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WITH THE NOMADS OF CENTRAL ASIA

A Summer's Sojourn in the Tekes Valley, Plateau Paradise of Mongol and Turkic Tribes

BY EDWARD MURRAY

With Illustrations from Photographs by the Author

BEYOND Bukhara and Samarkand lies Tashkent; and from Tashkent eastward stretches an ancient silk caravan road to Cathay. It winds across steppes, mountains, and the Chino-Russian boundary until it runs past the glamorous Central Asian metropolis of Kuldja (or Ningyuan) in Sinkiang, whose bazaar is a riot of color and whose community is an amazing mixture of tongues.*

Here, in the winter, old-style Russians in gay troikas race to and from all-night parties; solemn processions of Mongol lamas parade through the streets on horseback; and long-robed Chinese and Turki merchants shout and gesticulate in the crowded market places.

In summer lumbering oxcarts replace racing troikas and, from the streets which have become dust ponds, clouds of fine sand swirl aloft to hover over the city like a pall. Then life in Kuldja becomes unbearable and the populace, by horse, wagon, and on foot, packs off for the mountains.

And so it was that, after spending seven winter and spring months in the snows and dust of Kuldja, I found myself in mid-June two days by horse south of the city, half lost in the mountains and searching for the famous Tekes Valley.

My trail was winding up the bottom of a deep ravine. The steep slopes were bare of trees, but covered with an unbelievably rank growth of grass and weeds. This vegetation formed walls of the narrow trail, cutting off my view of everything save a thin band of sky above and a short patch of trail before and behind.

Suddenly a horseman emerged from the overgrowth onto the trail in front of me. I recognized him as a Kalmuck, a nomad from one of the Central Asian tribes of Mongols; his dark skin, high cheekbones, and brimless, domed felt hat made that certain. Apparently he had been watching me from some vantage point and was accosting me for a purpose.

SILENCE PRECEDES A NOMAD GREETING

We rode up the trail for a short distance without speaking. Among nomads silence is a prelude to greeting. It is a fine point in their social etiquette, so I always let the natives make the advances.

"Where are you going?" As he turned back in his saddle to speak to me, his expression was decidedly unfriendly.

"To the Tekes Valley," I replied.

"What is your business in the Tekes?"

"I visit Sayjan Beg, the chieftain of the Kirghiz."

* See "Russia's Orphan Races: Picturesque Peoples Who Cluster on the Southeastern Borderland of the Vast Slav Dominions," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, October, 1918.

TWO APPRENTICE SHEPHERDS TALK OF THE FLOCKS THEY HOPE SOME DAY TO OWN

The infinite variety of the Tekes Valley makes it the ideal nomad stamping ground. In the lowlands are broad, sparsely treed, well-protected grass flats along a rushing, tumbling mountain stream—climate, quite temperate. Riding up the mountainside several hours on horseback, one reaches rolling hills, richly vegetated in summer and often covered with impenetrable forest—climate, subarctic.

The man drew rein and swung his horse around, his face a complete transformation. Where before had been sullen distrust, there was now smiling friendliness.

"This trail does not lead to the Tekes," he explained. "If you follow it you will be lost in the mountains and have to spend the night in the open." Then he gave me elaborate directions for retracing my steps and picking up the right trail.

"And carry greetings from the Kalmucks to the chief of the highland Kirghiz," he called after me as we parted. He probably was a sentinel stationed to protect the Tekes pastures of the Kalmucks.

Following his directions, at the first fork beyond an old sheep corral I dismounted to examine the muddy trail. It was even as he had described; there were many tiny tracks made by a flock of goats which had recently passed up the slope to the right. I mounted and rode off in pursuit on a trail that led over a series of hogbacks until suddenly I came out on the crest of the last ridge.

THE GOAL OF THREE YEARS' TRAVEL

At my feet lay the goal I had been aiming at for three years—the Tekes, the valley of valleys, the nomad paradise of Central Asia.

My eye sought the opposite valley wall, above which the foothills of the Celestial Mountains leveled off to a great plain which stretched away to meet the snow line. On that undulating plateau were those far-famed highlands I had come to see.

Even in distant Istanbul we had heard tales of how the nomads migrate to these Tekes highlands, bringing with them their flocks and herds to spend the summer months in a veritable earthly paradise for Mohammedans, drinking the famous mare's milk, feasting on mutton, sporting, loving, and marrying.

AN ENTIRE HOUSEHOLD BUSIES ITSELF ABOUT AN OPEN FIREPLACE

Striking steel and flint together, the squatting man lights a bit of tinder in the pit beneath the iron kettle. The nomad in the background fashions a tripod from which to suspend a pan of water for boiling. Weather in the Tekes is generally brisk enough to warrant a fire in the yurt, but cooking in summer is always done out of doors.

Far across the valley in one of the recesses I made out a scattering of brown huts amid a black splotch of trees. It fitted the description which my Kuldja friends had given me; it must be the winter quarters of the nomads, the home of Sayjan Beg, chieftain of the Kirghiz.* I seized the bridle rein and picked my way down the perilous zigzag trail.

"So you are a real American!" exclaimed Sayjan Beg, the Kirghiz chieftain.

He was seated cross-legged on a *sedir* (deep Turkish couch) reading the introduction I had handed him (see page 11).

I had to explain to him my coming to the Tekes. His Tatar cousins had been my students at Robert College, in Istanbul. While at the school, they had captured my fancy with tales of their home city, Kuldja, and the Tekes Valley. When the boys returned home, they had given me a warm invitation to visit them.

Sayjan Beg was strangely cast for a nomad chieftain, small, thin-boned, and delicate; yet, as one came to know him, his littleness was forgotten and one was conscious only of his wiry strength and vitality. He had unbounded nervous energy and a regal manner, coupled with a quick, decisive way of uttering commands. One suspected Russian blood somewhere in his strain, for his skin was much lighter than that of the Kirghiz about him.

Perched on his head was the embroidered velvet Moslem cap, for he considers it a breach of etiquette to be seen with uncovered head, either indoors or out. Buttoned tight about his neck was a clean, white Russian shirt, while the rest of his costume was made up of a corduroy coat, Russian riding breeches, and knee boots of excellent

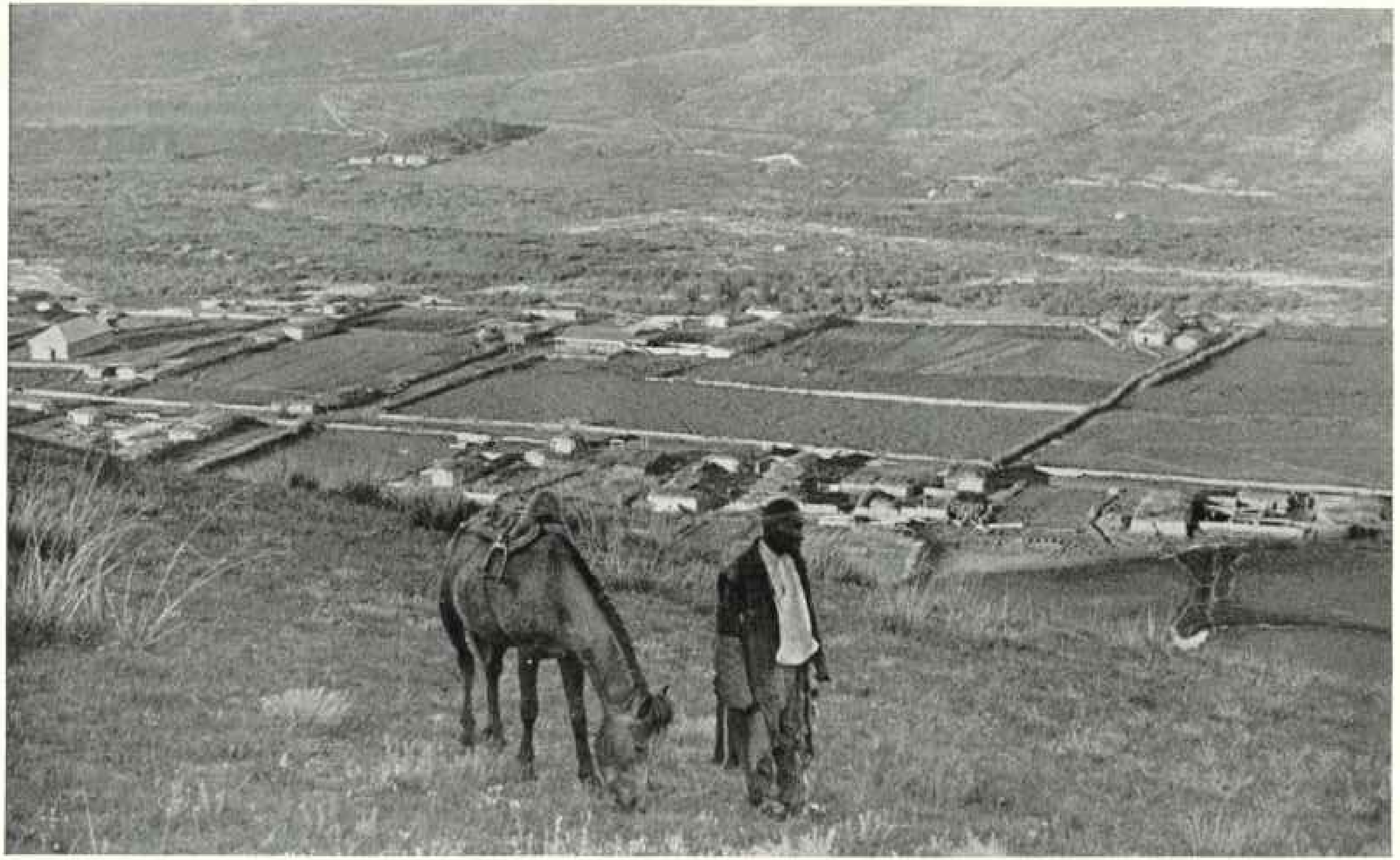
* See "First Over the Roof of the World by Motor: The Trans-Asiatic Expedition Sets New Records for Wheeled Transport in Scaling Passes of the Himalayas," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, March, 1932.

THIS PROSPECTIVE BRIDE'S BABY ILLIK "STEALS THE SHOW"

Although not yet in her teens, the youngster, a descendant of one of the followers of Genghis Khan, the Mongol conqueror, wears a gala headdress intended to catch the eye of some rich yurt owner who can pay a good bridal price. Her people prize owl feathers as hat talismans.

SHE'S WORTH 25 HORSES AND 300 SHEEP TO ALA BEG!

Kirghiz heritage is revealed in her features, while her poise, grace, and intelligence may hark back to the race of Tatar women whom Marco Polo lauded. A rich suitor will pay sometimes as much as 40 horses and 1,000 sheep for a bride (see text, page 45).



A BEARDED HORSEMAN SURVEYS THE SETTLEMENT AROUND KIRGHIZ HEADQUARTERS

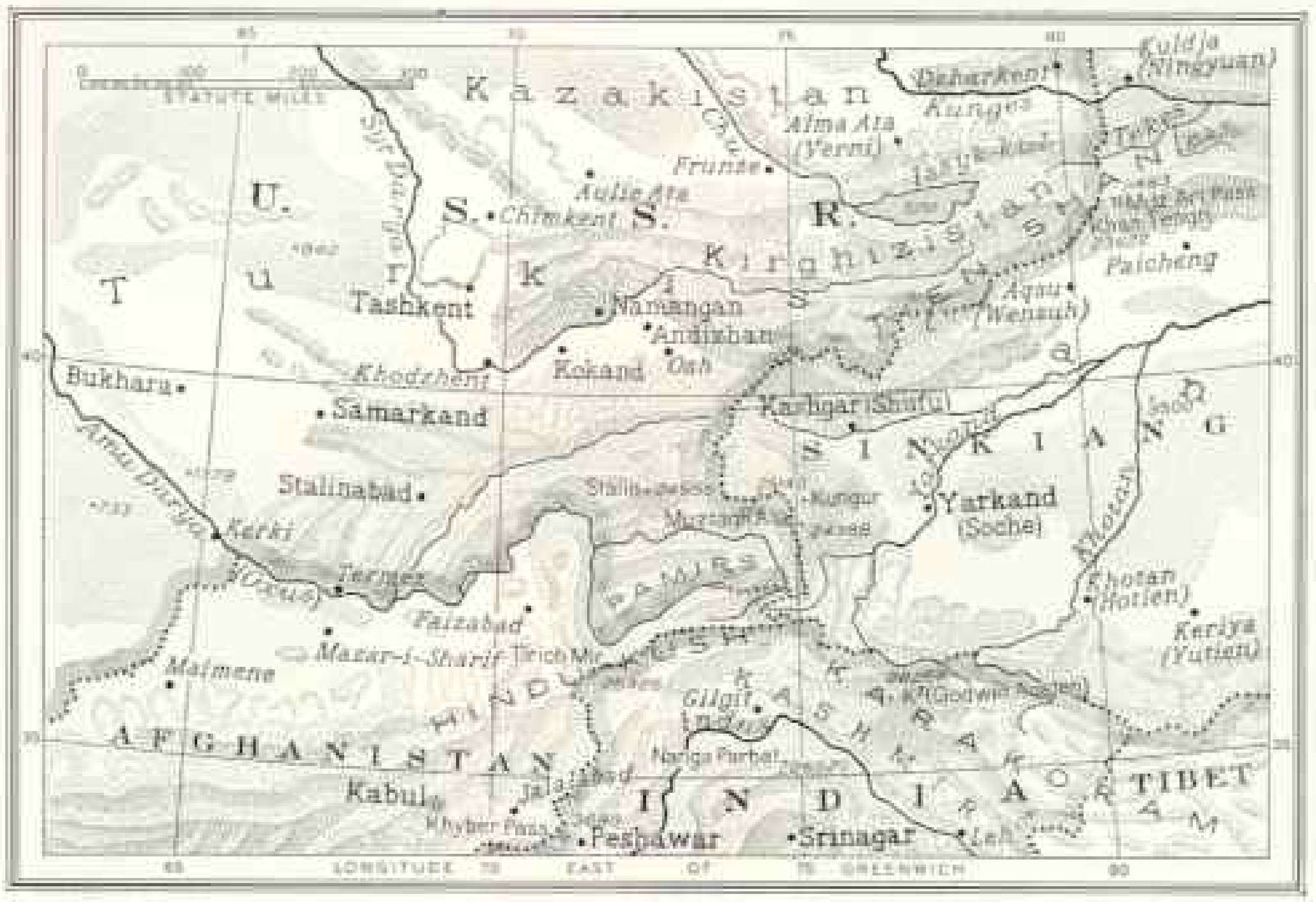
Sayjan Beg occupies the center buildings, bordered on three sides by the fields that comprise all of the land cultivated by the tribe. Other wooden buildings that hem in the fields belong mainly to Tatars, Tungans, and Chinese. The Kök Su runs just beyond the chief's houses.

TOP-HEAVY KIRGHIZ MATRONS GOSSIP AS THEIR PONIES JOG ALONG

Elderly women construct the white turbans by winding yards and yards of cloth around their heads. Though a family male accompanies this pair, they need no escort, for women may ride alone wherever they please, day or night (see Color Plate XV).

A NOMAD HOSTESS POURS TEA FOR HER HUSBAND'S GUESTS

Chunks of bread spread on the cloth mark this yurt owner as a plutocrat, for few Kirghiz can afford to buy wheat or have ambition enough to grow their own. It was the hostess (right) whom Foo Ben Yee complimented on her fertility (see text, page 37).



Drawn by Newman Bumstead

IN A VALLEY EDEN OF SINKIANG, NEAR THE RUSSIAN BORDER, AN AMERICAN TEACHER INTRODUCED AMERICA TO NOMADS WHO HAD NEVER HEARD ITS NAME

Bearing introductions from his Tatar students in Robert College, on the Bosporus, and fortified with a knowledge of Turki, the author "spent a rollicking vacation with the Kalmucks and Kirghiz in the Tekes Valley, drinking kumiss (fermented mare's milk) and feasting on mutton." Soon after his arrival, toward the last of June, his host, Sayjan Beg, Chief of the Kirghiz, took him along on a tour of the highlands, visiting the summer grazing grounds and a Lama monastery.

black leather obviously imported from Soviet Russia.

Tribal headquarters were soon crowded with Kirghiz. News passed swiftly around the village that a stranger who had lived in Istanbul was visiting the chief; so the more important tribesmen had come to pay their respects to both the chieftain and his guest. Sayjan Beg and I were sitting on sedirs opposite each other, while the onlookers sat Turkish fashion on the floor or stood about, leaning against the walls.

EARTH IS FLAT; AMERICA UNKNOWN

On this first evening and subsequently, when we sat cross-legged around camp fires, I found the nomads had rather old-fashioned ideas about geography. To them the world is flat and no amount of explaining can alter their conceptions. The earth is surrounded by "the great sea," while the sun circles about the earth.

They have heard of Russia, China, Iran (Persia), Turkey, Kashmir, Hindustan, Tibet, Afghanistan, and the mysterious far-away England. But America means nothing to most of them; in fact, I was invariably taken for a Russian unless I explicitly told them that I was a *Ferengi*—an Asian word of ancient origin derived from the word "Frank" and used to denote all western Europeans.

During a lull in my cross-examination by the circle of nomads, I questioned the chief about the different peoples living in the valley.

"There are two main races here in the Tekes, nomadic Turks and Mongols," he told me. "We Turks are represented by the Kirghiz and Kazaks, two great tribes whose customs, language, and religion (Mohammedan Sunni) are almost identical; in fact, in the time of Genghis Khan we undoubtedly were one tribe.

"However, we now have distinctions: our dialects are slightly different; the Kirghiz women wear a unique headdress, and through the years we Kirghiz have been more successful in amassing wealth. We came from Issyk-kul (Warm Lake), across

WITH MOUNTED ESCORTS, THE KIRGHIZ CHIEF TOURS HIS DOMAIN

The group heads across the valley floor, leaving behind the summer grazing grounds on the plateaus of the distant Tien Shan (Celestial Mountains). Two races of nomads, eastern Turks and Mongols, live in the Tekes Valley in separate sections.

SHEEP NUMBERLESS AS THE STARS GRAZE IN THE GRASSY TEKES HIGHLANDS

The shepherd, driving a flock into new pasture land, rides back and forth behind the half-mile-long rear line, urging on the stragglers. Here the heavy tails of the sheep are broad and flat, for the animals, after grazing in rich pastures all summer, have laid in their storage of fat that will tide them over the winter (see text, page 43).

WINTER IS DEPARTING, AND THE KIRGHIZ WILL SOON MOVE THEIR YURTS TO THE HIGHLANDS

For untold centuries, the nomads have made two migrations annually. In early summer, when the blazing sun dries up the grass, they seek the cool air and green pastures of the plateaus. In the fall the first snow flurries send them back to the lowland rivers. There the winters are milder and the snowfall light enough to permit flocks and herds to paw through the white blanket and eke out an existence on dead grass until spring.

TO CLEAN HOUSE KIRGHIZ MERELY MOVE THEIR YURT TO A NEW SITE

One day the chief's mother, surveying the living quarters, declared them too dirty to be tolerated. Women servants set to work. They peeled the felt coverings off the wooden framework and moved the boxes and quilts outside. Then everyone lent a hand and carried the yurt skeleton bodily three rods to the windward. When the servants had replaced the felt and household furnishings, the job was complete (see text, page 17).

ON CRUDE LOOMS, KIRGHIZ WEAVE THEIR COARSE RIBBONS AND HOMESPUNS

Deftly and rapidly the weaver manipulates the wooden swordlike battens. At astonishing speed she turns out a strap to bind the felt cover on the frame of a yurt. A Central Asian woman's work is never done, for when household tasks are completed, she must spend her "spare" time at the loom.

