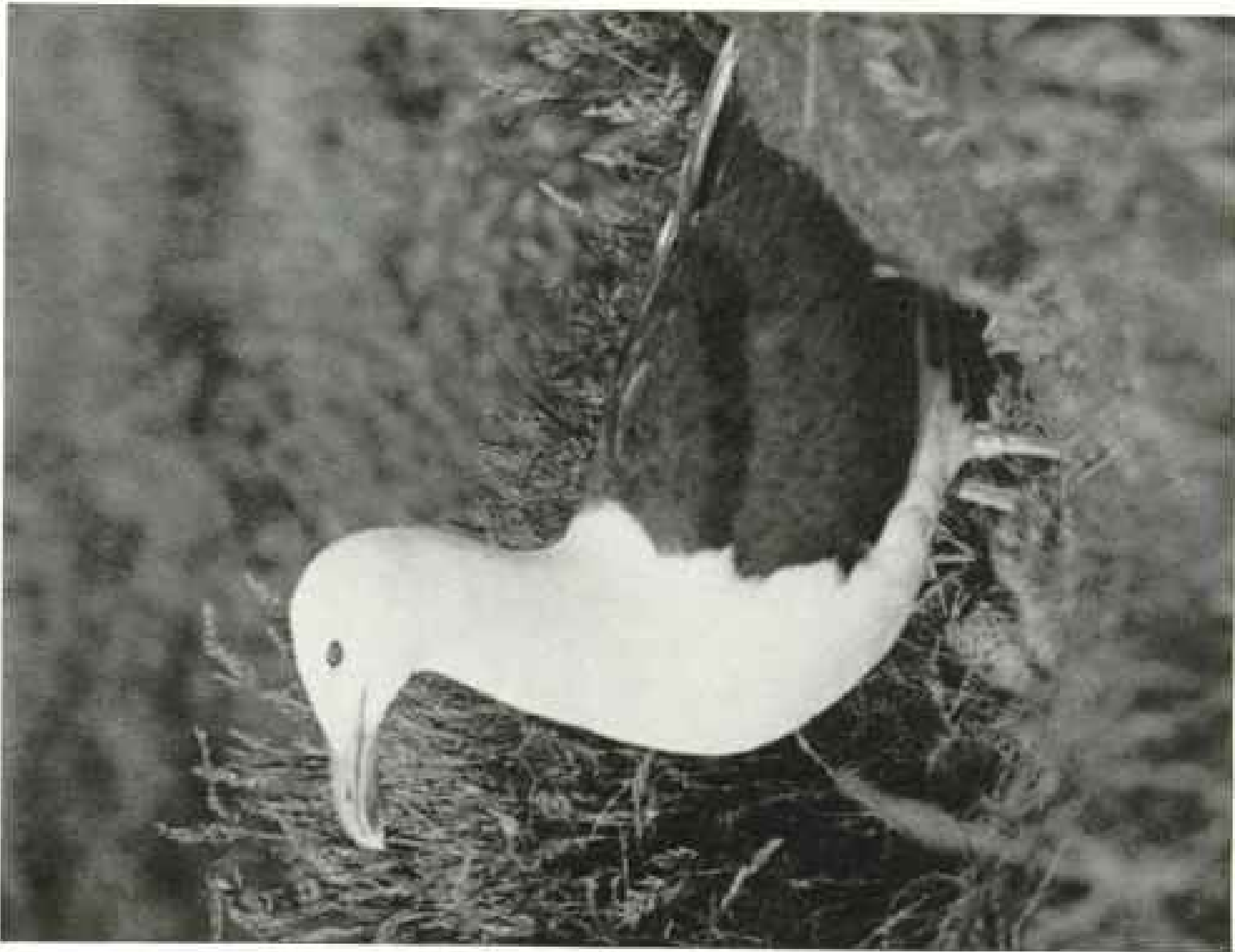
Photographs © Capt. H. Morrey Salmond



© Fox from Globe

UNAFRAID OF HUMAN CALLERS, BIRDS OF A FEATHER FLOCK TOGETHER WHEN THEY COME HOME FROM THE SEA TO NEST

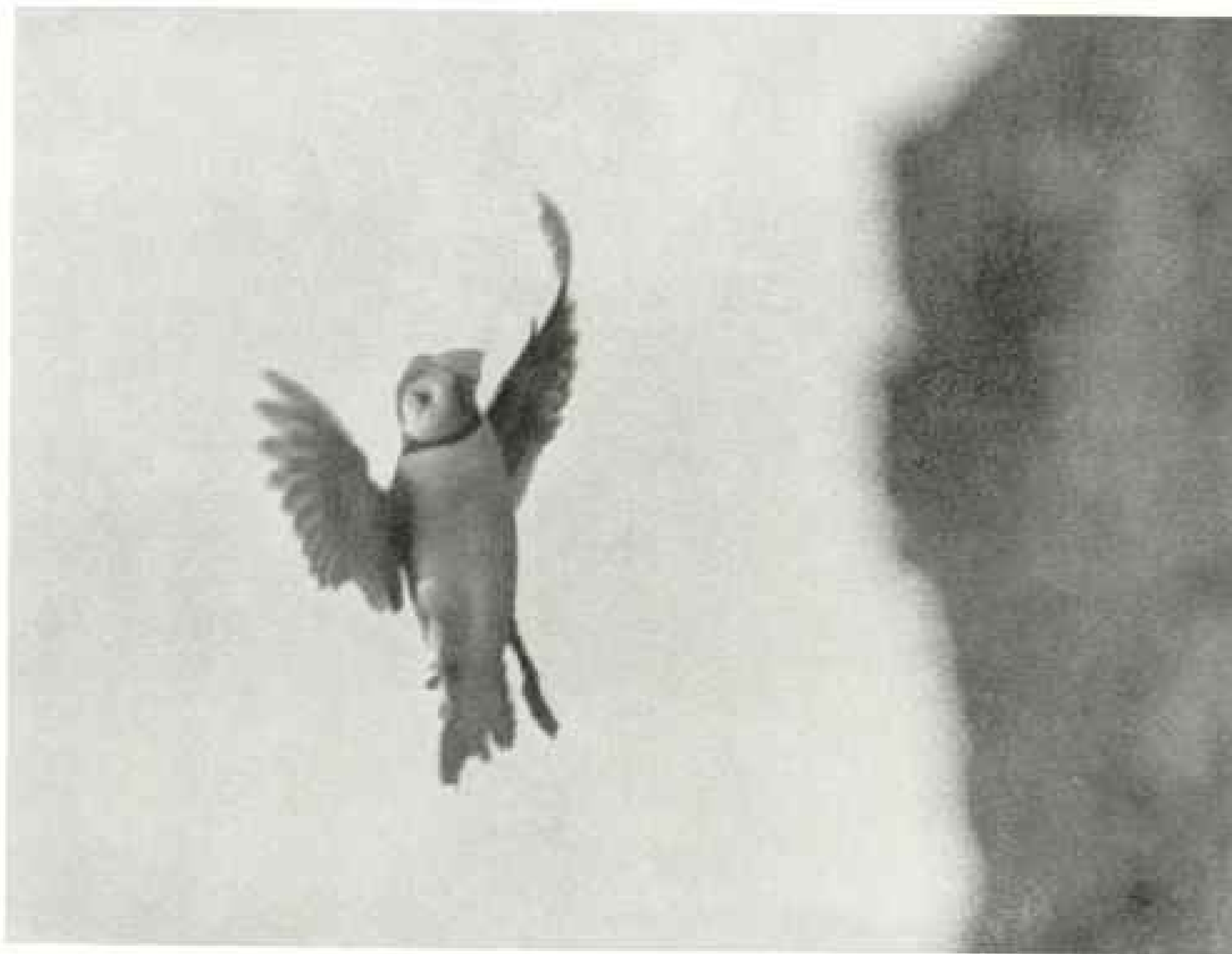
The guinets (page 246) on neighboring Grausholm Island are a wondrous sight to visitors in breeding season. Recently the author and Captain Salmon made a census of this 22-acre British reserve and found 17,000 birds, of which about 10,000 were breeding adults, making a total of 5,000 occupied nests. This represents a wonderful increase over an estimated total of 300 pairs in the years before the World War, which brought the colony freedom from persecution by local fishermen.