SEATED AMONG HIS KIN, SAYJAN BEG, WEARING GLASSES, SEEMS AN OCCIDENTAL

The sister on his left shows Mongolian blood, while the two in front might pass as Russian children (see text, page 3). His mother wears a checkered dress and white scarf, and the family Kazak "mammy," sitting with her dark-skinned son, has a white helmetlike headdress.

the border in Russian Kirghizistan, while the Kazaks have migrated from the dry steppes of Kazakistan, in southern Siberia.

A KIRGHIZ OPINION OF THE KALMUCKS

"The Kalmucks, or Mongols, in the other end of the valley have lived for centuries, with only a few interruptions," he continued, "a law unto themselves, with their Tibetan religion, Mongolian language, and unspeakable customs. They have always dispensed their own civil and, to a large extent, criminal justice.

"The Chinese have for years made it a practice to let our tribes regulate their own life as far as possible; they found that they could not rule us, so they have decided to let us rule ourselves. However, in late years there has been much political unrest in the province and the Chinese, feeling the need for a more centralized control, have given our family nominal civil jurisdiction over the whole valley. The scheme works admirably, with us acting as go-betweens for the Chinese, on the one hand, and the Kirghiz, Kazaks, and Mongols on the other; but we try to interfere as little as possible in the affairs of these worthless Kalmucks."

In the meantime he must plan for my stay here in the Tekes. Soon he would gather a group of the valley officials and visit the highland pastures to see that there was peace among the tribesmen. From the highlands we would go to the pastures of the Kalmucks and there I could see for myself what an amazing race these Kalmucks are.

"Why," he exclaimed, obviously to pique my interest, "they do not even bury their dead, but throw them stark naked to the dogs!"

He raised his hand to forestall my questions. "Be patient; in due time you shall know all. In the meantime, while I am here and busy with tribal business, Ala Beg (Chief Ala) will be your guide and companion."

Sayjan Beg nodded toward a smiling young Kirghiz of about 25 years who wore his white felt hat at a rakish angle and was fitted out in a corduroy coat, thick woolen riding breeches, home-made Russian knee boots, and a sash of coarse black homespun wound about his waist.

AN AX IS THE TEKES VALLEY CARPENTER'S ONLY TOOL

The home he builds is more of a dugout than a cabin, but for six months of the year, when blizzards roll down off the Tien Shan, he is more comfortable in it than are his neighbors in log cabins. The little girls have their hair braided in typical Tekes "rat-tail" fashion.

"Ala Beg knows every man, horse, and," with a wink, "woman in the valley," said Sayjan Beg. "Incidentally, he is the only one of us Kirghiz who knows the Kalmuck tongue, has learned the mysteries of their Buddha, and can explain their strange and evil customs; time will go swiftly for you here in the Tekes with Ala Beg as companion and story-teller. Perhaps he will find a suitable bride for you to buy and you will decide to settle with us here in the valley."

"Now see here," I said to Ala Beg the next morning, "the chief must have been joking when he told me that the Kalmucks throw their dead to the dogs."

"You Ferengi are most incredulous," he laughed. His laugh was singularly pleasant; it had a silvery ring and utter natural abandon. "When we visit the land of the Kalmucks, I will show you that the chief was not exaggerating; but the Kalmuck women are so ugly and dirty—*Vakh!* Are your American women beautiful?"

I assured him he would be quite overcome should he meet one. "Of course," I added, "I haven't seen your Kirghiz girls."

"Ah yes," he exclaimed, "wait until you see the Kirghiz girls on the highlands. But come, I will show you the real Tekes beauty." He pointed to a yurt (felt tent) a hundred yards down the valley and called loudly for a servant to bring our horses.

"But we can easily walk."

He looked at me in amazement. "And why? Have we not horses? Are we servants?" It was an opportune lesson and I was careful after that not to jeopardize my reputation by being seen on foot.

At the door of the yurt we dismounted and threw our halter ropes to a servant boy. Inside we shuffled off our slippers at the edge of the large felt rug and settled down cross-legged on the rug with our backs to the door. The master of the yurt was reclining on a pile of pillows, drawing away at a long-stemmed pipe. After seven or eight puffs he suddenly seemed to notice us and mumbled a greeting, "*Salaam aleikum.*"

WHY A TATAR DOES NOT SHAKE HANDS

"*Aleikum salaam,*" we returned. I nodded and Ala Beg bowed low respectfully. Handshaking is much too intimate to suit the oriental Turks, and it would also be inconvenient, since they are usually

THIS COQUETTISH MAID MIGHT BE THE FAMILY'S FORTUNE

But her father holds out for a bridal price of forty horses! The old Kirghiz, living by the side of the trail, has an excellent opportunity to display his prized possession. Wayfarers say that the schemer will never get his price, even though she may be a beauty.

seated when introduced. The host motioned for us to take the seats of honor in the back center of the yurt facing the door.

Ala Beg had told me our host was a Tatar who had married a Kirghiz. From living for several months among the Tatar city merchants I knew them for an aristocratic and snobbish lot. Any city Tatar marrying outside the pale—marrying a Kirghiz, or nomad Turk—certainly would be ostracized. After his marriage our host, rather than face a hostile Tatar society in the city, had chosen to bring his wealth and bride and live among his wife's people in the mountains where, because of his large possessions and city breeding, he was looked up to with awe and respect.

The women were grouped off to one side in the capacious yurt. The daughter, round-faced, robust, and really quite nice looking, was making a dress of some gay-colored piece of cloth evidently brought from Soviet Russia. She showed her Tatar upbringing in the good taste and style of her dress as well as in the care and neatness of her person (see page 4).

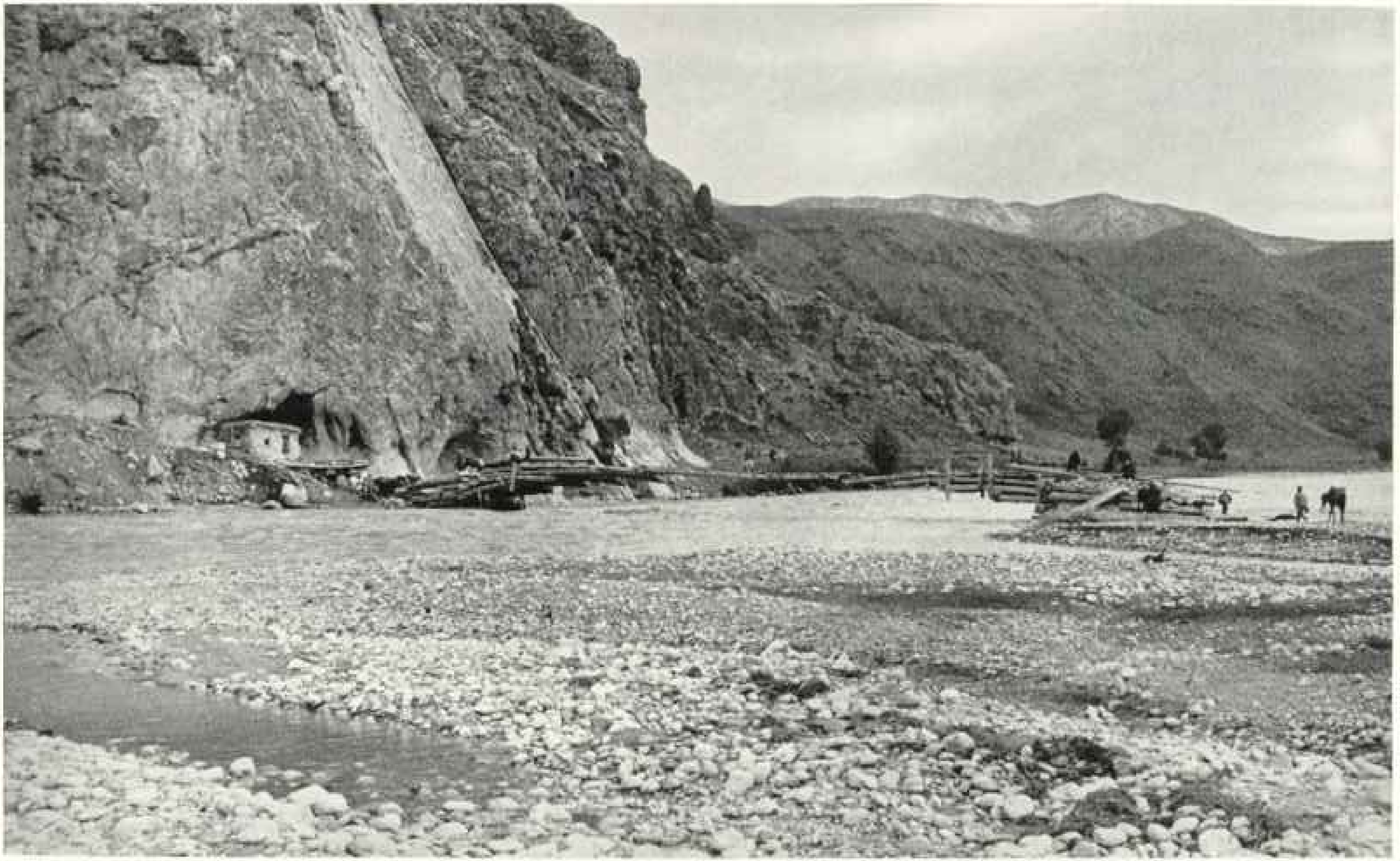
Her mother was pouring out a kettle of mare's milk for us to drink, while the old grandmother, easily distinguishable by her sunken toothless jaws and the yards and yards of white homespun cloth wound into a tall headdress, was leisurely churning some freshly drawn mare's milk in a colt skin.

TURKISH TOWELS FOR "HOPE CHEST"

A little Kazak servant girl, seated with her feet curled up under her, was embroidering Turkish towels. She was obviously helping the daughter, a prospective bride, complete her dowry (see page 41).

While the host was questioning me about the state of affairs in the great Islamic city of the sultans, Ala Beg literally crawled off and entered into conversation with the women; it was easy to see that my guide had a way with the ladies.

The Tatar several years previously had received from Istanbul a letter written in the new Turkish script and he asked me to read and translate it for him; he sent his wife and daughter to another yurt to hunt for the letter in the trunks.



"EVERY FOUR OR FIVE SUMMERS SOME HORSEMAN IS CARRIED TO HIS DEATH WHEN THE BRIDGE ROTS OUT"

Then the structure is rebuilt (see text, page 46). Getting across unbridged rivers in Asia is always an exciting, and sometimes a dangerous, ordeal. Loads are often lost or spoiled by wetting, and frequently pack animals are swept away and drowned. Ferries are few and far between. The currents in mountain streams, such as the Tekes, are so swift that the ferryboats are carried far downstream, and it takes hours to drag them back. Years ago Moslems built this crude cantilever bridge to gain merit in their afterlife.

TRAILING OVER TEKES LOWLANDS, A KIRGHIZ PARTY HEADS TOWARD THE LAND OF THE KALMUCKS

Including the author, seven nationalities made up the group. The Tekes Valley lies cradled in mountains far off the beaten track. From the desert trail between Kashgar and Urumchi, where the artist Alexandre Iacovleff traveled with the Citroën-Haardt Trans-Asiatic Expedition (see Color Plates I to XVI), it takes a week to journey into the valley.

KIRGHIZ HEADQUARTERS RESEMBLE AN OLD-FASHIONED WYOMING RANCH

Except for the rider and strange saddles, these log cabins and riding horses might be located on the other side of the world. A jolly Tungan, Foo Ben Yee, keeps a store in the center building. After treating his customers to tea and "rock candy"—stale melted sugar—the old fellow displays his wares: tobacco, soap (it takes a sheep to buy four cakes), candles made from sheep-tail fat, paper, and safety pins.

NO ONE RISES TO LEAVE UNTIL A BLESSING HAS BEEN SAID

Moslems, like Christians, say grace at the family board. In the household of Sayjan Beg, here dining with kith and kin, no meal is complete without a cup of tea. The family uses modern spoons, and heats water for the beverage in a tall metal samovar, such as those used in Russia. Piled against the back wall of the yurt are dozens of heavy quilts to make beds for the guests.

SADDLED OXEN DRAG LOGS FOR LUMBER AND FIREWOOD DOWN TO CAMP

It may take the servant two days to climb to the mountain forests, cut the trees and drag the logs back to the lowland encampment, but time is no important factor in the worker's life. He doesn't mind spending the night in the open, for his coat and blankets make an excellent bed.

When they had gone out, Ala Beg looked about furtively, picked up the daughter's sewing, and, taking out several of the pins, fastened them in a little design at the spot in the goods where the girl had been working. Suddenly he found the old grandmother's eye upon him and they both laughed. The grandmothers are the proverbial matchmakers and go-betweens. When the girl came back and picked up her sewing she blushed, stole a sidelong glance at Ala Beg, and then bent industriously over her work.

DOWRY: 25 HORSES, 300 SHEEP

"Now, what do you think of her?" asked Ala Beg, after we had bowed our way out and ridden off. Without waiting for a reply, he went on: "She's mine just as soon as I get ready to pay the bridal price. Her father and I have agreed upon 25 horses and 300 sheep."

The nomads have evolved the yurt, a home which is easily transportable, commodious, cool in summer and warm in winter.* The yurts vary in size from the one-man variety to a chieftain's yurt 30 to 35 feet in diameter (Plate V).

The structure consists of a framework of collapsible trelliswork about three feet tall (four or five feet when not unduly extended), which is set up in a circle, leaving an opening for the door frame. At this stage in the yurt pitching, it looks much like a kindergarten play pen. Next, arched poles resembling ribs of a huge umbrella are lashed all around to the top of the latticework, and these curved ribs, instead of meeting above in an apex, are socketed into a wooden ring about a yard across (p. 10).

The roof of arched poles is covered with large pieces of felt about a quarter-inch thick, and to the corners of these are attached long, gayly colored bands. The latter serve to fasten the felt pieces to the framework and, seen from within the yurt, add a decorative touch to the under roof (see Color Plate XI).

HOME LIFE IN A NOMAD'S YURT

In winter the trellis wall is covered on the outside with felt, but in warm weather it is simply screened in with a reed matting

* See "By Coolie and Caravan Across Central Asia," by William J. Morden, NATIONAL GEOGRAPHIC MAGAZINE, October, 1927.

MILKING SHEEP, LIKE MOST ODD JOBS, FALLS TO WOMEN

The ewes are placed in a double row facing each other, their heads pushed through loops on a long tether stretched between two stakes. The sheep's broad, flat tails of fat are plainly visible (see text, page 43). From the milk a cheese is made which is dried on the yurt roofs.

on which, with their home-made woolen yarns, the nomad women fashion striking red and blue designs.

PRIMITIVE AIR CONDITIONING

The open ring at the top lets light and air into the yurt and allows for escape of smoke. A flap of felt can be drawn back and forth over the aperture by ropes; thus the draft can be regulated or in rain the interior made watertight.

To the right of the door as you enter is a reed matting enclosure which serves as a storeroom for milk and cream, and also affords the women a cramped bit of privacy.

The family possessions are ranged along the back wall, set up off the ground on a low wooden platform. Here are the metal-worked trunks which contain the family heirlooms of embroideries and gold and silver trinkets; around and on top of the trunks are piled gay-colored comforters, while on the ground beside the platform are usually lying one or two silver-trimmed wooden saddles. To the top of the trelliswork all around the inside of the yurt are hung whips, bridles, ropes, girdles, and other saddle trappings.

Other household wares consist of such articles as iron and copper cans with handles and lids, a loom, kneading trough, hatchets, floating-wick lamps, a two-stringed lute, pokers, and an iron stand for the large iron kettle.

As Ala Beg and I rode, we passed a tribesman building a log cabin.

"It is a 'sick' Kirghiz who thinks a cabin is a home," Ala Beg remarked.

"I have heard it said that you mountain nomads do not cultivate the soil, yet I see numerous garden plots in the village," I observed.

"If there are gardens, you may be almost certain that they are grubbed by Tatars, Chinese, or Tungans. Of course, when fall rolls around and we nomads have to leave the highlands, we think it would be fine to have wheat, which would mean bread, to munch along with our tea and mutton, but any resolutions we make to

cultivate the soil fade when spring comes.

"In summer months we rove with our flocks over the upland pastures. How can we be tied to the drab soil in the hot lowlands when kumiss is to be drunk and friends feasted in the mountains? We leave a few servants and old women on the river flats to cultivate a little plot of wheat for us—it suffices.

"Then I judge that you yourself don't do any farming."

"Ala Beg with a spade!" The silver tones of his laughter put an end to my questioning.

THE LEGEND OF THE FORTY MAIDENS

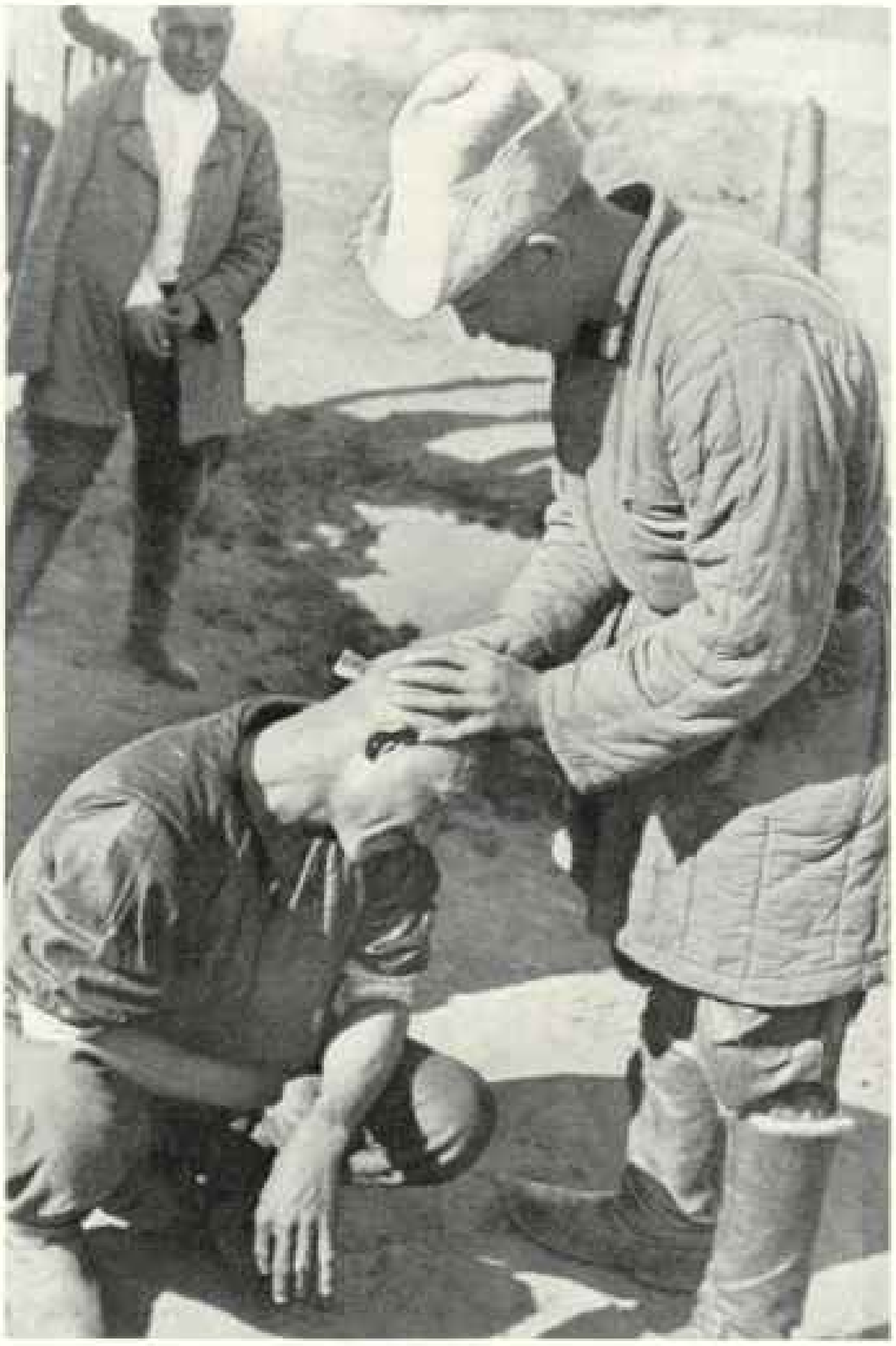
My Tatar students had told me a rather unusual legend of the origin of the Kirghiz people; so to corroborate it I asked Ala Beg one day what were the beginnings of his tribe. His account was substantially the same; it is associated with their name, Kirghiz.