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THE BLOODTHIRSTY BLACK-BACKED GULL IS A TENDER MOTHER

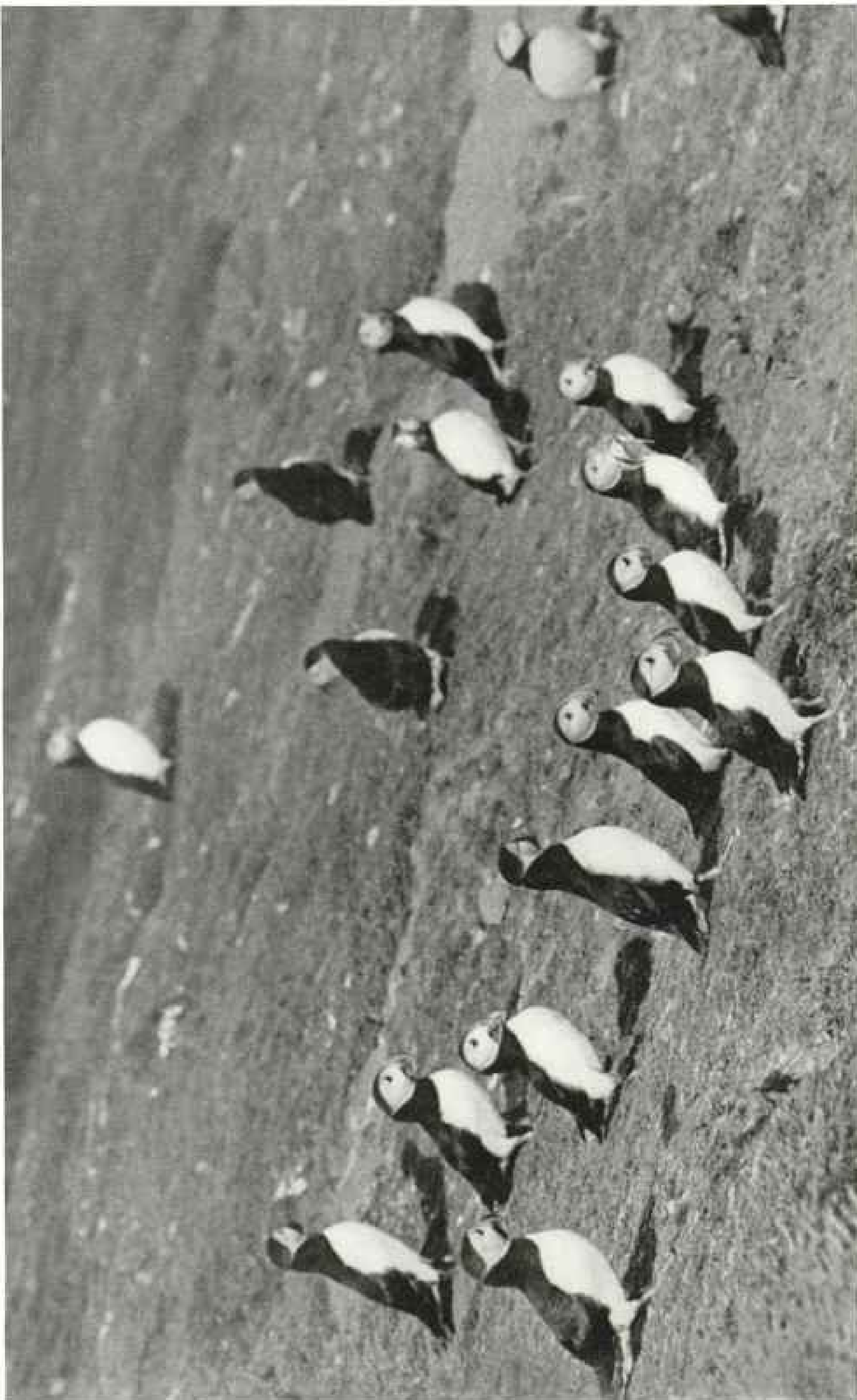
Greatest gull of all is this fierce robber, which at every opportunity kills the lesser sea birds, such as the puffins and shearwaters. Yet it is patient at its own nest. Here the bird is looking up at the photographer's tent on Skokholm after delicately assisting one of its chicks out of the shell.



© Capt. H. Murray Salmon

WHEN THE WIND BLOWS FRESH, PUFFIN GUIDES AND PLANES

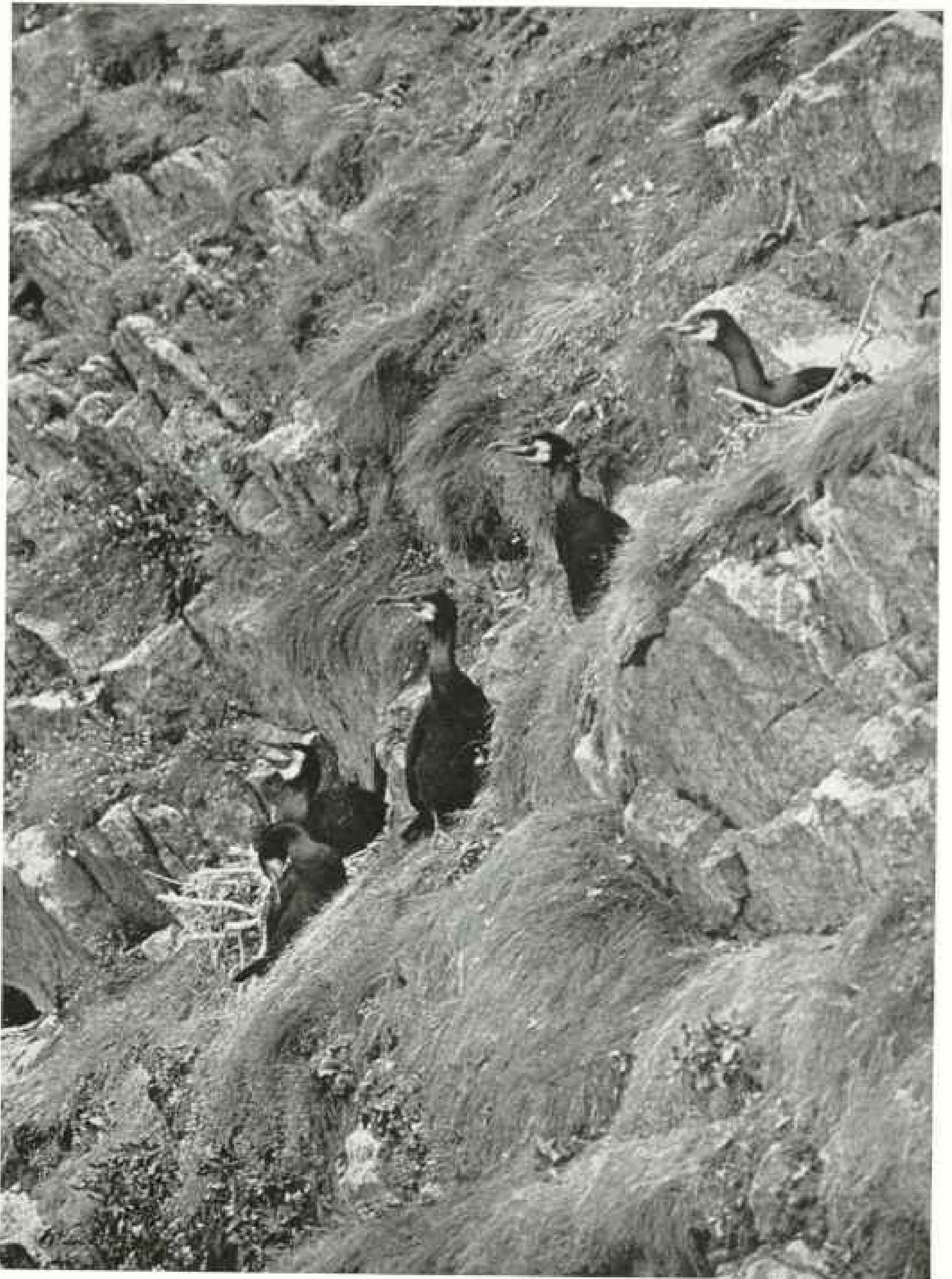
If the breeze is gentle, the sea parrot works his wings rapidly to fly above the grassy slopes. In that curious bill the puffin can carry two or three fish crosswise to feed its solitary youngster back home in a rabbit burrow (p. 259). The heavy beak molts in autumn and is not regrown until next spring (p. 274).



© Capt. H. Morrey Sabinin

LABBITS LEAVE HOME WHEN PUFFINS, POMPOUS CLOWNS OF HIRDLAND, ARRIVE

About 20,000 pairs of "bottle noses" come punctually to Skokholm every April to breed. They promptly dispute possession of rabbit burrows, not only with their rightful owners but also with shearwaters, which also temporarily oust the conies in the spring. Puffins win all these arguments because of their formidable and curiously grooved bills. Where the homeless rabbits dwell during the stay of the ocean birds is a mystery (pages 258, 262, 274, 275).



© Capt. H. Murray Salmon

CLIFF-DWELLING CORMORANTS KEEP A WEATHER EYE ON THE FISH-FILLED SEA BELOW

Rocky ledges on both sides of the Atlantic are frequented by these birds. The nests on Skokholm consist of large masses of seaweed, and eggs number from four to six. The young are blind when hatched, and covered with an inky-black skin. Cormorants breed in large numbers off the Pembrokeshire coast.



© Ronald M. Lockley

WHEN ATLANTIC GALES LASH LONELY SKOKHOLM, THE ISLANDERS MAY BE
MAROONED FOR WEEKS ON END

On this summer morning a boiling sea is making up rapidly. Barely in time was the author able to beach his boat, moored in apparent safety the night before. Here big combers are breaking over the concrete dock in the unprotected harbor (page 277).

I worked instead in the ruins of the garden, restoring its boundary walls and digging deep to clean out a tangle of briar, bracken, and rabbit holes. As I worked, I planned how we might live in the future. I sketched out the budget carefully. Every penny of my slender capital would disappear in the cost of reconstructing the house. After that, we would have to live on what the island could produce.

With luck I should market 3,000 conies each winter. In the summer I should fish for lobsters around the island shore, which was known to be the best ground on that coast for three popular crustaceans: the lobster, the crayfish, and the crab. There would be side lines, too. I should experiment with raising tame rabbits for fur, and I should try my hand at shepherding. Essentially I must see how simply one might live on what Nature had already provided.

Plans have a way of going astray. The storms which held up my building opera-

tions also prevented our crossing with the hundreds of rabbits that had been caught. They became stale and had to be buried, a dead loss in more ways than one. In fact, only the daring of John in deciding to cross in quite unfit weather saved us from losing more than half the rabbit crop.

Once we were launching the boat loaded with rabbits when a huge sea swept over the landing beach, lifting the boat high upon its foaming crest. Rather than lose the boat we both tumbled into it, and by good fortune were safely drawn out of the narrow harbor in the wild swift ebb of the same wave. There was no going back. We put up sail and made the crossing to the mainland in record time before the rising gale.

A TREASURE-TROVE OF COAL

As it should, to perfect every island adventure, treasure-trove came to us in due course. One mild February day the morning stroll in search of birds revealed

a schooner hard aground beneath the tall cliffs on the southeast point. She was the *Alice Williams*, burdened with 200 tons of coal. At high water she had sailed, with none to guide her, straight into this cove, smashing her bowsprit in that first and last embrace with the red cliffs.

Except for that broken spar and the tattered headsails hanging from it, she appeared at first glance to be in magnificent trim, every sail filled and pressing her firmly in her berth in the rocks.

Where were her crew? To this day I do not know what happened to them. They answered not to my shout when, scrambling down the cliff, I leaped aboard. They had abandoned her long before she reached Skokholm, given her to the sea, and now the wind had made treasure-trove of her for my delight (pages 263, 265).

But the sea was merely resting. Twice each day the returning tide came to caress the broken ship, playfully tearing her side open. In one day of storm the waves would reassert their claim and take her forever.

Wrecking is a heritage of fishermen. I had only to offer a share of the spoils to a few selected men on the mainland to obtain eager workers for the task of dismantling the schooner.

A wise word first with the local underwriter proved to him the hopelessness of trying to get the *Alice Williams* off the rocks. He accepted with a good grace the song I offered him for what was in all but legality mine.

Now we were free to make the most of our prize. The schooner's masts, lying at a rake toward the cliffs, afforded the height we needed for lifting tackle. We braced over the upper topsail yard until it stood above the ledge where we had planned to store the booty. In the yard end we fixed a strong block, and through this reeved a halyard to the ship's deck winch.

SALT BEEF SALVAGED FROM A WRECK

Everything movable was hoisted in this fashion to the yard arm and pulled in to the ledges of the cliffs. These were soon overflowing with timber, tools, tanks, chains, ropes, sails, fixtures; even the topmasts, yards, and booms were lifted out, and the cook's galley and the little wheelhouse.

Then we began on the coal, cutting the decks open to get at it the more easily, swinging it aloft in baskets.

In one week I worked my crew to ex-

haustion. We had lived hungrily and roughly on the salt beef and potatoes from the chests of the *Alice Williams*, washed down with great draughts of tea. We had yarned and slept together under the leaking roof of the old dwelling house.

For me it had been a week of delight, for I counted everything gained from the wreck as so much off the capital required for building the house. Already I had all the timber I needed.

Then the storm came, heaping wild seas upon the disemboweled schooner, which tumbled in pieces in the first high tide.

The *Alice Williams* was ground into mere planks, her foot-thick oak beams and knees torn apart as if they had been twigs. A hard sight to witness, this destruction of a good ship, but we were too occupied in gathering up her residue to feel regret.

Meanwhile spring had returned to the island. There were primroses and violets out. The herring gulls sat paired along the cliffs, their wild, sweet love notes echoing in every bay. Daily in March there were rushes of wings over the island, as migrating birds flew northward toward their breeding grounds.

In the winter the island had never lacked birds, chiefly small migrants fleeing from the cold of continental Europe. Now, however, the large sea birds were coming back in their tens of thousands. Following the mated herring gulls, the nocturnal shearwaters, which had arrived early in February, immediately occupied the rabbit burrows. In March murrets and razor-billed auks thronged to the ledges of the cliffs and the rocky moraines in the creeks (p. 255).

In April the puffins returned, and they, too, disputed possession of the rabbit holes with the shearwaters and also the original architects. The rabbits could not stand up to Mr. Puffin's parrot bill and gave in, but where the conies found a home is still a mystery to me (page 259).

There are in spring some 20,000 pairs of puffins requiring underground accommodation, and half as many shearwaters with the same desire. Yet the rabbit manages to thrive, in odd corners!

Late in April the dainty storm petrels, fondly known, with their relatives, as "Mother Carey's chickens," arrived and began their catlike purring in crannies in the old farm hedge walls, under stones and boulders (page 269). The predatory great and lesser black-backed gulls were building



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WHEEL OF THE ILL-FATED "ALICE WILLIAMS" TURNS IN PEACEFUL HARBORAGE NOW

Relics of the wrecked schooner adorn the kitchen and messroom, converted from a ruined barn, on the island farm of Skokholm. The brass-bound helm, fixed in the breast of the chimney piece, is geared to turn the spit over the fire. Ann, daughter of the author, four years old when this picture was made, is having her bedtime cup of goat's milk.

by that time, the buzzard and the peregrine falcon were laying, while the raven had already brought out a brood from a nest of heather twigs and wool in Mad Bay (p. 273).

One sight and sound after another thrilled the bird lover, and my happiness was nearly complete when I watched many small birds, some of them rare, migrating over the island. Some of them sang, and a few, such as the wheatear and the pipits, stayed to breed.

A thousand pairs of gulls, predators that live up to a sinister reputation for stealing young rabbits and the eggs and young of harmless small birds, breed on Skokholm.