In the dim past there were once *kirk kiz*—forty maidens—who came with child by a red dog (in other versions, by the foam of Issyk-kul, the Warm Lake); from these have descended the various Kirghiz tribes. The mythical tale of descent from an animal is not without analogy in Central Asia.

In the evenings, there was always a gathering of the tribesmen at headquarters. The cabin consisted of two rooms, one a small anteroom, the other a large meeting room with the two sedirs on which Sayjan Beg and I slept at night. Here the Begs frequently would sit in formal court.

"No outsider can witness a Kirghiz court," Ala Beg forewarned me; so a slight nod from him told me when the court was about to assemble and I was expected to retire to the anteroom. Then the men would gather around the long table with Sayjan Beg seated on a sedir at the head end.

Questions of tribal justice would be discussed. What should they do about the thief, the divorced woman's property, the unpaid taxes, and the disputes about boundaries between the pasture lands?



HE YEARNS FOR A COOL AND STUBBLED PATE!

The razor is a keen-edged piece of hammered steel. Among the nomads, hair cutting is not the monopoly of a small guild. When a man wants his head shaved, he produces a sharp-edged tool, and any of his friends will oblige him as barber. Moslems think it healthy to crop their hair occasionally, and shaven heads come into style when summer heat reaches the Tekes.

One dripping evening the court was especially long and noisy. As I lay on the anteroom floor wrapped in my padded all-seasons overcoat, I heard an incessant rumble of voices from the inner room. Now and then someone pounded a fist on the table; the words I didn't understand, but I judged they were curses. Finally there was a loud exclamation, a crash as all the Begs put their hands together in an oath on the rough-hewn table. It was the signal that I knew so well: the court was over; judgment had been passed.

The door opened and a troop of men filed through the anteroom out into the night. The Begs mounted and rode off into the darkness amid a splattering of mud and a jangling of silver saddle trappings; then the night settled back into the quiet drip of rain off the gently sloping roof.

I crawled out of my overcoat and went into the inner room. A tallow candle sent a flickering light into the corners and showed Ahmed, a Kazak servant (page 38), sitting cross-legged on a sedir, his fingers playing over a string of prayer beads, his eyes, unseeing, glued to the floor. I settled myself on the other sedir and waited. After several minutes Ahmed broke the silence.

WHIPPING FOR A TAX DODGER

"Yes, *Ferengi*, the chief's wrath has been stirred again. A Kirghiz yurt owner owed him a tax of six sheep. Months ago the man promised on his oath to pay, but when I went to get the sheep he made excuses: the sheep were far away on the highlands; they were too young; not fat enough. So I came home empty-handed.

"Tonight the Kirghiz court demanded an explanation; they asked me for the six sheep, and when I told them how I had been put off there were angry words, for an oath is held sacred among us tribal people. We have but one punishment for broken oaths: the riders have taken their whips tonight and they will use them."

Ahmed had seen whippers return before and it was always in an ugly mood. "Keep out of sight tonight," he warned. Then he added, "Don't worry; they will have slept it off by morning."

I rolled myself up in the blankets on the sedir reserved for me and was but half stirred to consciousness when hours later the sullen group stamped in. Dripping overcoats were hung up, Sayjan Beg curled up on the opposite sedir, and blankets were rolled out on the floor to bed down the other Begs; all without a word having been spoken.

There was silence, save for the dripping of the wet padded overcoats and the pattering of rain on the roof.

"Our tribal business here at the headquarters is finished," announced Sayjan Beg one morning. "We leave for the highland pastures before sundown." On Ala Beg's shoulders fell the burden of organizing the party. He disappeared and by mid-afternoon had rounded up the various men who were to go with us.

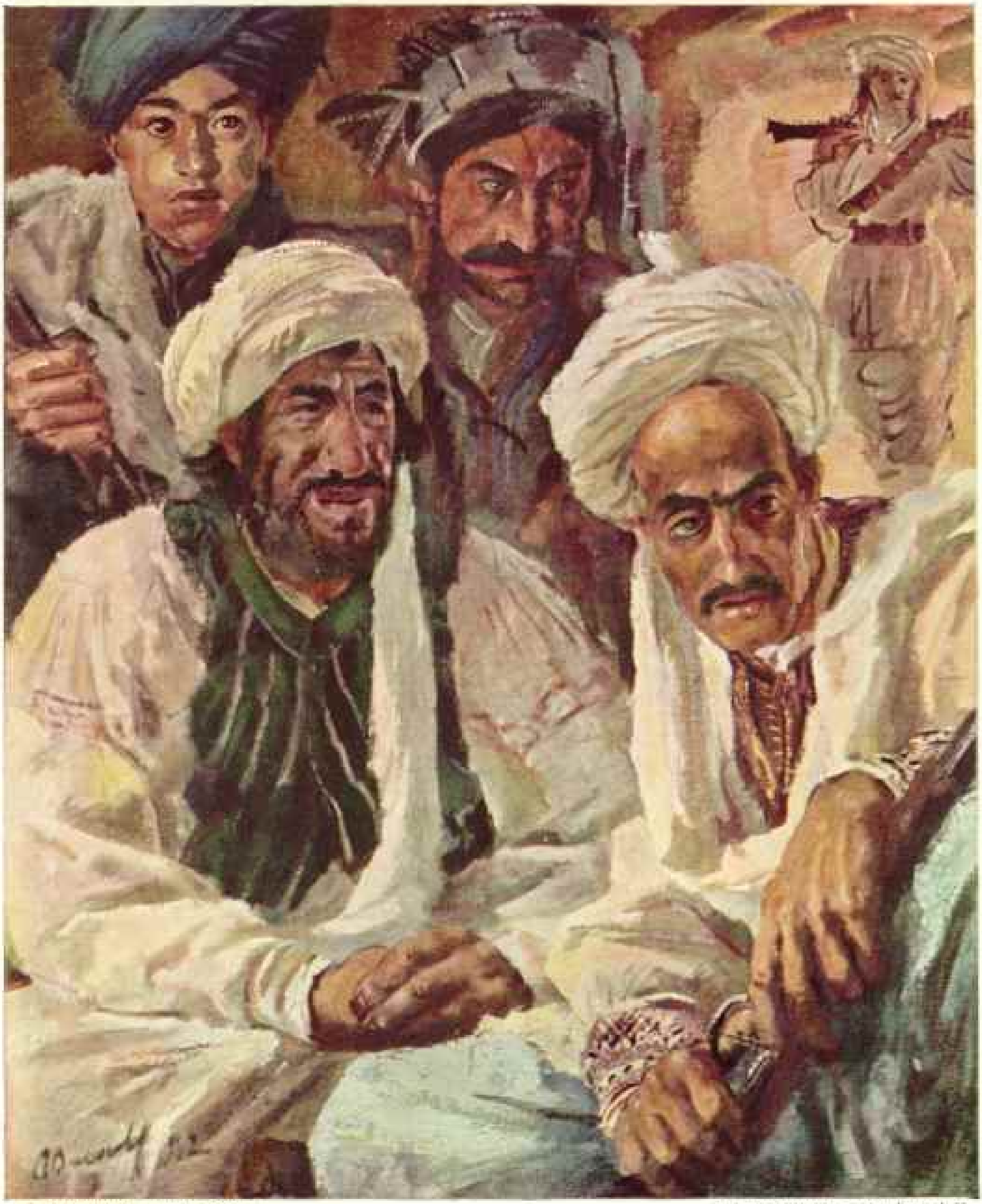
MANY TRIBES AND MANY TONGUES

As we started from the headquarters cabin that afternoon, ours was the characteristic Central Asian polyglot party: seven different nationalities and Sayjan Beg, a mixed Kirghiz-Tatar. I cantered ahead with the chief and his friend, Ala Beg. Behind rode Foo Ben Yee, the Tungan—half Arab and half Chinese; Arduch, the Kalmuck boy; Shang Yo Yacup Beg, the Tatar official of the valley; a Turki soldier; Ahmed, the Kazak servant; and four other Begs.*

The many national groups of Central Asia living in such intimate geographical and social relationship have naturally become adept at picking up languages and dialects. Whenever I met with groups made up of tribesmen speaking different tongues, I was always fascinated to note how soon they fell to conversing in a jargon understandable by all. Our own party quickly evolved a common tongue: it resolved itself into a sort of pidjin Turkish—a composite of half a dozen Turkic dialects.

The day was magnificently clear—a rather unusual occurrence in the Tekes, where clouds commonly hover over the Tien Shan so that few and fleeting are the glimpses one gets of its towering peaks. Just once did I catch sight of the majestic 23,622-foot Khan Tengri, and I learned by experience that one can never be certain of the Tekes weather; within a quarter of an hour a brilliant day may change into a torrent of rain and hail or a driving windstorm. But the natives do not complain: it is this very rain which makes the Tekes

* See "Desert Road to Turkestan," by Owen Lattimore, NATIONAL GEOGRAPHIC MAGAZINE, June, 1929; "Life on the Steppes and Oases of Chinese Turkestan," by W. Bosshard, March, 1931, and "On the World's Highest Plateaus," by Hellmut de Terra, March, 1931.



 Painting by Alexandre Iacovleff

MYSTERY DEEP AS TIME LURKS IN DARK AFGHAN FACES

Two of the men carry old-fashioned Russian guns, and all wear the turbans of their tribes. In 1931, Alexandre Iacovleff crossed the mountains and plains of Asia as artist of the Citroën-Haardt Trans-Asiatic Expedition. There he made the portraits of many of the people he met, some of which are reproduced in this series. He drew many of the lifesize originals in crayons and pastel quickly, in one sitting, and did not retouch them later. For his paintings the artist used tempera, a paint based on raw egg and linseed oil, because it dries quickly. He composed and completed Plates I, IV, V, X, XI, and XIII after returning to Paris, from notes and sketches made on the trip.

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HER TRIBE BELIEVES THAT STARS DETERMINE HUMAN DESTINIES

This woman of Baghdad suggests a painting of Saint Anne in the costume of Mesopotamia. Her hand bears a tattooed cross. Mr. Edward T. Holmes, of Boston, owns the original.

Drawings by Alexandre Iacovleff

WHEN THE CLANS OF HIS PEOPLE MIGRATE, PLAINSMEN TREMBLE

He comes from a nomadic Kurdish mountain tribe which descends upon the lowlands with the arrival of winter. For himself he has chosen a more sedentary life as a Baghdad porter.

"FOR MY LOYAL SERVANT I HAVE ONLY PRAISE"

"On his back my baggage moved as if by magic," says the artist. "He pitched my tent; he cleaned my shoes, and served my tea." Sultan Mir, from the Indian state of Hunza, accompanied Iacovleff in the Himalayas until a jealous head-servant discharged him.

Drawings by Alexandre Iacovleff

MALARIA GIVES SHEIK SATTANI A WISTFUL EXPRESSION

This Bedouin Arab of princely bearing came to Palmyra to arbitrate a blood feud between his and another tribe. He rides a camel or a horse where he cannot drive his American-made automobile. The original is owned by Mr. Edward T. Holmes, of Boston.

Painting by Alexandre Iacovleff

THEIR MALLETS SWINGING, RACING RIDERS HIGH ON A ROCKY PLATEAU DRIVE THE WOODEN BALL TO ITS GOAL

Long before Britons or Americans learned to play polo on grassy grounds, natives of Afghanistan, Persia, and India developed the strenuous game in their mountain haunts. Teams of rival tribes hold a tournament every year at Misgar, in northern Kashmir. A man runs to the field (left) to hand a new mallet to a rider who has broken his own. Male spectators gather about the "grandstand," while women, forbidden by tribal custom to mingle with the men, look on from the top of the shelter. After this game, a physician of the Trans-Asiatic Expedition sewed up a gash in a player's head. When the Expedition first entered a similar clearing, all members galloped horseback at top speed across the field at the request of the tribal chief, who said it would bring good luck. The originals of this painting and that on the opposite page are owned by the National Geographic Society.

Painting by Alexandre Iacovleff

WHEN WINTER COMES THE KIRGHIZ WILL DESERT THEIR VILLAGE ON THE "ROOF OF THE WORLD" AND MOVE INTO THE PLAINS

The roving tribe lives mainly on sheep or yak milk, cheese, and mutton. Their hospitality knows no bounds. Whenever the Expedition left one of their encampments, the local chief presented a sheep or two to the party, and it was not long until the travelers had collected a sizable herd. Felt made of sheep or yak wool covers the wooden framework of the portable yurts, or huts, at the left (see Color Plate XI). Two riders (right), one on a horse, the other on a yak, return from a scouting trip, while a woman in high cotton headdress milks a yak. Over a pass to the left, an age-old trade route crosses into Afghanistan. The encampment is near the undefined boundary between Sinkiang and India.

AMID ASIAN PEAKS, BAGGAGE MUST MOVE ON THE BACKS OF MEN

This man, whose dash of Mongolian blood is evident, had an extraordinary sense of balance that enabled him to carry huge loads. Mr. E. R. Frederick, of Detroit, owns the original.

Drawings by Alexandre Iacovleff

A SOLEMN AFGHAN PATRIARCH GAZED LONG AT HIS PORTRAIT

But he never permitted curiosity to show on his face, or forgot his dignity as chief of a nomad Afghan tribe. The old fellow, seen in Kabul, reminded Iacovleff of some ancient Sassanid king of Persia.

NO DELILAH HAS SHORN THIS TRIBESMAN'S LOCKS

Claiming descent from the tribes of Israel which Nebuchadnezzar carried into captivity, the Durani Afghans of Girishk dominate a mixed population allied to the Turks, Persians, and other neighboring peoples.

Drawings by Alexandre Iacovleff

BABA DARIA WAS CALLED "FATHER OF THE RIVER"

As chief boatman on the Helmand River, barrier to caravan travel between Herat and Kandahar in Afghanistan, he ferried the Expedition's seven tractor-type cars over the swift stream. Each boatload had to be grounded on a sand bar enough to slow it.

 Drawing by Alexandre Iacovleff

MONGOL PRINCES CAME TO A DESERT CAMP TO HONOR THEIR RELIGIOUS CHIEF

Inner Mongolia is divided among local lords. One of them, at his camp between Sharamuren and Kalgan, entertained the Pantshen Lama, or "Great Chief" of the church in Mongolia, at a New Year's reception. The host (lower) wears a rich necklace, while one of his distinguished visitors (right) has a headdress of fox fur.

MONGOLIAN SOLDIERS AT SHARAMUREN RIDE CAMELS WHERE HORSES CANNOT LIVE

 Drawings by Alexandre Iacovleff

"LOOK, HE'S DRAWING OUR FACES ON A BOARD!"

As the artist worked, astonished tribesmen frequently gathered to watch. These shaven-headed princes, also guests at the New Year's reception (see Plate VIII), wear fur caps that indicate their tribe and rank; the flaps serve as ear muffs in cold weather.

WITH NOOSES ON 15-FOOT POLES, MONGOLS HERD SEMIWILD HORSES NEAR A STUPA THAT HONORS BUDDHA

Paintings by Alexandre Iacovleff

MUD VILLAGES DOT THE PLAINS OF IRAQ, IRAN, AND AFGHANISTAN

To the citadel (left), where the tribe stores its grain in a common bin, women and children flee in time of war. Families live in dome-shaped buildings, each of which has an opening near the top on the side away from the prevailing winds. When a chief dies, his house is abandoned.

Painting by Alexandre Iacovleff

INTO THEIR TEA THE KIRGHIZ STIR CHUNKS OF MUTTON FAT AND PIECES OF CHEESE

The result is an invigorating broth which the artist tasted and found palatable and refreshing. This family, camped in Chinese Turkistan, burns dried yak or camel dung to cook the food and warm the yurt. Smoke escapes through a hole in the roof, stream-lined to resist high winds. A felt covering stretched over the wooden framework keeps out summer heat and winter cold. Silk for the costumes probably came from Bukhara; the cotton cloth in the background from Russia or India.

FOUR TIMES HIS PEOPLE SACKED HERAT, WHOSE GOVERNOR HE NOW SERVES

Nomad Turkoman horsemen shave their polls and wear enormous shakos of dyed sheepskin. They live between the Caspian Sea and the Oxus River, centering about Merv.

Drawings by Alexandre Iacovleff

A SMILE WOULD DISARRANGE HIS NEATLY BRUSHED MUSTACHE:

The Hunza ambassador to Kashgar, Sinkiang, seems somewhat oppressed by the cares of state. But his tightly rolled felt cap is worn at a rakish angle.

Painting by Alexandre Iacovleff

ROLLING BENEATH GLADIATORIAL SHIELDS, PERSIAN ATHLETES PRESERVE TRADITIONS OF THE PAST

The leader (right) thumps a crude drum at a fast tempo and chants tales of ancient heroes while the athletes swing their heavy shields in perfect rhythm. To end the exercises, the drummer rings the overhead gong, decorated with three ostrich plumes. The leader of the school here at Tehran asked the artist never to touch the instruments lest they lose their sacred purity.

THE RICH TURBAN IS A BADGE OF ROYALTY

It is a single woolen band, dozens of yards long, wound round and round the head. The Princess, whose bright silks came from China, takes no active part in governing her home province of Annam in French Indo-China. She posed at Huế, where she seeks to preserve the traditional music and dances of her people.

Drawings by Alexandre Iacovleff

WEARING HER CLOTHES LIKE A FASHION MODEL

Gaudy jacket and loose-fitting trousers make an attractive costume for Mme. Vo Chuan. Her husband is a mandarin, or public officer, in Annam, a province of French Indo-China. This young woman has acquired keen insight into occidental life by meeting distinguished foreign visitors at Huế, where she lives.

BENEATH THE PILLOW HEADGEAR SHE WEARS A TINY CAP

From the under piece hang scarlet ribbons, with amber beads, pearl buttons, corals, and silver plates. This was the artist's hostess, wife of a Kirghiz chieftain of Subashi, in the Pamirs.

Drawings by Alexandre Iacovleff

THE PRINCESS ONCE STUDIED MEDICINE IN BRUSSELS

Her tresses, streaming from a silver crown set with corals, are wrapped about horsehair cylinders and held in place by gold brocade. She greeted the artist at Urumchi in English, French, and Russian.

FIELD WORKERS DON A COMBINATION SUNSHADE AND UMBRELLA

In rain or sun, the hands are free. This Nung woman, like many others in Indo-China, chewed betel and blackened her teeth with lacquer. The native women consider white teeth immodest.

 Drawings by Alexandre Iacovleff

A MADONNA OF THE RICEFIELDS WEARS A HUGE HAT LIKE A HALO

Fear stiffens the child, but the mother's eyes are trusting. Peasant girls in Annam Province, French Indo-China, marry very young and often have many children. The silver ring around the infant's neck is highly prized.

unique in Central Asia—a verdant paradise in the hub of a large expanse of semidesert.