A METHOD OF BIRD CONTROL

I should really say they attempt to breed, for we control these rapacious birds by collecting their eggs as fast as they are laid. The eggs are very good eating, especially when fried, and we also put down some hundreds in preserve for cooking. As a

rule, the gulls beat us in the end, for they will go on laying two or three clutches, and the growing bracken hides the later nests.

The rabbit-catching season finished in March, leaving us free from the necessity of crossing to the mainland twice a week to market them. With "Man John" as assistant, I now turned seriously to house-building. We became masons, carpenters, plumbers, glaziers, and slate-layers.

The wreck was to save me half my expenses and cut down my imports for the house. The ancient oak beams from the skeleton of the *Alice Williams* made the best supports in the way of collars and main beams for the house. Her thick deck planking made ideal purlins and wall plates. Her fresh-water tank, holding 200 gallons, was fixed to catch rain water from the roof and deliver it on tap to the kitchen.

To give access to the sleeping loft, we used her cabin stair ladder. There were six rooms to our house: the porch, with



© Ronald M. Lockley

AUTHOR AND FAMILY FORSAKE SKOKHOLM, BUT ONLY FOR A SUMMER EVENING CRUISE

Storm Petrel spreads her fine-weather sails, and the islanders set forth to procure a bit of supper. Lines trail astern to lure mackerel and pollack, which will soon be transferred to the frying pan. When Mr. Lockley first made his home on Skokholm, he included fishing among his commercial enterprises, but later gave it up for more profitable occupations (page 267). In the trim boat many cruises are made to adjoining islands, where more bird lore is acquired.

north and south doors to be used according to the direction of the wind; the living room, from which opened the kitchen, the storeroom, the guest room, and, via the stair ladder, the loft, or main bedroom.

Out of doors were the ruins of the farm buildings, and some of these I intended to adapt for men's quarters, carpenter's shed, and stock houses.

THEN CAME THE BRIDE!

By keeping hard at it I got my house roofed over, replastered throughout, and as nearly ready as a pioneer-minded bride could wish it to be, by the date in July appointed for the wedding. On that day I sailed to a mainland beach within stone's throw of a little church, met Doris, was married, and sailed away forthwith on a honeymoon cruise about the coast.

We headed across a white-capped blue sea for the far islet of Grassholm, the nesting place of 10,000 gannets, and slept a night in the long grass close by this clamorous colony of huge white birds (page 257). Pictures alone can do justice to a gannetry such as that on Grassholm. Below, on the tide line, basking seals sang pleasant moaning dirges (page 275).

After Grassholm we sailed to more civilized islands. But soon our own called us. In brilliant summer weather we took up the threads of the Crusoe life I had begun in storm nine months before.

There was still work to do between the idyllic hours of observation and exploration which too often tempted us. The garden, now growing flourishing crops of useful vegetables, called for attention; goats and chickens had to be catered for; details of the house and the men's quarters were



© Capt. H. Murray Salmon

"ALICE WILLIAMS" STILL BRAVES THE SALT SPRAY

When the four-masted schooner of which she was the serene figure-head crashed on the rocks of Skokholm (page 262), the author salvaged her from the sea. Now the statue stands as a beacon on the ledge at the entrance to the little harbor. Her white frock and old-fashioned bodice are in the style of the 1850's. Around her neck is carved a rosary of jet, and a black cross to match her raven tresses. Before the ship broke up in a gale, Mr. Lockley managed to unload much coal, timber, and furnishings for his farm home.

incomplete. That summer fled on airy wings in the happiness of congenial tasks.

After seven years of island life, we have reached certain conclusions.

Really, the game of Crusoe or Swiss Family Robinson is the pursuit of the rich or the moderately wealthy—at least as regards islands off Britain. Skokholm is no tropic isle where breadfruit and bananas hang ready for each meal. We had no monetary capital on which we might lotus-



© Capt. H. Murray Salmon

WIND-HOUNDED COMBERS LEAP 150 FEET TO BEAT THE CLIFFS OF SKÖKHOLM

The rich spray which thus drenches the island has a beneficial effect on the grasses. In summer the sheep graze greedily and fatten readily on their naturally "salted" forage.

eat. Hence, we were ready to pay for the essentials of life in this climate by contributing to civilization such of those salable raw products as we could make the island yield to us.

EVOLUTION OF ISLAND BREADWINNING

It is interesting to follow the evolution of our plans for breadwinning and their execution. It was a period when prices were tumbling. At first the winter rabbit crop yielded us something like 3,000 rabbits at a net profit, without labor charges, of the equivalent of \$650. But in succeeding winters the price steadily dropped to less than half this figure.

In the first year we experimented with raising chinchilla rabbits for fur. We ran large hutches of these animals for two seasons, growing an acre of greenstuff and turning the young down in a three-acre war-

ren which had been fenced and cleared of wild rabbits. We found chinchillas unable to thrive on the short island grass without considerable artificial food. The expense of providing this would have been justified if prices had held up in the skin market. But they slumped until you could not sell chinchilla skins any better than wild skins.

Rather than carry this heavy burden of unprofitable stock, we turned those we could not sell loose on the island. There are still traces of this chinchilla infusion in the large size of some of the wild rabbits we catch today.

The nucleus of a sheep flock had early been started and each year, as the season's crop of lambs grew up, we sold only the young rams. In four years we were fully stocked with 100 ewes (page 270).

We had become shepherds and were finding it the most attractive and most

profitable of all the occupations we had tested on the island. Shepherding means days and weeks of heavy work at certain seasons, but this is more than compensated for by longer periods of comparative ease at other times.

The summer fishing paid for the year's wages of Fisherman John. I have, since I became a fisherman, understood why a man sticks to this trade in spite of being poor. Man is a born gambler, and none is more so than the fisherman. There is just that anticipation before each haul of net or pot to give an extra sparkle to life. And you are always your own master, weather allowing.

FISHERMAN JOHN GOES "ASHORE"

All the same, I gave up fishing gladly when John resigned his job with us to look after his ailing folk ashore. Henceforth my wife and I became absolute Crusoes, living alone as shepherds, fishing only when the mood and need for a meal of fish demanded. And besides, daughter Ann (pages 255, 268) had arrived, and there was enough to do looking after her, milking goats, keeping the garden, the house, and the sheep.

At this time I think we were easing up on our first energetic pioneering work. We began to appreciate the need for leisure in which to enjoy our island home, its wonderful birds, flowers, and scenic beauty. We called a halt, and in that third summer we basked in the sun as much as was consistent with the state of my bank balance.

Not that we were entirely idle. Apart from the duties enumerated above, we turned to study the lives of those about us, and became less preoccupied with our own.

The gray, or Atlantic seal (*Halichoerus grypus*) made good company in our rambles along the shore of the island, as well as at lonely Grassholm (p. 275). Often we surprised a huge old bull eleven feet long, or a cow and her calf, asleep on the seaweed-covered rocks, for this seal loves to roll on to the ledges at high water and to rest there over the low tide, which may drop four fathoms or more below it. Or they would sleep in the calm water of some quiet bay, assuming a vertical position with only the snout above the surface, looking like logs weighted at one end.

A soft note on a wooden pipe which I often carried would wake them and for a while they would listen, mystified. Then,

locating me, they would roll down the rocks to the water, or, if already in it, turn a joyous somersault and vanish into the green depths.

In the autumn they brought forth their calves on pebble beaches in the safety of deep caves in the high cliffs. At low spring tides we often hunted the breeding seals with flashlight and camera. Sometimes the equinoctial storms dealt roughly with the young seals in their lairs at the back of the caves, and we found them afterwards badly bruised and sometimes dead from the battering by the ground seas.

The range of colors in this seal is wonderful. In a group of 74 we once counted resting on the rocks together, there were shades from velvet black through fawn, brown, and mottle to cream-white.

Each evening we studied that interesting bird, the Manx shearwater (*Puffinus puffinus puffinus*). Some nine or ten thousand pairs breed in rabbit burrows on Skokholm, so that our opportunity was unique (pages 274, 276).

ADVENTURES IN BIRDBANDING

We leg-banded a little group nesting in burrows a few yards from our back door. We traced each burrow to the end, dug a hole in the ground above the nest, and placed a turf over the hole as an inspection lid.