We were not the only ones on the trail. It was the last of June and the hot weather on the valley floor was rapidly drying up the grass, sending the nomads up to fresher pastures. We overtook many caravans of them. Some of the riders were mounted on saddled oxen. Servants and others too poor to own or keep horses ride oxback; it is a common and respectable means of transportation—slow, but comfortable; unromantic, but safe.

BABIES STRAPPED TO CRADLES

Each caravan consisted of from three to a dozen cattle on which had been piled the dismantled yurts and their contents (see page 46). Women on horseback were herding the pack animals along the trail. Across the saddle in front of them many of the women balanced the typical Turkish cradle. The babies are strapped down tightly, with a hole in the bottom of the cradle to permit the calls of nature, for the infants are frequently kept thus tied down for twenty-four hours at a stretch.

"It makes the baby grow straight," one of the mothers told me.

For several hours the horses had been straining up the steep path. The warm air of the lowlands was giving way to upland air that made one tingle. Suddenly we came out on the highland plateau.

It was far and above my wildest fancy. It dwarfed any of the stories that I had heard about it. It was superb—mile after mile of rolling pasture land, knee-deep succulent grass; sharp ravines appearing like notches cut out of the highlands; irregular patches of tall pines running down the sides of the ravines.

Here was grass to pasture millions; here was a summer yurt ground which was faultless. No wonder that these highlands were heralded through Asia—the Tekes plateau has no peer. Coming from the dried plains around Kuldja and having left behind thousands of miles of semiarid Russian steppes, I felt like dismounting and rolling on the turf. The horses whinnied and capered as they trotted along through the tall grass.

Dotting the plateau were little colonies of yurts—three or four in a group, with horses and sheep milling about them.

"There is our destination," cried Ala Beg, pointing to a group of yurts at the head of a deep ravine.

Our highland host came smiling to greet us as we galloped up abreast. We dismounted, threw our reins to the servants, and were soon inside the yurt, guzzling bowl after bowl of mare's milk. I was amazed at my own capacity; one seemed to get a second wind after the third or fourth bowlful.

KUMISS IS MILDLY INTOXICATING

I soon discovered that kumiss is also mildly intoxicating. When I got up to go out I found myself somewhat unsteady; and all from pure mare's milk a day old. None of the Kirghiz Begs, the initiated, seemed in the least affected; in fact, they claimed that a full stomach of kumiss is an aid in sighting game. But milk drinks can be downright intoxicating to the Kirghiz Begs as well as to the foreigner—that I learned later in Kalmuck yurts (page 56).

The hostess brought in a copper teapot, scraped up a few hot embers from the scattered heap of ashes under the center hole of the yurt, and soon had a fire blazing. Two healthy little children toddled into the yurt. One wore a small jacket that covered not much more than his arm pits; the other had not a stitch on. The men made much of them.

The nomads, childlike themselves, have great love for children and will play with them by the hour. Even the richest Beg is considered poor if he has no children, while the poorest servant gains much respect if he has many children playing around his yurt.

Foo Ben Yee, the bearded Tungan, was seated near the hostess, who was kneeling by her copper teapot, stirring the fire. She was expecting to add another son to the yurt in a few weeks. Reaching over, Foo Ben Yee tapped her on the belly, and in a jovial way complimented both her and her husband on their fertility. She beamed happily (see illustration, page 6).

So long as a wife is bearing her husband children, she reigns supreme in her own household and has the respect of her husband and of the world at large. Only after she has stopped bearing does her husband look around for a new wife, and she is relegated to the yurt of the past generation.

Foo Ben Yee's comment called for a round of risqué repartee, at which the men laughed boisterously and the hostess smiled deferentially. As usual in such badinage, Ala Beg carried off first honors.

A TRUSTED SERVANT EXCHANGES SMILES WITH HIS WIFE

Ahmed is a Kazak, honesty personified, and a teetotaler. The latter quality endears him to the chief, who relies on Ahmed to extricate him from the many fracases into which his penchant for the Kalmuck intoxicant leads him. Ahmed's wife is a Kirghiz; her headdress establishes that fact (see illustration, page 54). Behind her hangs a wall decoration of Kirghiz-Kazak design.

First kumiss, then tea, then mutton; such is the order of a Tekes feast. We had arrived at sundown, and it was well on toward the setting of the quarter moon before we had disposed of the last of the sheep, licked our fingers, and cleaned our knives. An old shepherd came in with a two-stringed lute; he warbled away in a high-pitched voice, a weird falsetto in which most of the Turkic songs are sung. It thrills of the hills, of the wild steppes, and of the road.

STRICT PRECEDENCE RULES ORDER OF SLEEPERS IN SEMICIRCLE

We slept in a semicircle with our feet toward the smoldering fire; the host and his wife at the head end, Sayjan Beg and myself next, while the rest of the party were graded in rank down to Ahmed, the servant, at the tail end.

The wife of our host was the last to bed. She was foraging around in the darkness for sticks of wood to throw on the fire. The nomads of the Tekes are unusually blessed with wood for fires. Wood is a luxury rarely obtainable in Central Asia and the fires must generally be kept with dried dung.

I once asked one of the women which she preferred to keep, a wood or a dung fire; she thought a moment, shrugged her shoulders, and laughed. "What is the difference? If it is dung, we must gather it; if it is wood, we must chop it."

Morning found us up at daybreak, for people who live close to the earth waste none of the best hours of the day. A young Kirghiz took me down the ravine to the stream bank to show me his gaming eagle; it looked like an American golden eagle, was hooded, and tied to a three-legged perch.

He showed me a small illik (Tien Shan roe deer) it had caught the day before. When in the velvet, the immature illik horns, as well as those of other deer, bring a fine price, because the Chinese buy them for medicinal purposes.

OFF FOR THE HUNT WITH A TRAINED EAGLE, AS IN MARCO POLO'S DAY

Kirghiz sportsmen catch eaglets and train them to falconry. During the hunting seasons, men ride deep into the mountains, each owner with a bird strapped to a leather-gauntleted arm. When the hunter sees prey or suspects its presence, he unhoods the bird and sets it free. Soaring upward, it pounces on the game, and then is recaptured.

In the Tekes, hunting with falcons and eagles is a traditional sport.* There are gay hawking days when the men go off on horseback, the hooded birds fettered to the hunter's leather-protected arm. When the quarry is seen or suspected of being in the vicinity, the bird is unhooded and released; it soars up and pounces on the prey, to be recaptured again with the prize. In addition to the small game and illik hunted with eagles, there are ibex, ovis poli, bears, snow leopards, wolves, and foxes.

A NOMAD WOMAN'S WORK IS NEVER DONE

The scene around the yurts in the encampment was typically nomadic: the men were sprawled on the grass, conversing; the women were toiling at household duties.

In nomadic life the woman does almost all the hard work. She must keep the fire and prepare the food, except for feasts, when the men cook the meat in special deference and honor to their guests. She weaves carpets and ribbons, winds ropes and yarns, milks, and tends the flocks, children, and household.

It is the woman who catches, saddles, and bridles the horse, and brings it to her liege lord, holding the stirrup while he mounts; and on his return she must be waiting to catch the bridle rein when he dismounts. In moving, the woman again bears the brunt of the labor; it is she who must pitch and strike the yurts, pack the goods on the oxen, and drive them to the next camping ground.

The males live a life of ease, lying about smoking or listening to one of their number plucking at a two-stringed lute. Every now and then they rouse themselves to call for some more tobacco, shout some directions to their women, or organize a horse race.

* See "Falconry, the Sport of Kings," by Louis Agassiz Fuertes, NATIONAL GEOGRAPHIC MAGAZINE, December, 1920, and "Eagles, Hawks, and Vultures," 28 illustrations in color from paintings by Maj. Allan Brooks, July, 1933.

THE VILLAGE BLACKSMITH WORKS WELL CLEAR OF THE "DANGER ZONE"

This method of roping a horse to a stock for shoeing leaves considerable leeway for the animal to kick and struggle; ultimately it is bested and sprawls exhausted in the harness. The rocky trails and icy passes of the Tekes Valley require well-shod horses.

SAYJAN'S PET CAMEL, THE VILLAGE MASCOT, HOLDS UP ITS HEAD FOR A SCRATCHING

In Syria, Egypt, and elsewhere in Africa the dromedary, or single-humped camel, is common. Central Asians use the Bactrian, or two-humped variety, because it is able to withstand rigorous winters.

Toward midday, as we were drinking kumiss inside the yurt, we heard a pounding of hoofs outside; it was the mares arriving for milking time. Twice or three times a day they come in (usually without being driven) to suckle the foals which are tied to a long picket line near the yurts. Ordinarily the mares are docile and permit themselves to be milked; if one is obstreperous the foal is first allowed to suckle a while and then the milker takes its place.

THE MAKING OF KUMISS

The mare's milk is put into a large sack, made of a sheep's skin, or more often a colt's skin, in which there is still some sour milk with the fermentative bacteria left from the day before. The milk remains in the skin for about 24 hours and intermittently the old women churn it with a dasher. Nerime, the old mother of our host, explained that they churn it from ten to a dozen times a day, for five or ten minutes each time.

The milk separates into a thick white curd which settles to the bottom and a thinner upper layer which is the kumiss. This is ready to draw off and drink the next day and tastes much like buttermilk.

The curds are used in tanning hides. In summer there is an abundance of kumiss and a wealthy man with hundreds of horses can easily provide for all his household. Our host had to provision three yurts; his own, his parents', and the servants', providing for about 25 people in all.

During one of the rounds of kumiss in the main yurt a servant dragged a sheep to the door; the animal must be blessed before being slain. We stretched out our arms, palms heavenward, muttering the prayer, "Allah ekber rakmet" (God is great, we thank Thee). The ritual was completed by stroking our beards, or, if beardless, our chins.

The eastern Turk is meticulous in observing blessings. No animal is butchered on a festal occasion; no one gets up to leave after a meal; no ceremony is complete until, after a moment of silence with palms outstretched, the Beneficent Provider is invoked.

STITCH BY STITCH A KAZAK MAID HELPS WITH HER MISTRESS' DOWRY

The little girl servant of Ala Beg's fiancée is embroidering a wall decoration of Russian design. Since the early 13th century, when Genghis Khan's "golden hordes" swept over Asia, and the Tatars ruled supreme, there has been much mingling of Russian and Tatar blood. Now, many nomad war lords have tamed down to the ways of city merchants, adopting Russian arts and culture.

THESE TWO TROUT FISHERS HAVE NO SPORTSMEN'S SCRUPLES

When the Tungan storekeeper's son set out for the river to stock the family larder with fish, he went armed with this home-made net. The catch justified his undisputed claim of being the best fisherman in the village. Even while forcing his net through the water, he must carry a horsewhip, which seems to be a badge of masculinity.

TURHAN BEG HAS A WAY WITH THE LADIES

Kazaks and Kirghiz are playful as children. Both men and busy women are always ready for a joke or sportive scuffle. When the author wheeled about to photograph this lone woman rider coming along the trail, Turhan Beg held up the proceedings to rein his horse at her side. "It would be a shame," he said, "to take a picture merely of a woman!"

THE NOMAD'S SHEEP PROVIDE CLOTHES, SHOES, AND FOOD

Skins from the sheep killed to feast the author's party are being tanned with leftover curds from the kumiss making. Once cured, they will be used to make the nomad winter costume, which includes sheepskin moccasins, leggings, overcoat, and cap.

After the blessing we trooped outside the yurt to look on while our host sliced off the head of the sheep with one stroke of a knife, the blood draining into a wooden bowl.

ANIMALS WITH STOREHOUSE TAILS

The Central Asian sheep are all fat-tailed. The appendage is broad and flat instead of long and round as in North America, and apparently is an adaptation to the rigorous life of the steppes. During the months when the pastures are good the sheep store up fat in their tails. I have seen them in the market place weighing eight and ten pounds, and in the fall have seen tails so heavy that they were half broken off.

Turks have told me that, for their prize sheep, the shepherds sometimes rig up little carts which the animals drag along behind to hold up their fat-heavy tails.

In winter the sheep must paw through the snow for what little food they get. Then they literally "live off their tails," so that when spring comes their tails are thin and shriveled, ready to begin anew the function of a storehouse (see page 18).

The mountain people are past masters in the art of cooking meat; indeed, they have a long heritage of meat cooking behind them. Timur the Lame (Tamerlane), and who knows how many generations before him, ate mutton as a staple. Besides some bread, mulberry seed, and milk the nomad Turks eat little else.

ALL THE SHEEP USED BUT ITS BLEAT

In summer the meat is cooked outside the yurt at a fire hole. In our visiting Ala Beg was invariably self-elected chief cook, with a crowd of women and men-servants to do his bidding. Every bit of the sheep is used: the meat is eaten, the hide cured with the sediment of the kumiss churning, and the intestines saved for bologna.

Sometime in the year a number of sheep are traded for a mare, or the master of the yurt picks out an ill-colored, poor-gaited, fat young mare from his own herd, and the nomads make sausage. This is considered a delectable dish for an honored guest.

"The feast is ready," cried our host.

We assembled inside the yurt and took places in a semicircle, Sayjan Beg and I in

"... . AND MAY THE TAILS OF YOUR SHEEP FATTEN NICELY THIS SUMMER!"

Such might the host's parting words be as he bids his guests farewell (page 43). Wealthy stockmen are always welcome at lowland yurts, where all yearn for news of upland pastures. As the years roll by, the old and worn strips of felt used by the rich on their yurts gravitate to the poorer householders. There the pieces, patched and sewn, still make a water-tight roof.

the center as usual. A boy appeared with a hammered copper ewer and bowl. Setting the bowl down in front of us, he ran a stream of water from the long-spouted pitcher into it; we washed our hands and dried them on the towel he carried slung over his shoulder.

Ala Beg led the festal procession, carrying the enormous bowl of mutton. There was no free-for-all scramble, certain procedures being rigorously observed. The largest platter was for the honored guest and contained the head, part of the tail, and a piece of the loin.

Ala Beg set it down in front of Sayjan Beg, who picked up the head and handed it to me. I stripped off a portion from the cheek and handed it back. He cut off both ears, a large slice of the jowl, and passed what was left to a waiting servant. "Take it to the *baba*." This was our host's father who lived in a separate yurt.

With the devouring of our initial pieces of meat, the first hunger pangs had been stayed; then, gathering in three groups around kettles of meat, the Begs pulled their knives from their sashes and began cutting the meat into small bits.

After all the bones had been scraped clean of meat, bowls of meat juice, unsalted but seasoned with pepper, were brought in, and the traditional long Turkish towel was spread around, each one putting a section over his knees. The meat bits were dipped in the juice and eaten; more juice, more dipping, more chewing; silence save for the lusty smacking of lips, licking of fingers, and other uncamouflaged gustatory noises.

The Turk, like the Chinese, believes in a time for eating and a time for talking

and is horrified when the two are indiscriminately mixed. Even Ala Beg, whose tongue was ever on the rampage, seemed to become a different person as he sat before the meat bowl; he dipped and chewed, his whole being absorbed in the process.

It was amazing how quickly a fat sheep could disappear. When the meat was eaten the men attacked the bones, breaking them and sucking out the marrow; then there was a veritable sucking chorus.

The waiting women and children began where we men left off, and the powerful tongues and lips of the servants ferreted out any marrow which the children had left. The circle of dogs snarled and fought over what remained. Although everyone had more meat than he really wanted, the game of finding a shred of flesh continued until the bones were meatless and marrowless.

Then the boy with the pitcher and towel made the rounds again. All eyes began to wander, the lolling feasters straightened up, we stretched out our palms heavenward, "*Allah ekber rakmet*," the motion of stroking our chins, and the feast was over. So was all strenuous endeavor for the remainder of the day.

Days of feasting, racing, and visiting followed, and the young bloods had their nights out. Sometimes when the host's wife spread the blankets around the central yurt fire in the evening there were only four of us: Sayjan Beg, Yacup Beg, Foo Ben Yee, and myself.

"The boys must have their fling while they are young," laughed the jolly Tungan; "when they become the head of a yurt and are raising a family they can no longer go a-courting."

THE BRIDAL PRICE OF A KIRGHIZ DEBUTANTE

The Kirghiz and Kazaks marry their daughters off for a price, just as Marco Polo relates that they did 600 years ago, and as they probably had been doing for untold centuries before the Venetian visited Asia. The rich man buys the daughter of a rich man for a high price; the servant, the daughter of a servant for a song.

The prices are in units of livestock: so many cattle, sheep, and horses. The units are the *kara* and *yanduk* (like a system of dollars and cents). A kara is equal to a cow or horse (depending upon the quality); one yanduk is equivalent to a sheep.

Bridal prices run from as high as forty kara and a thousand yanduk (forty horses and a thousand sheep) for the daughter of a very rich man, down to as low as one kara (a cow or horse) for a poor servant girl.

"Now there," said Ala Beg, pointing to a little 13-year-old girl with a myriad of tiny, glistening, black braids of hair; "is a hold-out. Our host wants 20 kara and 100 yanduk for his daughter."

"But she's pretty enough." The girl was coquettishly smiling and shaking her braids at us, obviously enjoying the attention.

He pointed to a little servant girl carrying water. "Her price is but 16 yanduk (16 sheep); a servant boy from another camp is paying two sheep a year for her." The girl passed near.

"When do you go to your husband's yurt?" Ala Beg called after the child, but she ran and hid behind a yurt.

One of the servant women laughingly gave us the information. "Eight more sheep—four more years."

I singled the little girl out later, and with a lump of sugar inveigled her into telling me her age—eight years.

They marry from ten on up. An old priest in Kuldja told me how he had lost ten sheep on a Kazak bride. "She was homesick and cried incessantly until I finally had to let her go home."

"How old was she?" I inquired.

"Eleven, and her father wouldn't return the ten sheep," he added disconsolately.

The highlands were becoming populous; groups of yurts sprang up overnight. Our party was kept in the saddle, visiting the yurts of the new arrivals and meeting with the more important stock owners. These men had puzzling problems to ask Sayjan Beg, the man who had had an education; they all wistfully envied him. Did he think it was a good time to trade sheep in the market at Kuldja? Was the new government stable? Would the taxes be increased for the next year?

Sayjan Beg was greatly respected and not a little feared by the rich Kirghiz.

OFF TO VISIT THE KALMUCKS

And then one evening, after we had listened for long hours to a twanging two-stringed lute, Sayjan Beg announced: "We have found peace among the Kirghiz tribesmen; we must keep our promise and visit the pastures of the Kalmucks."

Next morning horses were rounded up, saddles thrown on, and we were off.

THESE THREE OXEN ARE BEARING A HOME AND ALL ITS FURNISHINGS

The lead animal carries the felt coverings of the yurt, while the two behind bear the wooden framework, a few clothes, and the household pots and pans. A yurt may be pitched or struck in less than an hour. It is early summer, and the caravan is migrating from the lowlands to mountain pastures.

We offered no effusive thanks to our host. We had grown fat on his mutton and kumiss; he had enjoyed the feasting and the opportunity to build up a reputation for his yurt. The Turks of all lands are little prone to verbose thanks; hospitality is taken as a matter of course, freely extended and expected.

The sun was well up before we reached the lowlands, splashed across several small streams, and came at last to the primitive cantilever bridge thrown across the Tekes River (see illustration, page 14).

Sayjan Beg and the others had told how dangerous the crossing was and said that there were men at the bridge who would lead the horses across for a fee.

Inwardly I laughed at them for being chicken-hearted; I would lead my own mount across. But it was a different story when the moment of crossing came. A man walked across, swaying dizzily above the rushing, muddy torrent. One of the bridge horsemen took a horse across; the flimsy log ladder, laid between the two juts of bridging, danced and swung.

"Every four or five summers," Ala Beg had said, "some horseman is carried to his death when the bridge rots out; then the structure is rebuilt."

A bridge guide approached; I slipped him a half-cent's-worth of Chinese currency and he, quite overcome at being paid three prices for the job, led my horse across.

Humbly I brought up the rear. Nor did any others of our party venture to lead their own horses across, even though they had been over the bridge many times before. One cannot accuse nomads of being especially foolhardy.

Once over the bridge, we were in the land of the Kalmucks.

REMNANTS OF THE MONGOLS

The Kalmucks are frequently spoken of as being related to the Mongols, when, as a matter of fact, they *are* Mongols—just as are those people called Torguts farther eastward. In centuries past there was a great confederacy of Western Mongol tribes, the Ölöt; the present Kalmucks represent the remnants of this great horde.

None of the Kalmucks call themselves Kalmuck, but the name has been given

EVEN THE KALMUCK LAMA CATERED TO THE KIRGHIZ CHIEFTAIN'S WHIM

When the chief insisted that the visit to the lama be "written in history," the party gathered on the porch of the host's ornately decorated house to have a photograph taken (see text, page 30). Sayjan Beg, legs crossed, sits in the center between the ranking priest on his right and the head lama on his left. The barefoot boy at the end is working up in the order.

WEAVING REED MATS, WHICH MAKE COOL YURT WALLS FOR THE SUMMER

Kirghiz women trim the stalks to the proper length and bind them together with woolen thread, such as the woman on the right is spinning. Sometimes the reeds are fastened with red and blue threads which, interwoven, form variegated, geometric designs (see pages 17 and 18).

them by the Turco-Tatar tribes among whom they live; it is probably derived from the Turkic verb *kalmak* (to remain).

The history of the Kalmucks is obscure. However, it is certain that in the 17th century they occupied the whole region in and around the Tekes Valley. Late in that century they fled the tyranny of Chinese war lords and crossed the Russian steppes to settle along the Volga.

Eighty years later the Chinese emperor, Chien Lung (1736-96), in frantic search for some settlers to create a buffer state of the Tekes Valley region, made an attractive offer to the Volga Kalmucks and the majority of them returned to set up their yurts again in the Tekes grasslands. Some remained, however, and still form a settlement of Mongols, the Russian Kalmucks, along the Volga River.

They are, in truth, a squalid race, reputed never to change their clothes or wash. When one coat wears out, a new one is put on over it and not until it rots off do they discard a garment. In spite of Ala Beg's education of Arduch, the Kalmuck boy, the little fellow was not even up to Kirghiz standards of cleanliness.

But their filthiness does not hinder the Kalmucks from gaining riches. Their flocks of sheep are countless and herds of horses blacken their pasture lands. Their wants are few, their standard of living at rock bottom, and their only expenditures an occasional sheep or horse bartered in the bazaar for gold and silver bracelets and earrings for a daughter of the household.

A KNIFE, CHOPSTICK, AND TOOTHPICK CASE

It was beginning to mist and drizzle, and the clouds rolling down from the uplands presaged another Tekes deluge when we galloped up to the yurt of Altan the Kalmuck.

Jumping off and scurrying for the yurt, we barely got inside before the storm broke in a torrential downpour. Ahmed, the servant, and Ala Beg, who stayed for a moment to see that the horses were properly tied, came in dripping.

Altan, a prince by birth, was the ruler of the Tekes Kalmucks, subject to the superior orders of the Great Lama. He wore a neat little velvet hat, and loose-fitting coat and long pants which were heavily padded to keep out rain, sun, and cold; from beneath his coat cuffs protruded a garment once white but long since changed to a grimy gray.

In his twisted sash he carried a combination knife, chopstick, and steel toothpick case. His head was cleanly shaven save for a knot well back in the center of his scalp, and from this hung a long braided pigtail with a silk tassel tied on the end. As their hair thins out with age, the Kalmuck men add strands of human or horse hair to the pigtail to keep it at a respectable length.

In the Kalmuck yurt we sat, as was the custom in Kirghiz yurts, in a semicircle facing the door. In front of each two of us was a footstool on which were placed such various Mongol concoctions as ground wheat sweetened with sugar, or goat's cheese dried and cured in the sun.

THEIR "PERMANENTS" ARE FALSE HAIR BRAIDS

The latter might have been palatable had it not been thoroughly mixed with hair. Since the women prepare the cheese, it is no wonder that it is adulterated, for the Kalmuck women wear long braids of false hair. They are most commonly fashioned from a horse tail, but the wife of an especially important man may have braids of hair cut from their own Kalmuck dead or bought from the Chinese in the bazaar (see illustration, page 52).

I frequently saw human hair peddled in Kuldja; the price was staggering, a thick braid of it being more expensive than a fat sheep. The custom is to tie two long switches together and suspend them over the crown of the head. The ends of the long braids are wrapped in cloth or leather and a green and brown wooden spool is hung as a weight.

The women rarely lay the braids aside even when chopping wood or milking; so that, unless they are rich enough to have an extra set for company, the braids are always coated with grime and grease. They practically never wash their own natural hair and rarely comb it; for dress-up occasions they smear on some tallow grease to make the braids glisten. It is no wonder that their own hair rapidly thins or falls out altogether.

Altan's wife, all decked out in her regal yellow domed hat, was serving the party the famous Mongol *arak*, or distilled milk, which is prepared by distilling the kumiss. It looked just like water, but I had heard that it was more potent. Therefore I

WHEN THE CHIEF STRUCK THIS POSE FOR HIS PICTURE, HE DREW LAUGHTER

Beyond him is the tether line for the foals, about which gather the mothers to be milked. The mares begin "coming in fresh" late in the spring, and from then until fall the nomads live on little else but the milk.

WHERE WOOD IS SCARCE, THE "YURTWIFE" GATHERS CATTLE DUNG TO FEED THE FIRE

One woman, when asked whether she preferred to keep a fire with wood or dung, replied: "What is the difference? If it is dung, we must gather it; if it is wood, we must chop it" (see text, page 38). Both give ample heat to boil their tea and cook their meat.

A KALMUCK "BEARER OF INVITATIONS"

Requests to attend nomad functions are sent through such emissaries, who appear at one's door with their tooled leather flasks of distilled mare's milk. After taking three goblets, the recipient may consider himself invited to the yurt of the emissary's master. The felt wall coverings and door flap may be raised or lowered according to the weather. Up, they allow a continuous draft; down, they retain heat from the fire inside.

looked askance at the silver gobletful which Altan's wife handed to Sayjan Beg and which he passed on to me, seated as I always was on his right. Sayjan Beg noticed my hesitancy.

"Drink it!" he snapped. "Don't insult them." This was the only time I incurred his disfavor.

I began sipping it.

"In one gulp," he urged. "It is a rule among Kalmucks, the first three goblets at one draught."

And then, of course, I was inveigled into drinking a fourth.

The rest of the party drank numberless goblets, toasting each other and our host, while Altan's wife kept refilling them from the leather skins.

Someone made an effort to clean out the great kettle with an object that looked more like a floor mop than a dish cloth. They filled the kettle with water from a leather bucket, threw in some leaves to give the liquid a muddy brown color, and started boiling up "tea."

I wandered outside, and when I got back to the yurt I found bedlam let loose. I had drawn the line at four goblets, but most of the party had drunk at least twice that number and were now in a rollicking, pugnacious mood—all but the faithful servant, Ahmed, who was trying to save the day.

That night we were entertained in Sayjan Beg's own yurt. The chief this year had acceded to the long-standing request of the Kalmucks that he pitch his summer yurt in their pastures; so it was set up on the grasslands in the very shadow of the walled Lama city.

The next day I suggested that we visit the monastery. The chief himself had never been inside the walls and was eager for the trip; he dispatched a request to the Great Lama, who sent back a priest to assure us that he would be honored by our visit.

MORALS UNCHANGED SINCE POLO'S TIME

Each Kalmuck tribe has its own Lama monastery, which is tabu to women save on the one or two religious festivals a year,

when women as well as men are welcomed within the temple grounds. On these occasions, so it is whispered among the Kirghiz, there are bacchanalian orgies.

I started what I expected would be a learned discussion with Ala Beg on the pros and cons of celibacy among Lama priests. He looked at me and smiled indulgently.

"It is true that the Kalmuck Lama and priests are not permitted to marry and women are not allowed in the monastery," he replied. "However, the priests are practically worshiped for their divine learning and are therefore always welcomed in the yurts of the tribe."

I recalled stories told by the inimitable Marco Polo.

My Tatar students had said that it was the custom for the Kalmuck bride to spend the first two nights after the wedding at the lama city. However, when I asked Ala Beg, he declared that this practice had been discontinued twenty years ago when report of it had reached the ears of the Tibetan Grand Lama.

A GRIM-VISAGED KALMUCK, CAREFREE AS THE WIND

Born to the saddle, he often rides for days at a time, seldom dismounting. "While our party stopped for tea at a Russian log cabin," says the author, "three such wanderers cantered up to us. Without leaving the saddle, they chatted for an hour, mostly truckling to our little Kalmuck mascot, Arduch, heir to a fortune (see text, page 53), for nomads fear and respect those who possess vast herds and pasture lands."

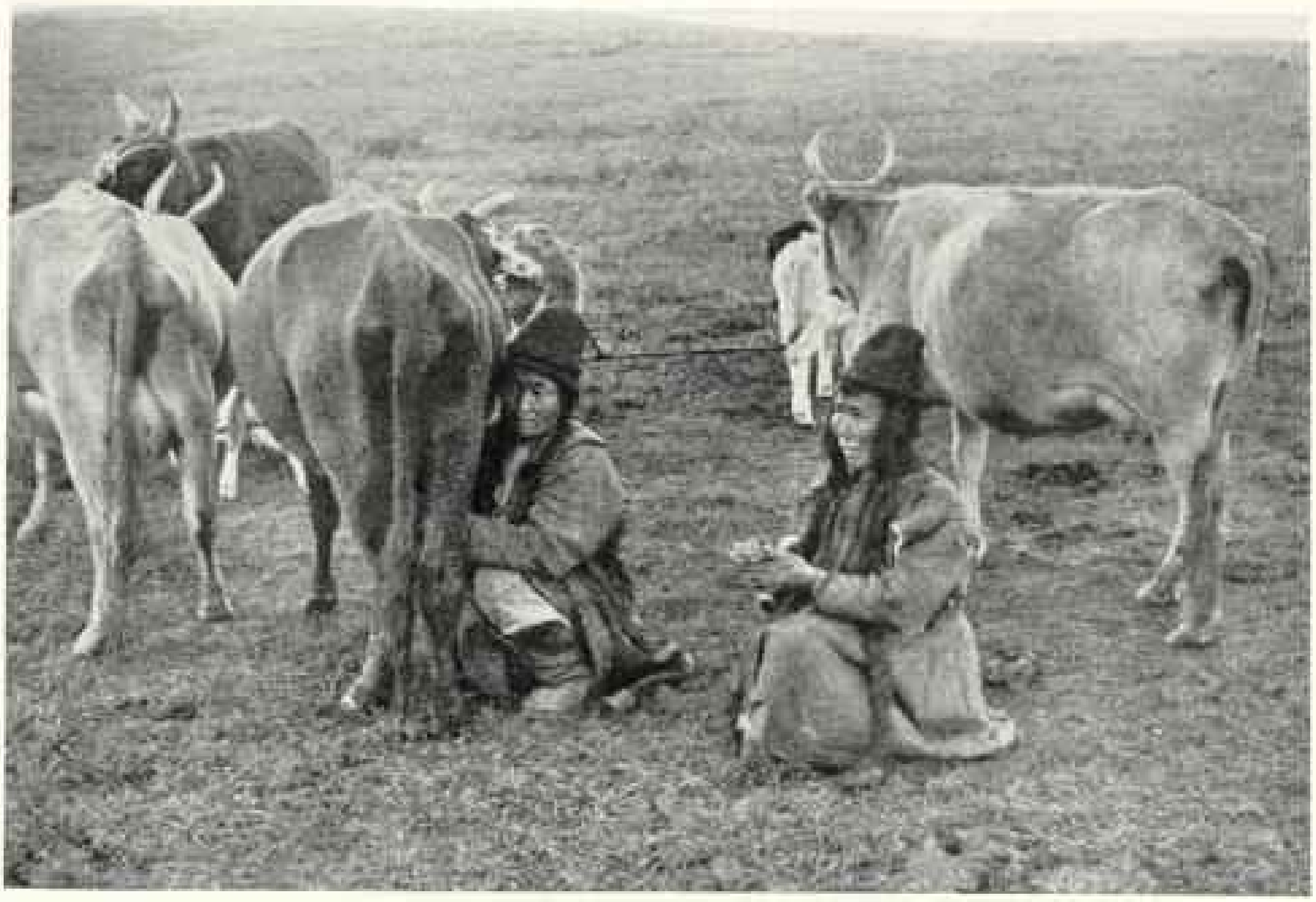
Although the Divine Lama may have endeavored to raise the morals of his distant flock, the Kalmucks are still far from bordering on the puritanical.

An old religious German resident of Kuldja told me he was visiting in a Kalmuck yurt where his host had three wives and no children. When the Kalmuck heard the German proudly tell of his five children and four grandchildren, he became extremely friendly and exclaimed, "You must remain as my guest for a week."

The Great Lama of the Tekes is the richest man of his flock. His pastures are boundless, his stock countless, and by the mere gesture of a hand or careless order he can add vast riches to his name; for the Kalmucks are fearful of his divine power and worship him as a god.

A LAMA'S "VEGETABLE STEW"

When we arrived at the monastery, the old Lama was waiting to receive us in his gold-brocaded robe. One of his priests brought in a skin of kumiss and we drank the ceremonial three bowls. The Lama's



IT TAKES MANY WIVES TO MILK A RICH KALMUCK'S COWS

A stockman with hundreds of sheep and cattle usually buys as many wives as he can support. He needs them for housework and to bear him children. Because of unsanitary conditions and the mothers' abysmal ignorance of the care of children, it generally takes a number of wives to rear a single family. Women seldom lay aside their braids of dirty false hair, even when milking, chopping wood, or sleeping (see text, page 48).

home was a two-room structure—one small room to eat and sleep in, the other a large room for his gods. A massive altar stood against the center wall.

In front of the centrally seated Buddha were dozens of small copper offering cups. Some of the cups held milk, others grains and crumbs of bread; but all were quite fresh and recently set out.

"Don't fear," whispered Ala Beg at my elbow, "they don't waste the gifts. Every morning they offer a prayer of thanksgiving to the Buddha—happy that he has received their offerings; then they empty all the little cups into the great iron kettle, throw in anything else they happen to have on hand, and boil up the hotchpotch for their one daily meal."

When I questioned the Lama as to whether he had been to Tibet, he brought out a long, narrow, red and white striped envelope of the Chinese variety. Tenderly he drew out and unfolded a long sheet of paper, brown and frayed at the edges.

"It is a letter from the Dalai Lama of Tibet," he said, casting a sidelong glance at me to catch my look of admiration. "As a young priest I went on a pilgrimage to Tibet and for seven years I remained there, studying the holy writings and learning the mysteries of the Great Buddha. Since my return, the Divine Lama has sent me several letters."

A BUDDHA OF SOLID GOLD

The lama called one of his priests and gave directions for showing us around.

As we stood in the main assembly room of the temple, I commented to Ala Beg on the size of the great central Buddha.

"But that is only their second Buddha. There is a Buddha somewhere in the temple which is of solid gold; I have never seen it, but the Kalmucks all over the valley speak of it with awe and reverence and look to it as their true and greatest Tekes god."

I stepped over to Sayjan Beg, who was looking at the strange collection of idols with unfeigned curiosity.

"Ala Beg says that there is an even greater Buddha of solid gold; why not ask the priest if we can see it?"

The chief spoke to our guide, who sent word of our request to the lama. A priest came back bringing the lama's permission for the chief, Ala Beg, and myself to visit the place of the Great Buddha.

Led by the priest, the three of us clambered up a steep back stairway. We found a felt yurt pitched in the center of the large second-story paneled room. The priest reverently lifted the yurt flap, went through a series of obeisances, and motioned for us to enter; however, he did not approach the altar or allow us to do so.

It was quite similar to the usual Kalmuck altar, but the foot-high Buddha was of yellow gold, and hung about its neck were dozens of strings of what appeared to be precious stones.

In addition to the usual offering cups set down in front of this all-powerful god, there was a heavy animal bone which put one in mind of the Biblical jawbone of an ass. I failed to learn the significance of this article; Ala Beg didn't know, neither did the priest, and when we went back to take our leave of the old lama I forgot to ask him about it.

For several days we were entertained at the chief's yurt. Sayjan Beg spent the day meeting with the important Kalmuck stock owners, while the rest of us lay about, talking, or rode off to visit at some near-by yurts.

Early one morning three Kalmucks rode up to the yurt, apparently on official business. Fastened to their saddles were elaborately tooled leather flasks; these they brought into the yurt, loosed the silver goblets strapped to their belts, and began to pour out arak for the company (page 50).

"It is formal invitation to the yurt of Arduch, the little Kalmuck," whispered Ala Beg.

We each drank our ritualistic three goblets, and the chief's Tatar mother taught me a valuable lesson. When she was offered a fourth goblet of arak she merely touched her lips to the cup and handed it back; and lo! the emissary drank it himself.

I tried the same procedure and found that it worked in my case, too. Whenever I was offered a goblet after the first three, I had merely to touch my lips to it and return it; it was an insult to me should the one who offered not drink his own returned cup.

Soon after the official invitation had been completed and the Kalmucks had left, we mounted and rode off to make the visit. There was the inevitable cry for a show of horsemanship.

Ala Beg challenged anyone to a real "horse and rider" battle. One of the younger Kirghiz accepted the challenge and they rode off, parrying, thrusting, and finally ending in a clinch. Neither could unseat the other; their mounts seemingly had joined in the sport and galloped along, ever veering and turning flank to flank.

Finally Ala Beg grabbed the rein, and drew his horse to a standstill. The other Kirghiz, thrown off balance, fell from his saddle.

"Hurrah, Ala Beg, hurrah!" shouted Foo Ben Yee, while the loser, rubbing one shoulder good-humoredly, clambered back onto his horse.

We rode up abreast into the Kalmuck circle of yurts. Waiting to meet us were Arduch and his Lama priest brother, who had come from the monastery. To greet us, they stiffly clasped their hands in front of them and gave a short, choppy curtsy.

They ushered us into a large, new yurt; one could see by the thick mat of grass that it had been only recently set up. We took seats on mats and blankets.

VERSATILE ALA BEG TURNS BUTCHER

"Yesterday I superintended the setting up of this yurt on clean ground," whispered Ala Beg. "Whenever Kirghiz are to be entertained in Kalmuck yurts, the Kalmucks call on me to make the preparations, for the Kirghiz cannot stomach the usual Kalmuck filth. It is I who must butcher the sheep for today's feast, too.

"These 'heathen' Kalmucks simply knock a sheep on the head and boil it, blood and all. That is forbidden in our Koran; so I must see that the sheep is slain and bled in the Moslem manner, otherwise we Kirghiz could not eat the meat."

After we had drunk the inevitable initial three cups of arak, footstools were set up and stocked with the sugared flour and dried cheese.

We were interrupted in the business of sorting the bits of cheese from the hair when a sheep was dragged to the yurt door. Lifting our palms heavenward we muttered the blessing and stroked our chins.

The Kalmucks are past masters in the art of aping the ways of others whenever so doing is either polite or politic. Yet asking

A PROMISING MISS WEARS HER FINEST CAP AND FROCK

Her mother's headdress proclaims her a Kirghiz. Kazak women wear a helmet that fits snugly around the forehead and neck, leaving only an oval aperture for the face (see illustration, page 11). Nomads barter for figured fabrics in city bazaars. The rest of the clothing is spun by hand. Never did the author see a Kirghiz punish a child, nor did he see a youth being impertinent to his father—though, of course, to his mother it would be permissible.

a blessing is not aping, but a genuine respect for an admirable custom. Arduch told me that even in their own Kalmuck gatherings they frequently carried out this Chinese Moslem ritual.