We quickly found that on light nights when the moon was shining, no shearwater came in or went out of the colony. Not only were they nocturnal: they were also moon-shy!

The next surprise was the incubation arrangements. One of the pair would remain sitting on the egg throughout the moonlit period without moving or feeding or being visited by the other over several days, even a week, so long as the nights were bright. The other bird was of course at sea during this time, evidently feeding itself up against a similar spell of duty on the nest.

On the first dark night this fattened tourist of the tideways returned to its hungry mate, and the change-over took place, the latter going to sea for a spell of recuperative holidaying. However, if the following night was dark, it might return for an hour or so, urged by the desire to renew contact with its mate and egg.

This returning only on the darkest night we put down to fear of attack by the numerous predators—gulls, crows, hawks



© Ronald M. Lockley

ANN, DAUGHTER OF THE AUTHOR, MUSTERS SKOGHOLM'S HERD OF WELSH MOUNTAIN PONIES

The sure-footed little animals are ideal for galloping over the rough island on inspection tours. Their six-year-old mistress knows every nook and cranny, for she was born there. Among her most intimate friends and playmates she numbers, in addition to the ponies, the sheep, goats, birds, and rabbits.



© Capt. H. Merry Salmon

AN OCEAN WANDERER IN THE HAND

The storm petrel is sooty-black except for a white patch on the rump (page 240). Its small size is apparent in the hand of a child. The bird often is seen at sea in the roughest weather; hence its name (page 275).



© Harold M. Lesckley

A STORM PETREL SETTLES DOWN TO RAISE A "FAMILY" OF ONE

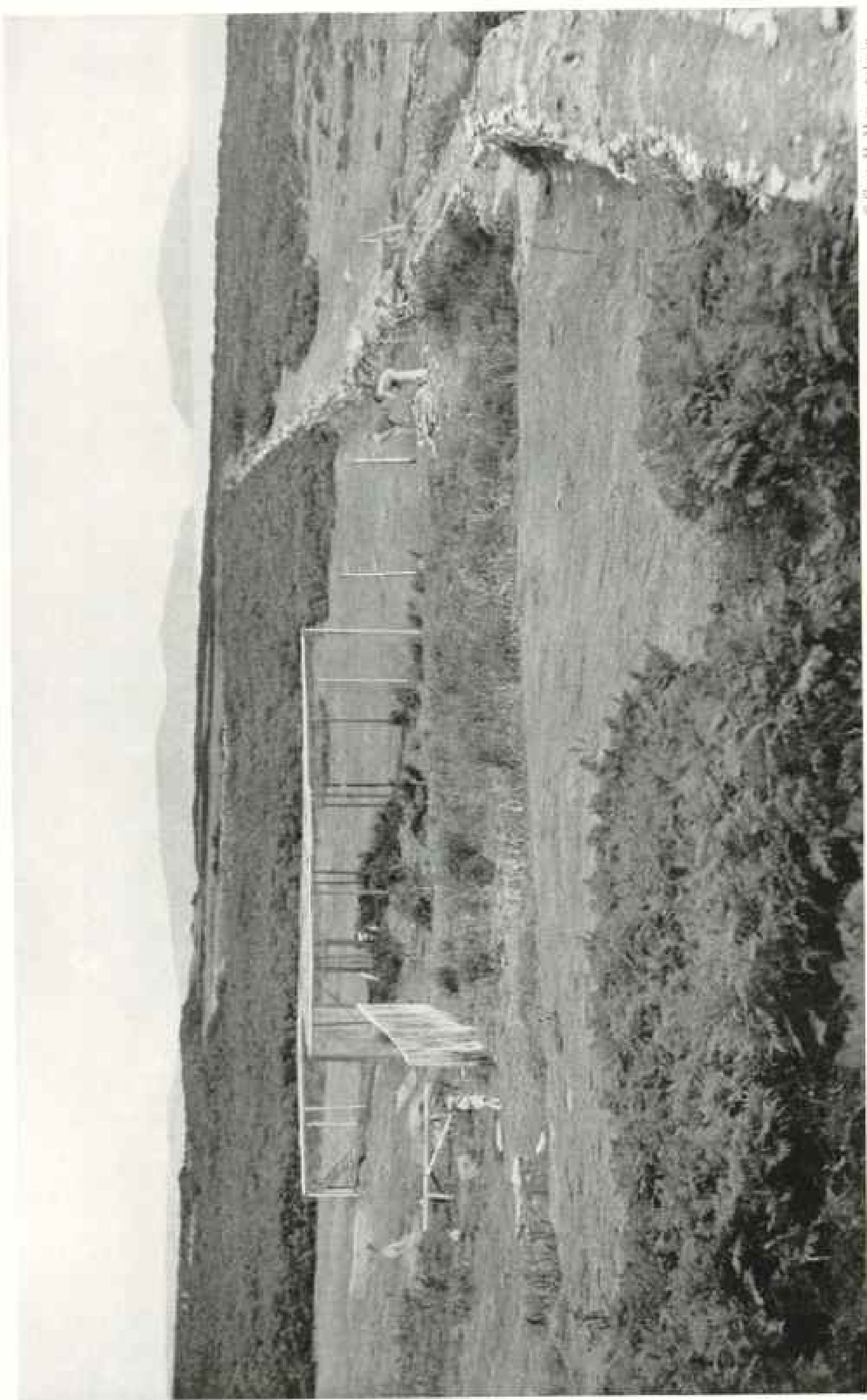
The dainty bird, met with by sailors everywhere on the North Atlantic, is one of the kinds known as "Mother Carey's chickens" (pp. 240, 244). It breeds in vast numbers in the crevices on Skokholm. Stories were removed to show the egg-



© Capt. H. Moorey, Dublin

NO LONGER DOES THE WELSH PONY SHEPHERD THIS PROSPERING FLOCK; SIKORHOLM'S RABBITS OVERBARE THE GRAZING GROUNDS

Today the island has been turned into a nature preserve and observatory, and the sheep have been sold. Only a herd of wild ones, from the island of Spay, St. Kilda, Scotland, are left. Those rasset, deerlike creatures, presented to the author by the Duke of Bedford, are chiefly ornamental, although an occasional surplus ram provides some good dinners (page 278). Island vegetation is chiefly of short turf alternating with bracken and clumps of heather.



© Capt. H. Murray Salmon

CURIOSITY LURES MIGRATORY BIRDS INTO SKOKHOLM'S FUNNEL-SHAPED BANDING TRAP

More than 6,000 feathered ocean and land rovers were "ringed" in one year by the author, chiefly through the use of this mesh enclosure. When the travelers come up to investigate the strange apparatus, they are driven to the far narrow end, captured, banded, and released. One *Manx shearwater* was retained, sent to Venice in an airplane, and then freed. It got back to the island in 14 days, despite the fact that the Adriatic Sea is outside the known geographical range of the species (page 275).



© Ronald M. Lockley

GOING DOWN—BY HUMAN ELEVATOR TO HIS NURSERY

Safe in the wire crook at the end of the bamboo pole, the baby razor-billed auk is not being lowered into the sea, but will be deposited gently on its nesting ledge. Mr. Lockley, in order to hand the fat fledgling, used the hook to lift it from its inaccessible home (page 255).

—which breed on the island, and which instantly kill any shearwater found outside the burrow in daylight. For the shearwater is very helpless on land. Its legs, placed at the rear of its torpedo-shaped body, are unfitted for moving over rough ground. Its long, narrow wings do not permit a quick take-off.

In fact, on windless nights we found that the shearwater, outward bound for the sea, scrambled to some rock outcrop in order to catapult into unobstructed space.

We learned that the solitary egg took at least 50 days before hatching—an unusually long period. The chick, a fluffy

darling that captures the feminine heart, is at first the apple of the parents' eyes. Turn about, they nurse it day and night for one week. But this affection gradually cools. By the time its feathers are sprouting under the great ball of double down, they are feeding it once a night only, but missing altogether during moonlit periods.