While Ala Beg cooked the mutton, Arduch showed me the encampment. The scene was similar to that in a Kirghiz camp: males talking, females toiling. The women, dressed in filthy garments and decked out in even more grimy-looking horsehair headdresses, were milking sheep tethered in a double row facing each other. The milkers were mostly older women; that is, relatively old, for the dirt, toil, and smoky yurts make the average Kalmuck woman wrinkled, leather-skinned, and misshapen long before she reaches forty.

OLDER WOMEN TOIL; "BEAUTIES" PAMPERED

The younger women were all beads, buttons, and braids. Their husbands order the older wives and women to do the hard, manual labor and let these younger "beauties" sit about and look pretty for as many years as they can. They do light work in the yurt, sewing garments of homespun and acting as mistresses of ceremony when their husbands have guests.

I stopped by the open fireplace over which Ala Beg was broiling lamb chops. He was squatting by the firehole and I sat down beside him, drawing him out on stories about the Kalmucks.

Our conversation was interrupted when the father of little Arduch rode up with a cavalcade of horsemen. The men dismounted, and then there was a passing of snuff containers back and forth between the new arrivals and those Kalmucks already there.

For greeting each other the Kalmucks carry a little stone phial, or gourd, containing *nasir*—a snuff consisting of pulverized tobacco mixed with other ingredients which are probably narcotics. When two Kalmucks meet, they draw their little

A LAMA GESTURES WEIRDLY WHILE PERFORMING A TRADITIONAL KALMUCK DANCE

To the tune of a two-stringed lute, he entertains the crowd with an acrobatic dance during a feast (see text, page 56). Among the nomads, dancing, singing, and lute-playing are done by the males. Women labor while men play, and members of one sex seldom encroach on the other's sphere.

HE CHOSE HIS WIFE BECAUSE SHE WAS OF A PROLIFIC FAMILY

The young bride's fortune lies mainly in her collection of beads and silver jewelry, her strong back and robust health, and her ancestral record of fecundity. Every prospective husband among the Kalmucks knows that whatever beauty a girl may have when she marries will quickly fade under arduous labors in a smoky yurt. It is sons he hopes for, to carry on his name and bring him respect in the eyes of his friends.

A KIRGHIZ BOY DISPLAYS HIS PETS

When the spring hunting season arrives, every little boy begs his father to get him a baby illik, or roe deer, and the hunters always bring back several. Bottle fed, the animals share sleeping quarters with the householders, and are adopted as members of the family. This one follows his young master about like a dog and has a special bond of friendship with the family cat.

phials or gourds from their sashes and exchange them. Then each man taps out a pinch of the concoction from the other man's phial into the palm of his own hand and deposits it with a quick movement of head and hand between the lower lip and gum.

The containers are returned, the powder thoroughly wadded and settled in place with the tongue, and then both men are free to exchange news of the pastures.

With the advent of Arduch's father and his friends, the drinking and feasting began in earnest. I consumed my share of the mutton, did my duty by the three cups of arak, and then, finding the ritual of touching lip to goblet and returning it a bit tiresome, slipped out and had Arduch take me around to meet his mother.

A LIFETIME PAIR OF BOOTS

For a Kalmuck woman of nearly forty she was remarkably young looking; and her serious demeanor and poise showed her to be unusually endowed with intelligence and common sense.

She wore the usual Kalmuck woman's costume. Perched on her head was a jaunty little felt hat; flung over her shoulders was a broad white collar, while around her neck hung a silver case containing various charms to make her fertile and thus keep her in the good graces of her husband.

Her dress proper was of thick homespun with heavy brocaded designs on the cuffs and over the breast. She wore cumbersome home-made high leather boots.

The soles of the boots were amazingly thick. Thick soles are the rule for women's boots, so that a husband rarely has to buy or have made more than one pair for each wife in her lifetime; and if his wives die young, as they frequently do, one pair does for a succession of wives.

Since none of the Kalmuck women know any other language than their own Mongolian dialect, Arduch had to translate greetings between his mother and me. She was dealing out the arak for the revelers in ever larger and larger lots; and all the while she kept warning the servants: "There will be trouble; I know it, I know it!"

Her prophecy was not long in being fulfilled.

The pitch and tone of the group grew louder and more strident. They called for entertainment and the lama priest brother danced to the time of a two-stringed lute, a weird rhythmic movement. It put one in mind of the antics of a college cheer leader, save that the dancer kept his feet firmly fixed in one place on the ground and accompanied his body motions with rhythmic, jerky movements of fingers, hands, forearms, arms, head, and neck.

Suddenly music, dancing, drinking, and feasting ended in bedlam; the chief had again drunk more than he could comfortably hold.

Twenty people inside a yurt made quarters far too crowded for a quarrel, so the group poured outside. The chief was loudly upbraiding the Turki soldier; the latter, rollicking drunk, had a long gash under one eye and his clothes were splotched with blood from head to foot.

I looked around and found the massive Foo Ben Yee beside me. He looked none too sober, but serious.

"The Turki soldier got into a playful squabble with one of the Kalmucks; they had both drunk too much, and before they knew what they were doing they had drawn knives and started to fight. They were finally separated, but not before the soldier had received a cut on the cheek; when the chief saw the bloody wound he became infuriated."

The commanding voice of Sayjan Beg rose above the babble of the crowd and silenced it. "Come! Strip off his saber! Take his hat! Give me his gun! He is no fit person to dispense justice."

"Vakh, Vakh!" exclaimed the peace-loving Foo Ben Yee. "There will be much unpleasantness trying to patch up this matter tomorrow."

Laying hands on the first scared-looking Kalmuck servant within reach, Sayjan Beg clapped the soldier's cap on his head, handed him the rifle, and ordered the bronze-handled saber to be buckled on.

"This Turki soldier is your prisoner!" he shouted to the frightened Kalmuck.

Then, on an unfortunate inspiration, Yacup Beg spoke up. "This is unnecessary, Sayjan Beg."

In a moment the chief turned his ungovernable wrath on Yacup Beg. Everyone gasped. The chief's whip flashed out and struck Yacup Beg full across one shoulder. The Beg straightened up, scarcely having flinched. Twice more the whip came down on his shoulder and then with the butt of his whip the chief knocked Yacup Beg's hat off.

"Soldier!" The poor amazed Kalmuck jumped from gaping astonishment to a half-mechanical salute. "Here is your second prisoner; you will bring these two men to my yurt in the morning. Now be off!" Sayjan pointed with his whip across the grasslands.

The group of three filed off on foot—Yacup Beg and the blood-stained Turki soldier in front; the dazed Kalmuck, gun trailing, behind.

There was nothing left for the rest of us to do but to thank our host, the little Arduch, and depart. The inimitable Ala Beg engineered a hasty retreat, encountering difficulty in getting some of the younger Begs into their saddles. Then we were off at a long, hard gallop in the gathering dusk, mile after mile over rolling grasslands.

Suddenly Sayjan Beg, sobered, called a halt.

AGAIN, "NEVER AGAIN"

"What a mess we've made of things tonight! Why do we always let these devilish Kalmucks steal our wits with their devil water? We must not drink too much again."

There were muffled grunts of agreement from the rest of the party.

"How can we make amends to our friends, the Turki soldier and Yacup Beg?" muttered the chief, then lapsed into silence as we rode over the few remaining hills to his yurt.

I thought of the long trek of that queer party of three on foot. It never occurred to Sayjan Beg to send horses after them. What the chief had said, he had said; in due time the matter would be righted with all due regard for dignity and honor.

Momentous news awaited me at the chief's yurt. As I tumbled off my horse at the hitching post, a servant thrust an envelope into my hand. In the yurt by the light of an oil wick lamp I made out the writing: a note from my Tatar friends in the city and inside the envelope a letter from the Russian consul. My permission to leave the country, now five long months overdue, had at last arrived. It meant that in the morning I must start my trek back across the Chinese border into Russian Turkistan; through Tashkent, Samarkand, and Bukhara to Iran (Persia).

As I lay in my blankets, feet toward the fire, looking out through the round hole in the yurt top, it seemed as if life in the Tekes were the only reality—the rest of the world revolved in a realm apart. Russia, Iran, Baluchistan, India, Shanghai, Tokyo, and Seattle—what were they? They seemed eerie and unreal, infinitely distant and unnecessary.

Photograph by Richard H. Stewart

THE GROUND CREW CLOSES IN TO ATTACH THE GONDOLA TO THE BAG

It is just before dawn and one of the final and most delicate stages of preparation is at hand. The 36 temporary lines, attached to the upper catenary band, that hold the balloon to the earth are being released gradually by the men stationed at snubbing posts in front of the circle of lights. Because of the zero cold, three men were assigned to each rope—two to hold it and one as a relief—so that time out could be taken at regular intervals for warming. Meanwhile the scientists, working on a time schedule arranged in advance, take turns checking the instruments inside the gondola.

MAN'S FARTHEST ALOFT

Rising to 13.71 Miles, the National Geographic Society-U. S. Army Stratosphere Expedition Gathers Scientific Data at Record Altitude

By Capt. Albert W. Stevens, U. S. A.

Commander of the National Geographic Society—U. S. Army Air Corps Stratosphere Expedition

ON November 11, 1935, in the flight sponsored jointly by the National Geographic Society and the United States Army Air Corps, Captain Orvil A. Anderson and I ascended in the gondola of *Explorer II*, the world's largest balloon, to an officially recognized altitude of 72,395 feet, thereby exceeding all previous attempts to rise in the stratosphere.

Taking off from the Stratobowl, near Rapid City, South Dakota, at 7:01 a. m., Mountain Standard Time, we remained in the air 8 hours and 13 minutes, making an "eggshell landing" 12 miles south of White Lake, South Dakota, at 3:14 p. m. (MST).

Our load of approximately a ton of scientific instruments was uninjured, and it was found that every one of our mechanisms had functioned perfectly.*

The question asked us most often of all is: "What does it feel like to be in the stratosphere?"

I suppose our questioners think one should be in a state of tingling excitement, as in a racing car going at highest speed. But my impression of the stratosphere was that of being in a profound calm, as we hung suspended nearly 13¾ miles high, motionless in air, although we were drifting with the air at a considerable speed. Our balloon even refused to turn, and my side of the gondola constantly faced toward the sun.

Outside I could see, through one of the ports, our fan for turning the balloon revolving at the rate of 5,000 times a minute. But the ammeter, in circuit with the motor of the fan, showed that less and less power was required to turn it over, and the fan blades were now turning in air so thin that the propelling action was nil. At lower altitudes the fan had been effective in rotating the balloon, but we were now floating in the nearest approach to a natural vacuum in which man has ever placed himself.

*It will require many weeks to compile scientific data recorded by the numerous instruments. These results will be summarized in another issue of the National Geographic Magazine.

When we discharged ballast, it fell in a thin, unbroken stream, straight and true as the line of a plummet, no longer breaking and spreading as it had done at lower altitudes.

When we released the spore-collecting apparatus of the Department of Agriculture, we watched in vain for its parachute to open. The air was too thin to spread the folds of fabric. But thousands of feet below us it must have opened, for it afterward was found to have operated successfully (see text, page 81).

SUN'S LIGHT WAS BLINDING

To look directly at the sun through one of the portholes was blinding. The sun's rays were unbelievably intense. Through the upper porthole we looked often at the vast bulk of the balloon, upon which the sun beat fiercely.

The central appendix, a huge cloth tube seven and one-half feet across, was open, as we floated at our ceiling. The three side appendices also were open, all spilling helium gas from the bottom of the bag. But the gas coming out was quite invisible. There was not even the shimmering effect that one sometimes sees when two different gases mix.

Through the central appendix we could look up to the very top of the balloon. The two valves, almost a hundred yards above us, appeared like little buttons. The tapes of the massive dome formed a perfect pattern—just like the meridians of longitude and parallels of latitude on a globe of the earth.

The balloon envelope, which a few hours before had been a somewhat messy, crumpled, wrinkled pile of fabric in a pocket of the Black Hills of South Dakota, was now, in its brief hour of glory, a practically perfect sphere, 192 feet in diameter, and expanded to its full capacity of 3,700,000 cubic feet—the largest sphere, by far, that man had ever constructed for any purpose whatsoever. The light inside the balloon

Photograph by Richard H. Stewart

TIME OUT FOR A SMILE ON THE HECTIC NIGHT OF INFLATION

The three United States Army officers in charge of the flight—Captains Orvil A. Anderson, Albert W. Stevens, and Randolph P. Williams—are dressed in heavy clothing, which was necessary because of the zero temperature. For nearly forty hours these men went without sleep during the preliminary preparations, the inflation, and the flight. White dots over the men's heads are a few of the 36 floodlights used to illuminate the Stratobowl.

was ample, for the single-ply fabric admitted a large part of the sun's light.

Our gondola "living room" was pleasant. If we had opened the switches to our batteries, had cut off our instruments, had silenced the radio, the quiet and stillness would perhaps have been maddening. But with life and action, our globular metal cell, nine feet in diameter, was really pleasant to be in. Its white walls reflected the light that entered through the glass portholes, so that it was not very dark within.

NOISES OF A LOFTY LABORATORY

On all sides we heard the constant clickings and whirrings and buzzings which meant that the many pieces of scientific apparatus were functioning.

Every 90 seconds came the rattle of the electric hammer that beat on the case of the mercury column and aneroid barometer. Our radio listeners will recall that noise.

We had provided this hammer to jar the column of mercury and the aneroid needle to overcome their tendency to lag, thus insuring more accurate readings. Its raucous note was the one irritation in our gondola, but we knew it to be necessary—and it served to remind us of the passage of time.

"WAS THE AIR BAD?"

Although we were sealed in an airtight ball and were manufacturing our own atmosphere, the air was quite as breathable as that in one's home, and much better than that of most laboratories—there were no chemical fumes, and there was no feeling of staleness. When, later on, we opened the manholes, the incoming fresh air seemed no different from that we had been breathing. Our air system on this trip worked perfectly, and we devoted practically no time to watching it (see text, page 75).

Our one difficulty was that the humidity in the upper part of the gondola was sufficient to cause a constant deposit of frost on the glass of the upper port, through which we must watch the helium temperature gauge and the unfolding and refolding of the balloon. When we used our binoculars, one of us would rapidly wipe the window free of frost while the other took a quick

Photograph by Richard H. Stewart

POLES AND TACKLE SPEEDED THE UNPACKING OF THE BAG

This, one of the most delicate of the preliminary operations, required extreme care, lest the fabric be torn or twisted. The crew entrusted with the unloading wore flying-moccasins, such as those used by aviators on winter training flights. The buckles were covered with white adhesive tape to prevent their tearing the bag.

reading. In ten seconds the window would frost again. But the other ports were quite free from frost.

The upper part of this gondola, as was the case in 1934, was the colder portion.* Water condensed on the upper walls and froze in a thin layer of ice. Thus they were very cold to the touch, but the lower walls, especially that part of the shell facing the ground, were relatively warm. The hand could be held against the bottom part of the shell without discomfort.

This difference, of course, was owing largely to the color of the gondola on the outside, for the lower hemisphere was painted black and the upper hemisphere was covered with a white paint of high reflecting power. The black paint absorbed heat from the sun and the earth; the white paint kept a certain part of the sun's energy from being absorbed by the gondola. The balance between the two was very good.

*See "Exploring the Stratosphere," by Captain Stevens, National Geographic Magazine, October, 1934, and other articles on The Society's Stratosphere Expeditions, issues of April, 1934, July, 1934, February, 1935, June, 1935, and October, 1935.

At times the temperature inside the shell fell to 21 degrees, Fahrenheit; at the top of the flight the inside temperature rose to 43 degrees, Fahrenheit. At no time were we uncomfortable, and we did not have to use our electrically heated gloves.

Persons unfamiliar with conditions in the stratosphere may think it odd that we found the temperature both inside and outside the gondola lower at around 40,000 feet than we did at the top of our flight, some six miles higher. This "temperature inversion," as it is called, is a normal condition, however, as one rises higher into the stratosphere.

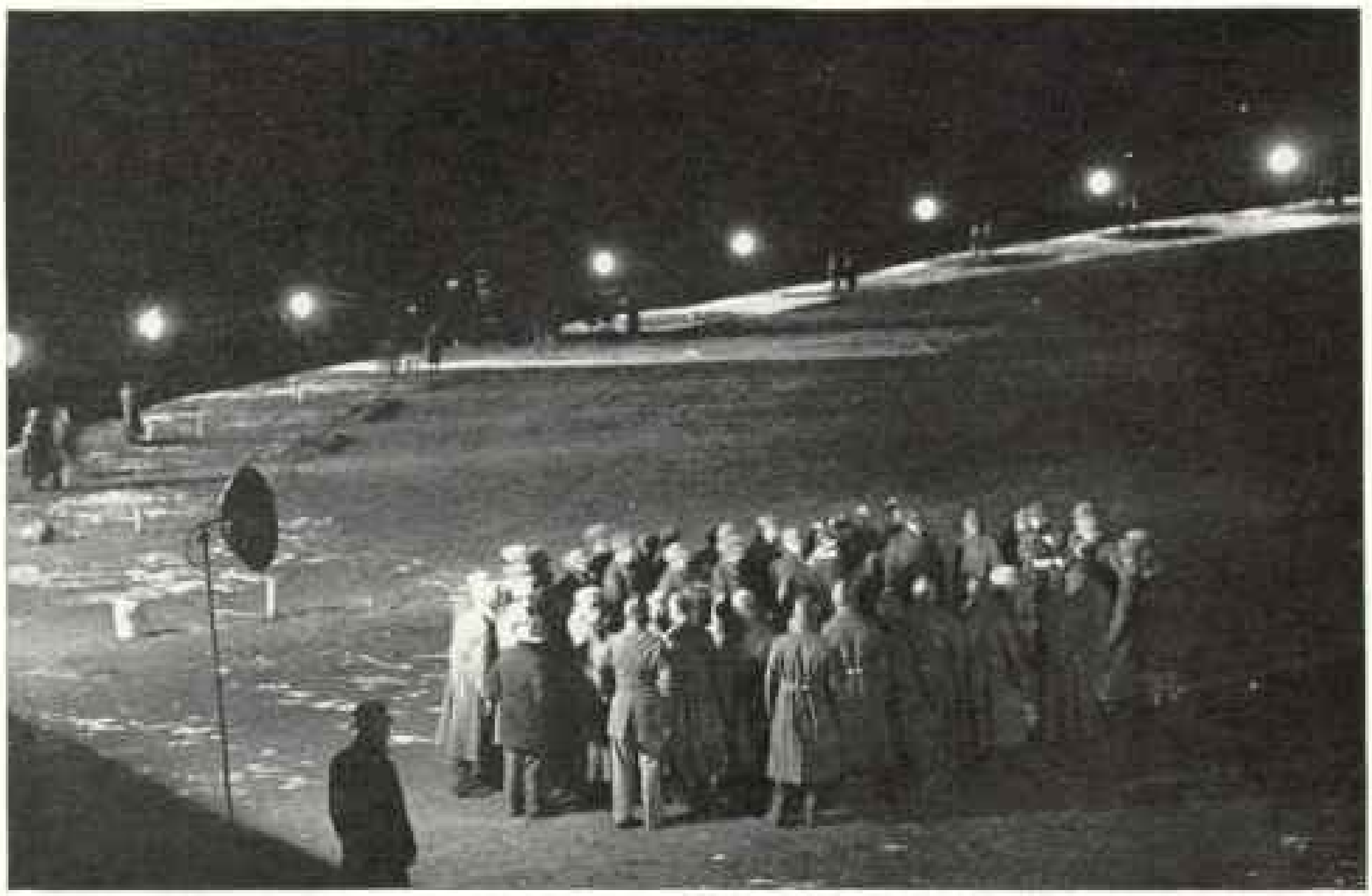
DRINKING WATER WARM; SANDWICH FROZEN

Captain Anderson tried to eat a sandwich, but it was frozen, and I saw it laid away on one of the instruments and apparently forgotten. I wondered momentarily at his sudden loss of interest in food.

Although I had eaten little in the preceding 24 hours, I was not hungry. But I was consumed by a tremendous thirst, and from

SERPENTLIKE HOSE CARRIED HELIUM TO THE BAG

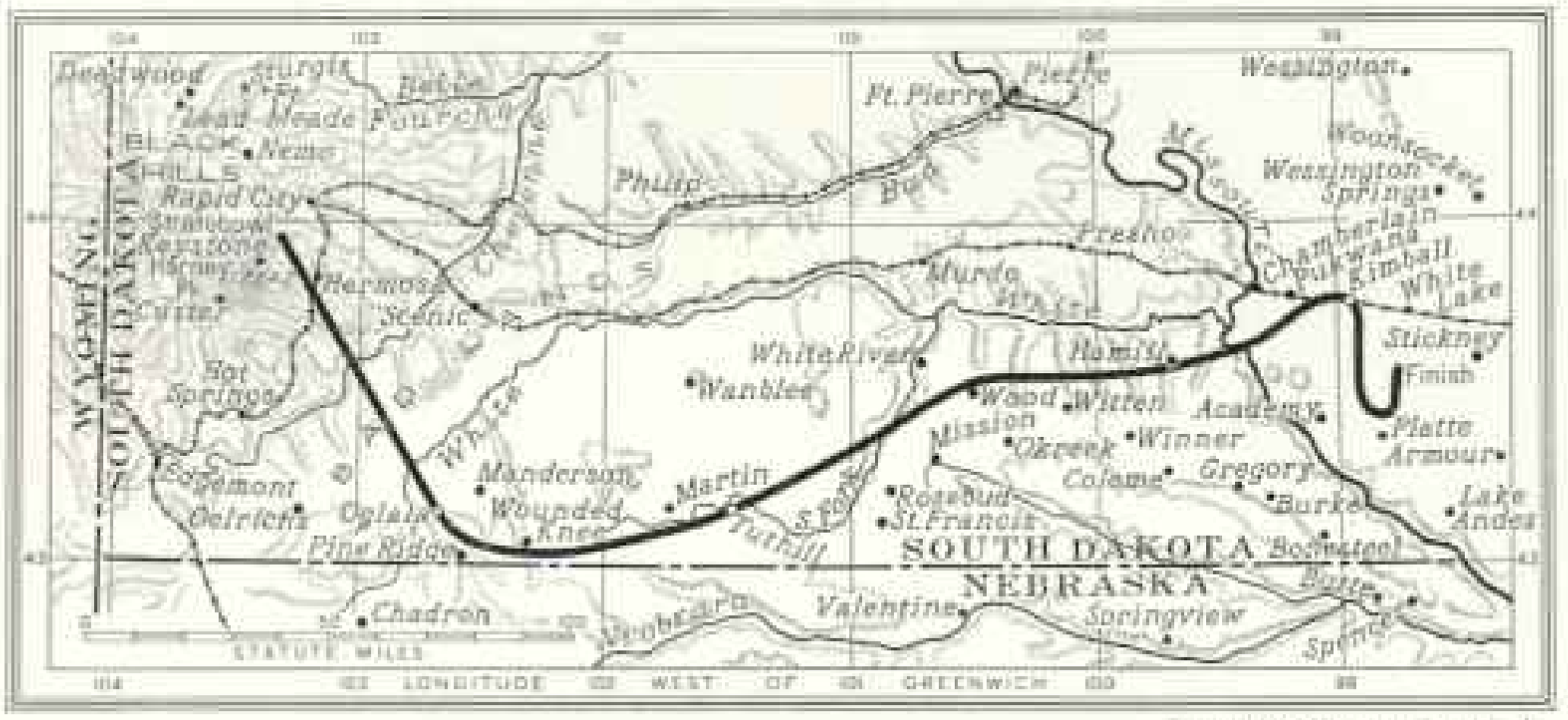
No one who has heard it can forget the deep-throated roar of the gas as it rushes through these canvas tubes to the balloon envelope, and that moment when the first "bubble" of gas raises the mass of fabric from the ground. The helium needed for the flight was stored on one side of the inflation field in 1,685 steel cylinders under heavy pressure. The metal bottles were connected to small, but strong, rubber hoses. The gas flowed from 40 of the cylinders at a time into the cloth "sleeves" shown in the foreground. These merged into one, through the Y-joints above.



Photographs by Richard H. Stewart

"BE SURE TO SNUB YOUR ROPE PROPERLY"

This last-minute instruction is given the ground crew. Three men were assigned to each of the 36 ropes holding the upper catenary band, but the major pull on each line was taken up by a hitch around a stout post. Two-thirds of the members of the rope-handling crew are at their places beneath the floodlights beyond (see illustrations, pages 68 and 69).



Drawn by Newman Bumstead

"EXPLORER II" FOLLOWED A SNAKY TRAIL THROUGH THE STRATOSPHERE OVER SOUTH DAKOTA

The balloon floated at its ceiling, 13.71 miles above sea level, for an hour and 30 minutes. This part of its path lay between Tuthill and Wood. The track of drift indicates that the balloon passed through several different wind layers at varying levels. While it climbed slowly to about 17,000 feet above the Bad Lands, the big bag floated southeast; then as the upward ascent to the stratosphere began, the course changed to the northeast. Upon the descent, it again took a southerly course, but just before the landing it reversed its drift.

time to time I drank hastily from a gallon can containing water.

Anticipating low temperature, we had put hot water in three cans before the flight, and had wrapped the cans in towels. Plain hot water from a can is not ordinarily anything to rave about, but if one is thirsty enough, it really tastes wonderfully good.

Our exertions on the outside of the gondola, at 16,000 feet, before we closed the hatches, probably did as much as anything to create thirst. I must admit that I finished most of a gallon of water, which is quite a lot for one person in the space of a few hours. On the 1934 flight we had a similar experience.

Perhaps the most extraordinary thing about these flights is the speed with which time passes. An hour seems like 20 minutes! We tried to keep in constant touch with the world below by radio, but there were times when we simply had to take the earphones off in order to concentrate on other duties.

From time to time I went the rounds of the various pieces of apparatus, reading meters, adjusting rheostats, listening for the noises that alone would tell whether certain instruments, hidden inside their metal cases, were still operating.

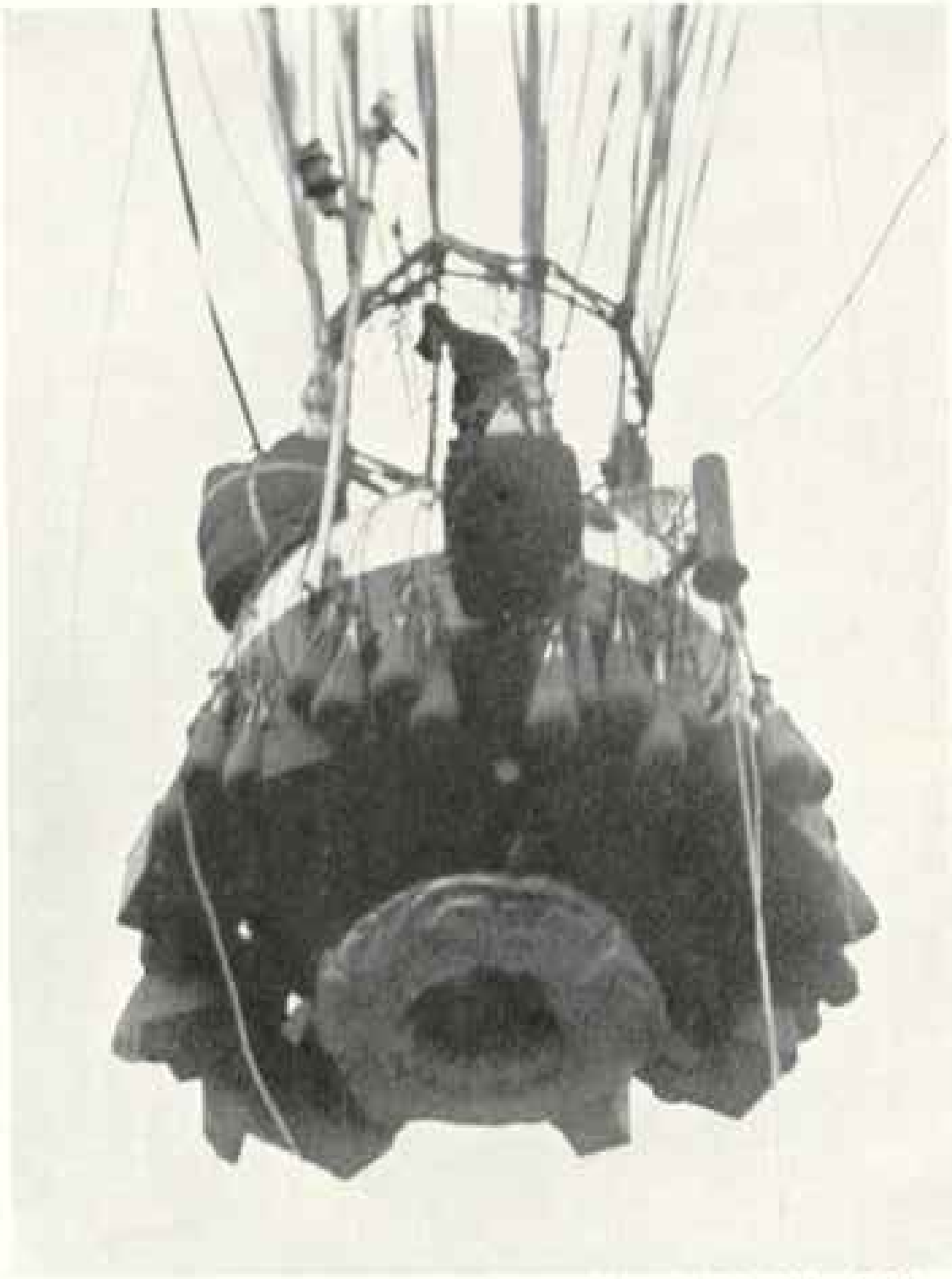
Anderson used the radio only when absolutely necessary, for it took his mind off his most important duty of controlling the balloon. He was a marvel of concentration, and after we had sealed ourselves in, he scarcely moved from a space two feet square.

His right hand reached for the ballast-releasing device, or for the handles of the valves that fed compressed gas through hoses nearly 400 feet long, and so operated the balloon valves far above us. His left hand held a stop-watch, and his eyes were always on the bubble of the big statoscope, which told us whether we were going up or down, and the supersensitive Kollsman altimeter, which measured our height.

Hanging beside these instruments was the condensed altitude table prepared by Dr. W. G. Brombacher, of the Bureau of Standards, showing, subject to temperature corrections, how many thousands of feet corresponded to pressures in millimeters of mercury.

TELEPHONED TO AIRPLANES FOR POSITION

Navigation was unnecessary. No time was wasted in plotting our progress across the country. Our vertical camera films would tell us that later. We found where we were, at any time, by asking Captain Randolph P. Williams in his airplane in flight far below us, or our base radio station at Rapid City (see text, page 84).



Photograph from Publishers' Photo Service

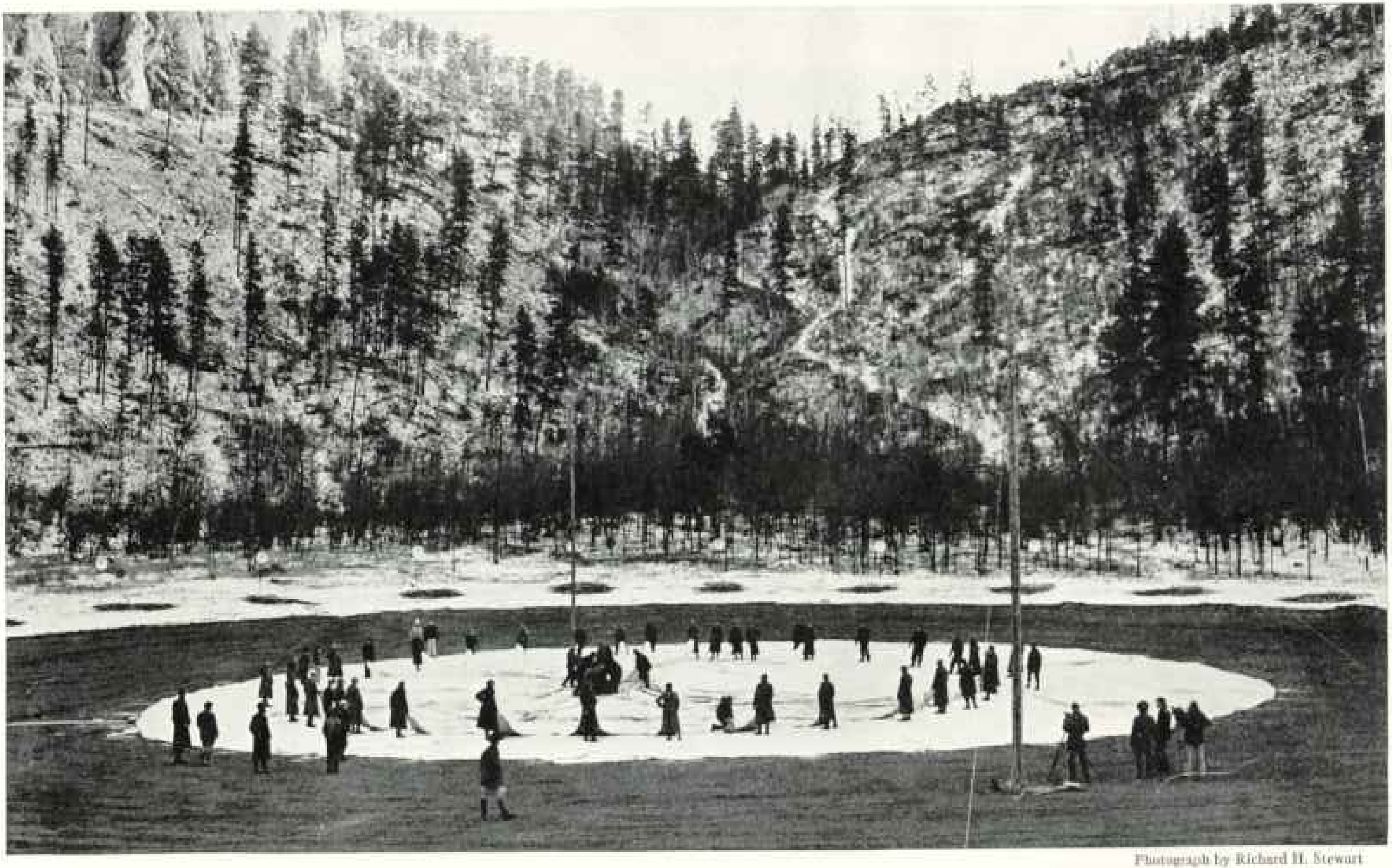
OFF FOR THE STRATOSPHERE WITH A FULL CARGO

Viewed from the ground 60 feet below, the gondola seems cluttered with a maze of dangling equipment. The pear-shaped bags are sacks of lead ballast electrically releasable (see page 70). The square boxes enclosed heavy batteries, some of which later were released on parachutes. Two circular bumpers are shown, one inflated, the other, beneath, wrinkled and empty. The black object in the center of the picture is the coiled dragrope.

Photograph by Richard H. Stewart

THE FLYERS HAD AMPLE ROOM IN THEIR FLOATING LABORATORY

The earliest stratosphere flights were made in the cramped quarters of globes seven feet across. The *Explorer II* carried a gondola nine feet in diameter. Captain Anderson (left), and Captain Stevens are shown during a test or "dress rehearsal." Captain Stevens is testing the radio instruments which kept the flyers in contact with the earth. The large metal flask on the left contains a mixture of liquid oxygen and nitrogen.



Photograph by Richard H. Stewart

LIKE SPREADING OUT A CIRCUS TENT IS "FLOWERING OUT," THE FIRST STEP IN A STRATOSPHERE FLIGHT

Soldiers are stretching forth the two and two-thirds acres of *Explorer II*'s fabric on its giant pancake ground cloth, preparatory to the night-long process of inflation. Heavy coats and snow on the near-by hillsides give a hint of the extreme cold that prevailed during preparations for the flight. Scrapers and shovelers had worked throughout the previous night to clear off the snow from the inflation bed.

Photograph by Richard R. Stewart

A HANK OF CLOTH AND A CLUTTER OF ROPES

Like a polliwog not yet a frog, or a grub before it is transmuted into a graceful butterfly, is a stratosphere balloon viewed from below at the take-off. The gas forms a bubble near the top of the bag. The thousands of square yards of fabric below are squeezed into fantastic shapes by air pressure. Hanging vertically are linen webbing tapes from which the gondola will be suspended. When the balloon reaches the high altitudes, its gas will expand and distend the misshapen bag above to a spherical shape; excess gas will escape through the appendices hanging below. On descending the helium contracts and the bag again assumes this awkward shape (see Plates II and III).

Photograph by Richard H. Stewart

A TEST—JUST TO MAKE SURE THEY CAN COME BACK FROM THE STRATOSPHERE!

Like a mound of ice rises the partially inflated bulk of the *Explorer II*. The two round spots are the valves through which the balloonists will release gas and thus control the ascent and descent of the bag. Captain Stevens and W. W. Cummings test the valves to make sure they work. The snaky line leading from the drum is part of the 400-foot small rubber hose through which compressed dry gas flowed from the control inside the gondola to operate the valves. The hose was fastened to the bag's outer surface at intervals in loops, snake fashion, so that, as the balloon fabric stretched, the line would not break.

Anderson and I talked to each other remarkably little, and most of our conversation hinged on the appearance of the huge balloon as it slowly and majestically swelled to its full proportions. Through our vertical port we could see only a fraction of the outside surface of the balloon—that part below the lower catenary band. That area was enormous; from it we could only imagine the proportions of the remainder of the bag that was concealed from our view.