Love of chick is not enough to make the adult risk contact with predators on a flight to the burrow by the light of the moon, but, in spite of fasts caused by this fear, the chick continues to grow steadily. At nine weeks, when the adults suddenly desert it altogether, it is a ball of fat.

DETECTIVE WORK
WITH BIRDS

Now, how did we find out that it was deserted at this stage, you ask? Did we spend every night watching the mouth of each burrow?

No. We simply placed matchsticks

upright in the entrance to the nest hole. For six nights those matchsticks were not knocked down, proving that there had been no visit by the adults. On the seventh night the sticks were pushed outwards, proving that the nestling, perhaps impelled by hunger and other urges, had come forth.

This evidence was supplemented in the trail of molted down left by the nestling, at this stage fully feathered, though down still clings to the tips of some feathers.

Realizing that the chick was on the move, we studied its procedure each night. Its fat was rapidly vanishing, but it was yet too timid to take flight to the sea. It

would sit at the mouth of the burrow, occasionally exercising its wings.

It is possible that the bird, during the several nights of this procedure, may be considering, intelligently or instinctively, the direction it must take to get to the sea, which it can hear so plainly beating on the rocks in the distance.

A TAKE-OFF IN THE NIGHT

At any rate, one dark night it makes up its mind to take off. It is then just over ten weeks old, and, unable to fly properly, it blunders downward to the cliff and flutters to the sea. There it is safe, for, although not yet able to rise on the wing, it can dive instinctively from enemies in the air, and under the water it can find little fishes to break its fortnight-long fast.

This in brief is the story which we unraveled by degrees. We published it in the ornithological journal *British Birds*, receiving as a result letters from leading ornithologists at home and abroad. Our little shearwater with the ridiculous Latin name suddenly became famous, and its life history even went into translations in Europe.

We were heartened by this reception of our bird news from Skokholm to continue our study and to publish further information about our other friends, the puffins, the storm petrels, and the gulls.*

Some of our banded shearwaters were recovered off Spain, and in the Bay of

* Our experiences and adventures have been described in part in two books, *Dream Island and Island Days*, and in contributions to *The Countryman*—The Author.



© Capt. H. Murray Salmon.

THE EARLIEST BIRD OF ALL

The raven begins his courtship in February, even in January, and by mid-April his four or five children are on the wing. One pair has nested on Skokholm since the author first settled there; but they will tolerate none of their kind, and eventually drive out even their own young before a new breeding season comes around.

Biscay at a time when they should have been nesting on Skokholm. But these we found in our records to be birds born a year previously, and evidently not ready to breed until at least two years old.

The old birds were always the first to come back in the spring, and we found that banded birds had seemingly paired for life, meeting each year at the well-remembered nesting site.

Adult shearwaters, released experimentally inland in the British Isles, at sea at several points off the European coast and the Faeroe Islands, successfully



© Capt. H. Morrey Salmon

SEVEN WEEKS OLD IS THIS MANX SHEARWATER, TWICE ITS SIZE WITH FLUFF!

An incubation period of at least 50 days was recorded by the author for the graceful ocean birds. The youngster remains in the natal burrow for 10 weeks before finding its way to the sea. Its parents depart about the sixtieth day, leaving the little fellow to make its debut alone. On a dark night the forsaken orphan, "free lunch" days over, sets out. Once at sea, it is safe, for there it can quickly dive out of reach of predatory gulls.



Photograph by Alfred O. Ginn

SHARP-EDGED IS THE PARROTLIKE BILL OF THE SOLEMN PUFFIN

Yellow, grayish blue, and vermilion are the stripes across its beak in the summer nesting season. After it is ready to put out to sea in the fall, the bright covering is shed in nine separate strips and is replaced by subdued tones of red. The bird's strong and heavy bill can injure a man's hand severely (pages 259, 275).



© Ronald M. Lockley

GREAT GRAY SEALS BASK ON THE SEAWEED-COVERED ROCKS OF SKOKHOLM

So close did the author creep to the sleeping creatures that he replaced the telephoto lens of his camera with an ordinary one. The experience was unusual, because persecution in past years had made the animals wary. Just before the photograph was taken, the cow awakened and lazily looked up, but the old bull still dozed in the warm sunlight (page 267).

homed again to their nest on Skokholm,

Perhaps the most remarkable effort was that of a shearwater which got back from Venice, whence it had been sent in a plane, in 14 days. The Adriatic is outside the known geographical range of the Manx shearwater, but, like the terns with which K. S. Lashly and J. B. Watson experimented in America, this bird found its way back over regions uncharted in its visual memory.

It would be interesting to know if it flew overland via the Swiss Alps or whether it took a ship's course through the Strait of Gibraltar!

Study of the puffin's life history revealed a similar economy, but the puffin is a day bird on land (pages 258, 259, 262, 274).

Quicker on the wing, and a good walker, it dodges the predators nine times out of ten. The tenth time, all too often, it may be caught at the mouth of its burrow and swallowed whole by a great black-backed gull (page 258).

The puffin is smarter and bolder than the shearwater, and its family affairs are less protracted by some weeks. Yet, like the shearwater, it deserts its chick in the end. This is a wise provision in both spe-

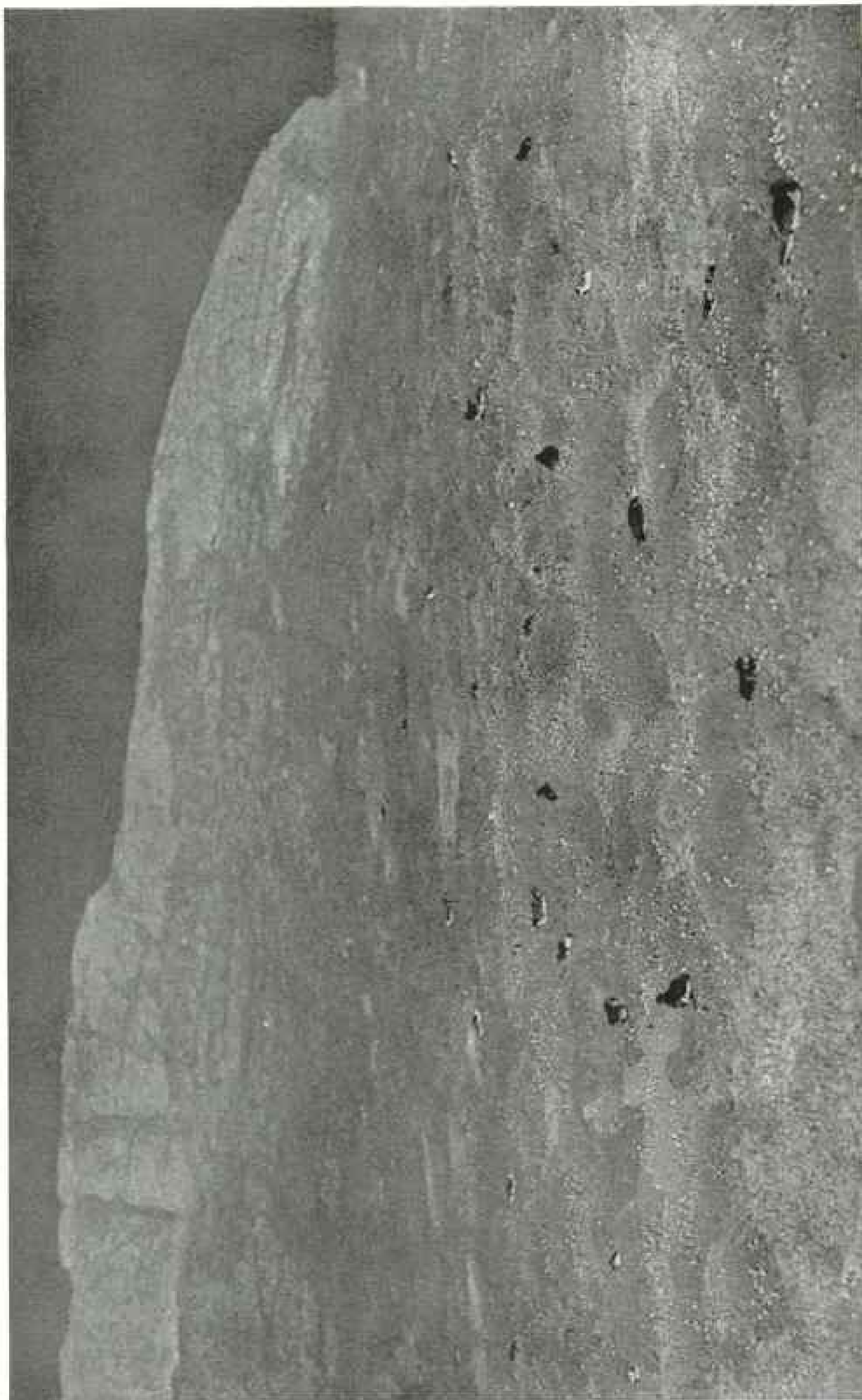
cies, since if the chick were to be fed at the same rate up to the time of flying, it would be so corpulent when taking off at the cliff edge that it would sink and go to pieces on the rocks below!

We noted this thinning precaution and also that, to avoid predators, the precocious young puffins wisely strolled to the sea on dark nights only. This, in a day bird (when adult and on land), is a wonderful example of instinct, inhibition, or inherited factor—call it what you like according to the fashion of the moment!

FLIGHTS ON UNTRIED WINGS

The storm petrel made a delightful study. Nocturnal on land, it is not afraid of moonlight, since it can fly like a swallow and dodge all predators save the European little owl, its one enemy on the island. Now we have banished this foreign predator in favor of the airy petrel, whose crooning notes from our hedge walls delight us each spring.

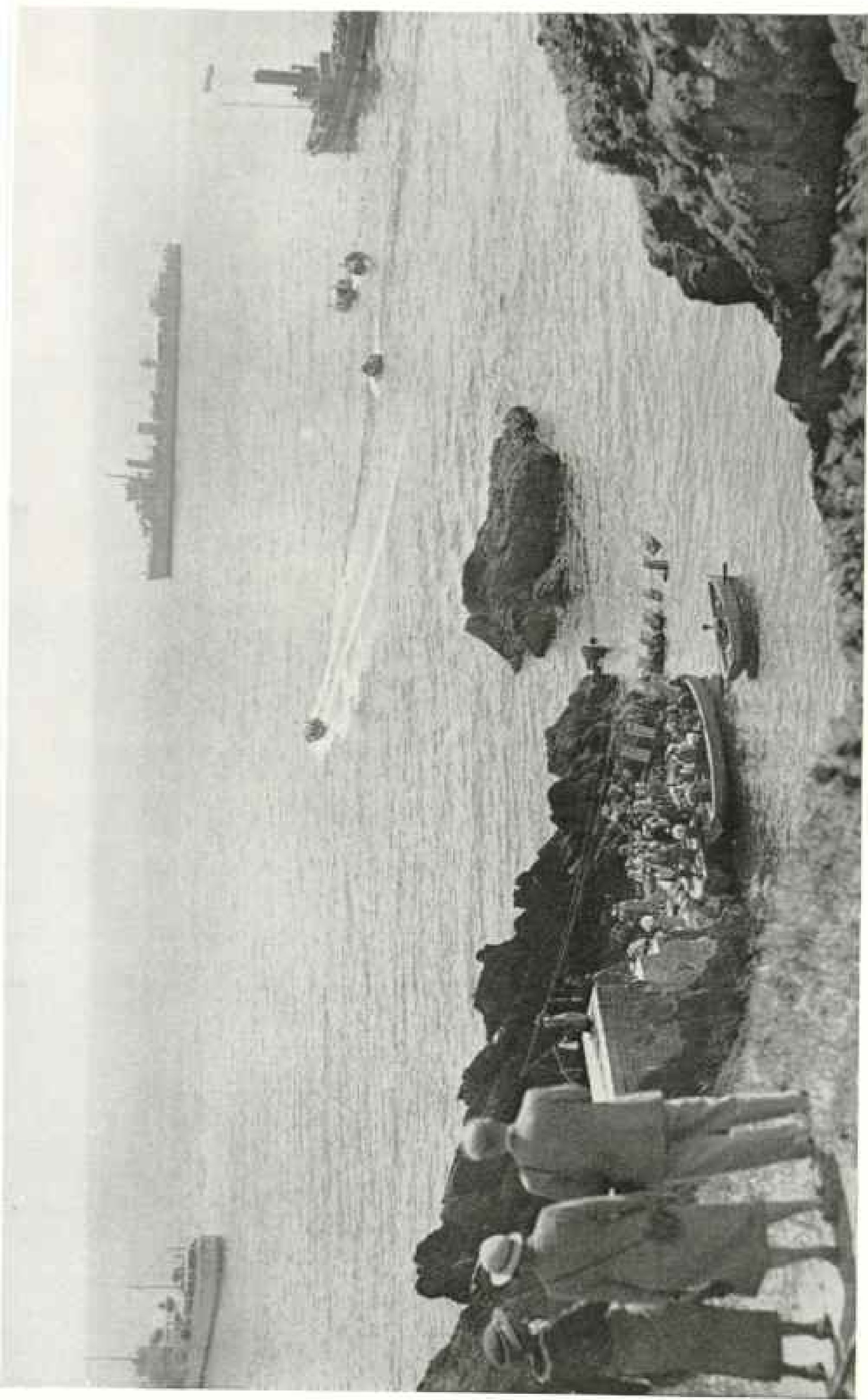
The storm petrel chick, deserted at fledging time, flies strongly from the nesting cranny, although it has never been able to exercise its wings before. We have taken these fledged birds from their cramped holes and released them at the edge of the



© Capt. H. Murray Mabbutt

FLASHLIGHT REVEALS A CROWDED NIGHT CONCLAVE OF NESTING SHEARWATERS ON SECKHOLM

Under cover of darkness the birds emerge from their burrows, safe from predatory gulls, crows, and hawks. Many are visible, dotting the landscape, but the air also is filled with blurred forms which the camera could not record distinctly. The author found that shearwaters are strictly nocturnal on land during the breeding season. Excursions to sea for food by one of the parents, sometimes lasting several days, never start or end in daylight (pages 256, 267, 274).



© Capt. H. Morrey Sulzain

FLAG-BEDECKED IS "DREAM ISLAND'S" HARBOR IN HONOR OF BIRD LOVERS FROM MANY LANDS

Two destroyer leaders of the Home Fleet of the British Navy, with a steam tug and a dozen speed and hand-powered boats, ferried members of the Eighth International Ornithological Congress to Skokholm with comfort and celerity. Here members leisurely re-embark after a sight-seeing tour and lunch on the island. Speedboats dash off to the warships with first loads (page 278).

sea. Though their feet are webbed, the nestlings refused to touch the water, but instead flew low over the waves. They continued to fly on untried wings for as long as we could keep their tiny forms in sight. We wished them good luck in the long winter storms. They never touch the land again until the next spring (page 269).

Birds became so interesting to us that we extended our banding work to cover the small migrants which streamed through the island in spring and autumn. Banding traps like those in use on Helgoland, Germany, helped us to catch them (page 271).

Between sea and land birds we have sometimes ringed (as we say in Britain) more than 6,000 individuals in a year. The returns from these, about 3 per cent, help us to work out the movements of each species. Nor could we have done this increasing work without the help of a succession of students, latterly.

Thus the island has grown quite naturally into a nature reserve and observatory. By degrees we have eliminated serious farming, admitting defeat by the rabbits.

For long a struggle went on between our sheep and rabbits. After employing a rabbit catcher who advocated and used steel-toothed traps, I became a rampant anti-trap agitator.

There is nothing so attractive to a hungry land bird in winter as the fresh earth covering the trigger pan of a steel trap set in the mouth of a rabbit hole. I would allow no more traps after I found that hundreds of birds had been killed by these instruments, though at first the trappers had concealed the slaughter from me.

Yet in this island, so honeycombed with bird and rabbit burrows, traps are probably as efficient as any other means of control. We have certainly tried those other means with less success—snares, ferrets, poison gas, even a fatal and highly specific disease—in our efforts to clear the land of rabbits so that we might use it more profitably for sheep.

Forced today to put up with the pest, we have been asking ourselves, "Are there any good points about the rabbit?"

Of course he is good to eat occasionally. In a bird sanctuary he is useful in keeping burrows cleared and open for certain hole-nesting species. And, thirdly, he keeps the grass short enough to make walking easy.

Otherwise he is a scoundrel!

We have now no sheep except a little

flock of wild ones from the isle of Soay, St. Kilda, Scotland, presented to us by the Duke of Bedford.

These pretty russet, deerlike creatures may have been put on Soay by the Vikings when they harried British coasts in the eighth and ninth centuries. They have remained a separate breed ever since. They are a fine ornament, and an occasional surplus ram is good eating.

Our "farm" today is confined to a few milking goats. Gulls lay eggs for us, the sea provides fish, bees honey, our garden fruit and vegetables. Rabbits and birds have the island to themselves otherwise. Sometimes a cony is made into a pie.

Looking back now on the sequence of our island experiment, it is not easy to remember the high lights of the story, which has, after all, less excitement in it than most island narratives. Perhaps the word "strange" fits it better.

VISITORS FROM MANY LANDS

I believe that the most nearly perfect day we ever had was that of July 8, 1934, when two destroyers of the Royal Navy conveyed to Skokholm 180 members of the Eighth International Congress of Ornithologists (page 277).

Such a cosmopolitan crowd surely never assembled before on such a remote island. They had come to see our birds, and we could lift from their nests individuals which had been banded for many years and had returned faithfully to the same burrow or corner of the island. As everyone signed his name in passing through our little house, we have a permanent record of that pleasurable occasion. In the list are well-known American naturalists.

Dr. T. Gilbert Pearson, representing the Association of Audubon Societies, was charmed with our storm petrels, cousins of Leach's petrels, which he knew in their breeding grounds on the coasts of Maine and Cape Breton, Nova Scotia. In hot sunshine tempered by a zephyr from the sea the party had lunch on the grass before the house. Then all re-embarked for a further cruise, which included a peep at the gannetry at Grassholm (page 257).

Finally the destroyers maneuvered to come up at sea with the great flocks of shearwaters assembling toward sunset off Skokholm. Never before has the British Royal Navy, I think, undertaken such an unusual but agreeable task as this of "bird-watching by warship!"

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To carry out the purposes for which it was founded fifty 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 3,025 feet was attained August 13, 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 Expedition.

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 ornithological survey of Venezuela.

On November 11, 1933, 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 72,995 feet. Capt. Albert W. Stevens and Capt. Cyril A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

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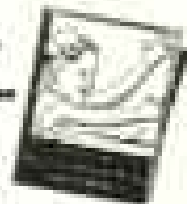
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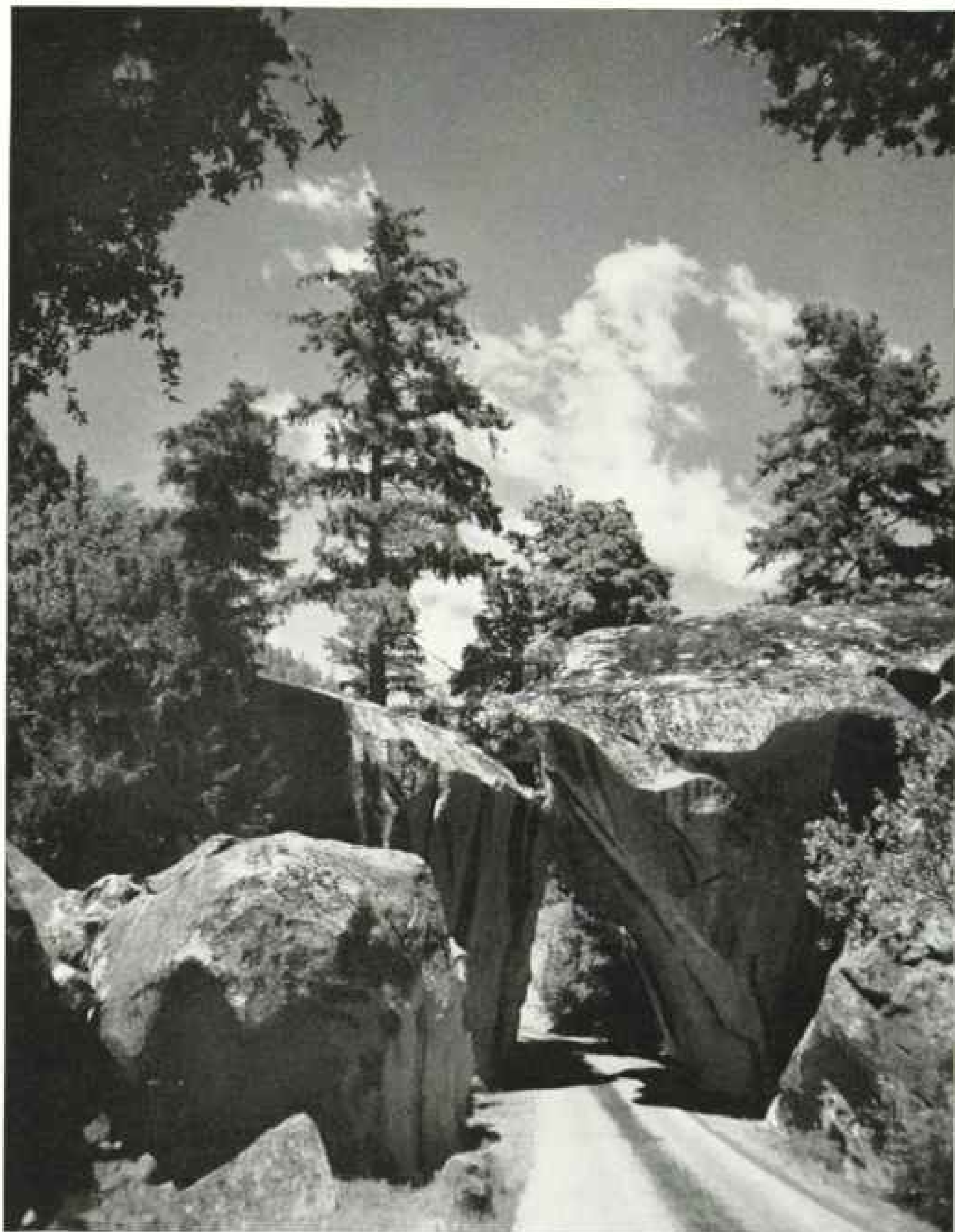
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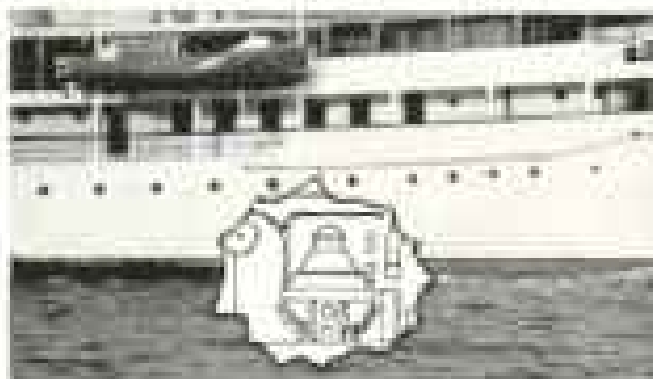
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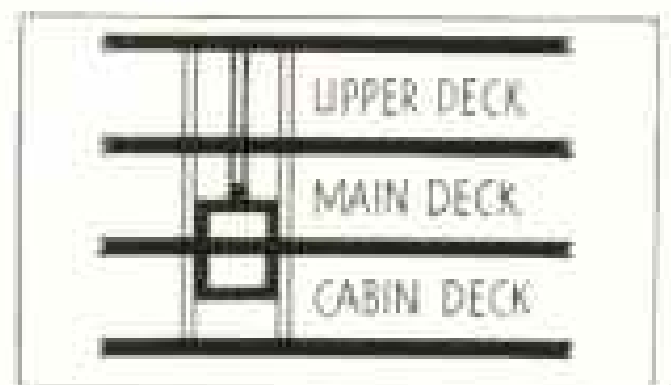
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