A BREATH-CATCHING MOMENT

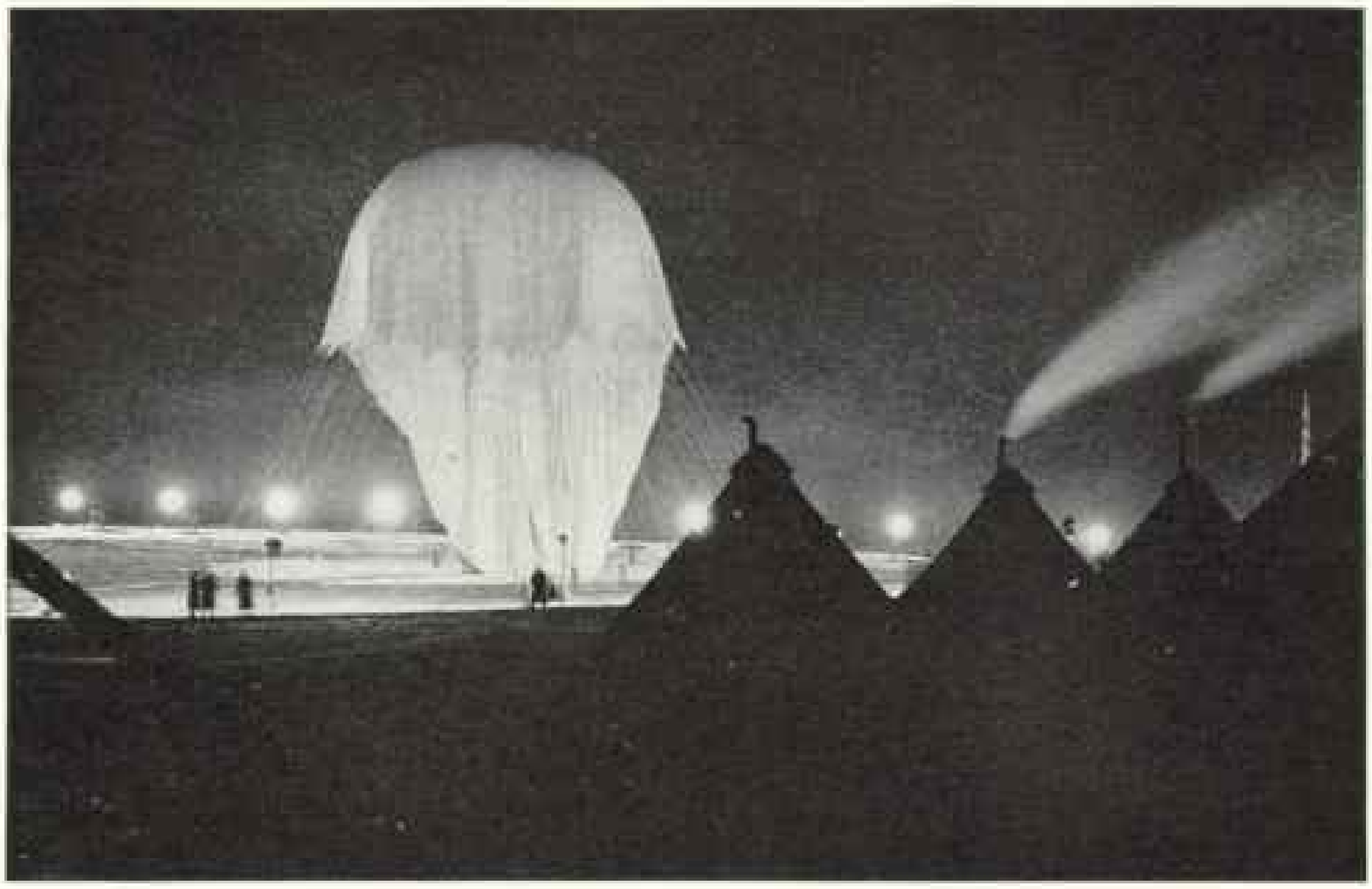
It may sound ridiculous, but to me the only moment of the entire flight that was breath-catching was the time when the big central appendix first opened at 65,000 feet and through it I saw the dome of the balloon so far, so very far, above us. It was incredible that we were riding under such a mighty ball of gas!

The opening of the central appendix marked our arrival at "pressure height," the altitude at which the gas in the balloon, which had been expanding throughout our rise, finally filled the huge bag completely and began to flow outward through these hanging chimneys of cloth which had been provided for that very purpose.

I have remarked that time passed very fast, but, paradoxically, after we had been in the air five hours, it seemed at least twice that length of time since we had left the ground.

I could picture again the take-off from the Stratobowl. The ropes holding the gondola to the wheeled platform, on which it had rested so long, had been cut away and our ground crew had "walked" the balloon and its burden as far as possible to one side of the bowl in the direction against the existing northwest wind, as shown by flags on the rim of the bowl and by small sounding balloons released a few minutes before.

In the bottom of the bowl there was practically no wind at all, and the huge bag floated without a ripple in its surface.



A GIANT MUSHROOM GROWS WEIRDLY IN THE WHITE LIGHTS OF THE STRATOBOWL

When the domelike top of the *Explorer II* had been inflated thus far, a tear was discovered in the fabric. Men, dwarfed to pygmy size by the immensity of the bag, are here beginning to repair the rent. The picture shows clearly how the mooring ropes were attached to the upper catenary band, to be paid out as the balloon filled with gas. Just before the take-off, these double ropes were pulled through the grommets, or eyelets, in the catenary and fell to the ground. In the foreground are the "warming tents" provided on the night of inflation for part of the ground crew of soldiers.

Photographs by Richard H. Stewart

LIKE A SILVER HUB ON A JEWELED WHEEL

This striking photograph taken from the rim of the Stratobowl shows the balloon, its top inflated as far down as the upper catenary band, beginning to rise in the center of the floodlighted floor. Mooring ropes were attached to each of the points in the scalloped edge and held by soldiers until after the gondola was attached. To the right, seen dimly, are the gas "sleeves" (page 62).

Photograph by Richard H. Stewart

POINTING FOR THE SKY AND STRAINING TO BE OFF

The *Explorer II* here towers 315 feet above the ground, higher than the dome of the United States Capitol, as the process of inflation nears completion. Soldiers are holding the spiderweb of mooring ropes attached to the upper catenary band of the balloon. To the right, at the edge of the floodlighted circle, the gondola is being wheeled out for attachment. Through the tubular "sleeves" (left) the helium is flowing into the bag.

However, we knew that the moment we ascended 200 feet in the air, the top of the balloon, now towering 315 feet above us, would be in the air current of approximately eight miles an hour that was sweeping across the rim of the bowl.

TAKE-OFF FASTER THAN RACING BALLOONS

The velocity of the wind had been observed constantly throughout the night by our recording instruments on the rim, and during the hour before the take-off an increase from six to eight miles an hour was registered.

Our problem was to shoot the balloon from the ground with such speed that it would not drift sidewise enough to hit the trees on the rim of the bowl. When Captain Anderson gave the signal to release the ropes, we shot upward at a much greater speed than is given racing balloons on take-off.

Our huge craft moved faster and faster, and it was evident that we were clearing the walls of the bowl with ease. Captain Anderson was on the outside of the gondola; I was inside.

We could look over the tree tops, see the plains beyond, and we knew that we were fully 100 feet above the rim. Captain Anderson started to climb down through the open porthole.

Suddenly he shouted to me, "I believe the balloon is leaking!"

I looked out of my manhole, saw that we were settling fast and sweeping down over the heads of the thousands of spectators.

I recalled the first flight of Commander T. G. W. Settle at Chicago, when his valve stuck open, and when he rose a few thousand feet, only to come down almost immediately in the railroad yards of Chicago. And so my first thought was to do as Settle was forced to do on that memorable occasion: help discharge ballast fast enough to keep the balloon afloat until we could clear the spectators and perhaps get over an open space among the trees. There was not a second to lose.

Photograph by Richard H. Stewart

READY TO ATTACH THE GONDOLA

The final stage of preparation is at hand, and soldiers at the retaining ropes are paying out enough line to allow the rigging to be secured to the upper part of the heavily laden metal ball. The flag of the National Geographic Society hangs in the rigging. The Society's tricolor, sky-blue, earth-brown, and sea-green, which has flown over the North Pole and the South Pole, and was carried to the lowest ocean depth attained by man, was borne to the highest stratosphere point yet reached. On the opposite side of the balloon was the Stars and Stripes.

As Anderson sensed the fall of the balloon, he shouted to me, stepped on the electrical switch, and turned the handle that controlled the 40 sacks of ballast, totaling 3,000 pounds in weight, hung outside the gondola. In less than three seconds he had tripped ten of these sacks, dropping 750 pounds of ballast (page 78).

I lifted a sack of ballast from the floor, held it out of a manhole, and pulled the pin from its bottom. The contents fell in a spray of fine lead directly on the head of a man who was already running from the rim of the bowl to get from beneath us.

As the shower of fine lead struck him, he shouted, ducked his head, and seemed to run even faster, if that were possible!

We were now about 50 feet above the tree tops. To the right and left the dense crowd was scattering in a frantic attempt to get away from the towering structure that apparently was about to wreck itself and fall on the heads of many of them, who probably visualized themselves trapped under acres of rubber-coated fabric.

But the balloon stopped its descent and started upward again. It was fortunate that we had available the electric ballast discharge built for quick emergency, and tested over and over again on the ground to insure that it would operate without fail.

A SPRINKLING OF LEAD SHOT

When we had wired these sacks into place before the take-off, we had provided that as the handle, operable from either inside or outside, was turned, from contact point to contact point, sacks would be exploded by dynamite caps and be dumped from opposite sides of the gondola.

Therefore, as Andy turned the handle that controlled the 40 sacks, lead shot spilled from ten 2-inch openings almost equally spaced around the gondola. From the ground, it may have appeared that we had turned on a sprinkler system. I have often wondered since how many scores of people were sprayed by those streams of fine shot.

Now the balloon started to rise rapidly, but for a minute or more we did nothing but watch it to see if it would again show any tendency to settle. It continued climbing steadily. It was then apparent that we had encountered a strong downward trend of air which had forced the balloon earthward just as we swept towards the rim.

Our electrical ballast-dumping device had worked perfectly, but it now remained to be proved whether our huge valves could halt the swift rise of the balloon.

With both of us inside the gondola, Andy opened the valve controls. We watched the gauges and saw that the craft was still ascending far too fast. Unless we could check the ascent, we would not have enough time properly to inspect our outside rigging before being forced to close the manholes.

Andy valved, and valved again and again!

As he opened the valves for still another half-minute interval (which is a very long time for a balloon to be valved at low altitude), the balloon started to slow down.

By this time we had reached 12,000 feet. Captain Anderson did not want to check our headway altogether, so he kept us moving slowly upward to 16,000 feet.

Photograph by Richard H. Stewart

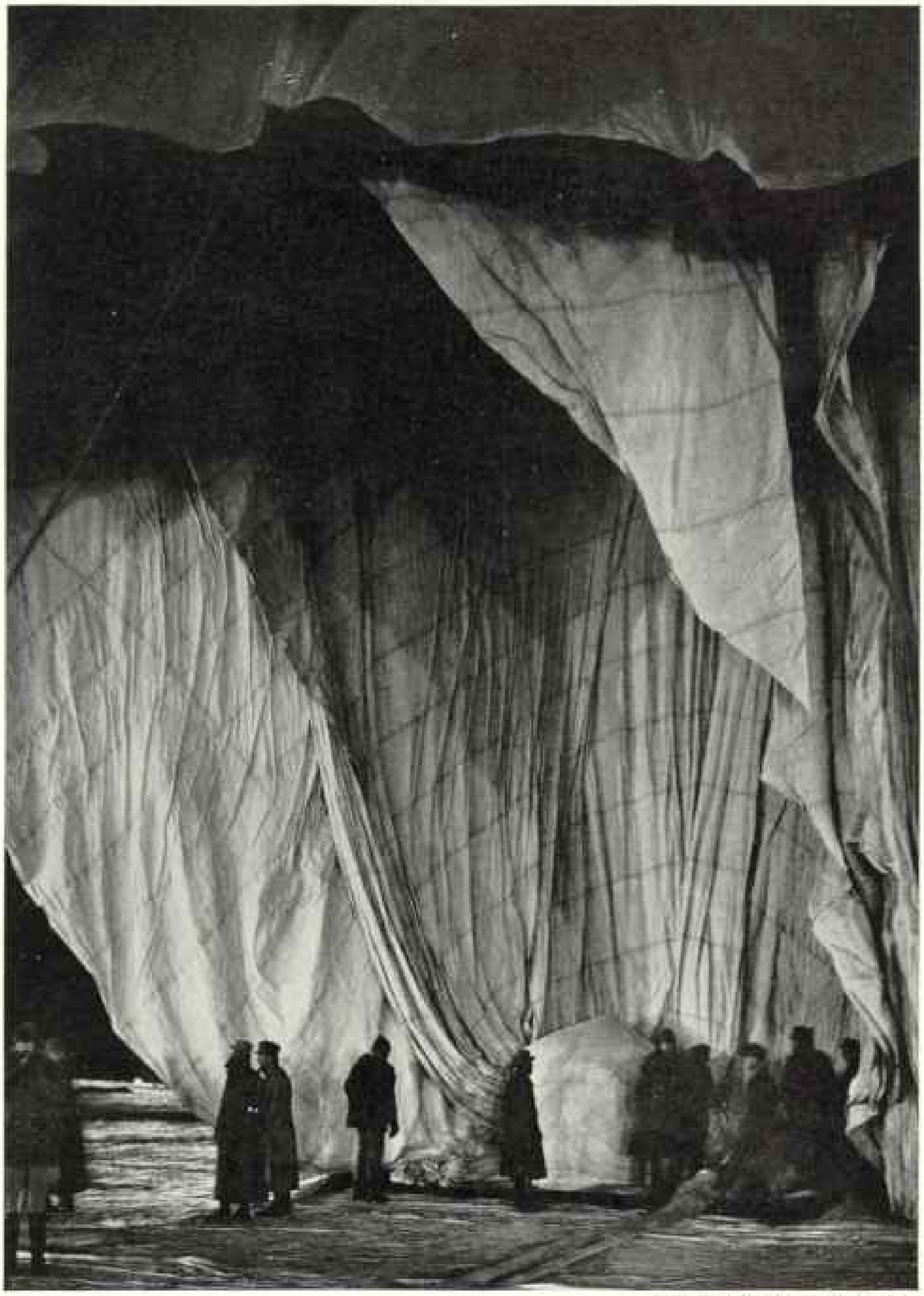
ATTACHING THE CORD THAT SLIT THE BAG ON LANDING

A rip at the right time, to release all gas in landing, is necessary to bring a balloon flight to a successful conclusion. Here J. F. Cooper, balloon builder of the Goodyear-Zeppelin Corporation, and two assistants have installed in the fabric of *Explorer II* a small, flexible steel cable which sliced the balloon's top as neatly as a sharp knife (Plate IV). The rip cord, a woven rope stained red, is shown here.

GONDOLA TOP AN OBSERVATION PLATFORM

Many people think it must have been extremely dangerous for us to walk around on the slippery surface on top of a gondola hanging in space. Actually there was no sensation of danger whatever. We climbed in and out, up and down, like monkeys, always having a handhold and a foothold.

The ten 1-inch ropes that suspended the gondola from the rope load ring, six feet higher, were stretched taut and were practically as rigid as iron bars. Each of these ropes carried nearly 1,000 pounds of weight. Together, they formed a cage through which it would have been difficult to fall, unless one really tried to fall, as in the parachute jumps that Major William E. Kepner and Captain Anderson made from the *Explorer I* in 1934.



Photograph by Richard H. Stewart

A COLOSSAL BACKDROP FOR A STRATOSPHERE DRAMA

The partly inflated balloon tugs at its 36 tethering ropes, of which two appear above. Beneath the "bubble" of gas in the bag, folds of rubberized fabric hang straight down. At this time the flow of helium was stopped temporarily so that a 17-foot tear in the cloth could be patched (see text, page 91). The rent was caused by full gas pressure from the inflation line forming a "pocket" and bursting the fabric. The rounded dome in the center shows the formation of a similar gas pocket. The cloth sleeve for carrying gas, flat and empty at the moment, extends from the bottom of the picture to the balloon.

Photograph by Richard H. Stewart

THE ZERO HOUR APPROACHES

The first faint suggestion of dawn was seen above the cliff beyond the tapes and ropes. The important task of fastening the gondola to the balloon has almost been completed. Through the cloth sleeve on the left, extending from ground to balloon, the last of the helium gas needed for the take-off will be fed into the bag. The 80-foot emergency parachute, packed in its bag, hangs against the upper portion of the globe. Below can be seen, hanging in place, the ballast bags and battery boxes. Five of the latter were released on parachutes to lighten the load as the balloon returned toward the earth.

Photograph by Richard H. Stewart

THE TWO HIGHEST-FLYING HUMANS CLIMB ABOARD FOR A RECORD SKY RIDE

Captain Stevens and Captain Anderson, in flying suits and parachute harness, are getting ready for the "weighing off," which immediately precedes the actual take-off. The balloon at this stage is held to earth only by its load and the short ropes shown extending outward from the gondola top. In weighing off, these ropes are slackened to see whether the balloon lifts its load properly. Still in place beneath the car is its wheeled platform. The nine bags strung above the open porthole contain parachutes on which heavy equipment later was floated to earth as the balloon came down, in order to lighten its weight. Hanging around the bottom are the forty 75-pound bags of lead dust which served as ballast. On top are the 80-foot parachute (right) designed to break the gondola's fall in case of emergency, and the padded bottom of the spectrograph (see page 90).

The first thing to do was to let down the official meteorograph. This we lowered 33 feet below the bottom of the gondola, in compliance with the new regulations of the Fédération Aéronautique Internationale.

This instrument, on its smoked drum rotated by clockwork, recorded air pressure, instrument temperature, and the temperature of the air outside the instrument. These three things are needed properly to calculate altitude by the pressure method.

The next thing to do was to let down the Dowmetal tube carrying the electrical thermometer resistance element and the fan for rotating the balloon. This operation required about a minute, and it was necessary to wrap an arm and a leg in the rigging to resist the weight of the device as it came into position.

The other operations required to put the ropes, hoses, and cords surrounding the gondola in order required little manual effort. Unnecessary dangling ropes were cut away and empty ballast bags were discarded. A check was made of the outside ballast that had been used and of the number of sacks remaining. As I called off the figures, Captain Anderson crossed the numbers of the used sacks from the numerals on the switch within the gondola.

He passed out to me the small sack of "stratosphere mail" and I lashed it in the rigging in order to give us more room in the gondola. I removed the canvas cover which we had long had in place to protect the glass of the porthole in the center of the top of the gondola and then climbed down into the interior.

I must confess that I had stayed a little longer on top than I should have, for it was rather pleasant in the bright rays of the sun and much warmer than it had been in the Stratobowl, where the temperature was only five degrees above zero, Fahrenheit.

CLOSING THE HATCHES

The inside altimeter showed that we were now approaching the 17,000-foot level, and already we were beginning to be aware of the thinness of the air by our breathing, which was becoming deeper and faster than normal. It was essential that we get the hatches closed quickly. We had practiced this operation many times on the ground, and it took less than a minute to swing each manhole cover into position, thrust the steel pins into place, and tighten the pressure screws.

Now came the time to test the gondola for gas leakage, and to see whether our liquid-air apparatus was adequate. Pressure from a small tank of helium was admitted to the top of a container holding a mixture of 45 per cent liquid oxygen and 55 per cent liquid nitrogen.

We were using helium not only to bear us upward, but to operate our air-conditioning equipment. It had been found in our tests that helium, because it is comparatively insoluble in liquid air, worked more effectively for this purpose than other gases.

This arrangement may have resulted in the mixture of a very small quantity of helium gas in the air we breathed. This fact was of no consequence, however, because helium is just as inert and harmless to man's lungs as is nitrogen, which makes up nearly four-fifths of ordinary air.

As soon as the helium from the little tank was turned on, the liquid started upward through the copper coil leading to the vaporizer. Air pressure inside the gondola immediately began to rise, and in about ten minutes we had caused the altimeter hand to move from 17,000 feet back to an indicated pressure of 13,000 feet. That is, in effect we gave ourselves the air pressure corresponding to an altitude of 13,000 feet.

At this point we adjusted the automatic exhaust valve of the gondola to hold this pressure. This valve, operated by a copper bellows, called a sylphon, thereafter kept the air pressure inside the gondola at a constant value and required no further attention. We reduced the pressure slightly on the liquid-air apparatus, and thenceforth we glanced at the gauges only occasionally throughout the flight.

An electric fan constantly circulated our gondola air through a tall metal cabinet containing a dozen sacks of sodium hydroxide, which were absorbing all of the carbon dioxide present in the air from our breathing, and most of the moisture.

In the meantime, the gondola was steadily rising and the precision altimeter showed that we were now approaching 25,000 feet.

GONDOLA UNDER PRESSURE

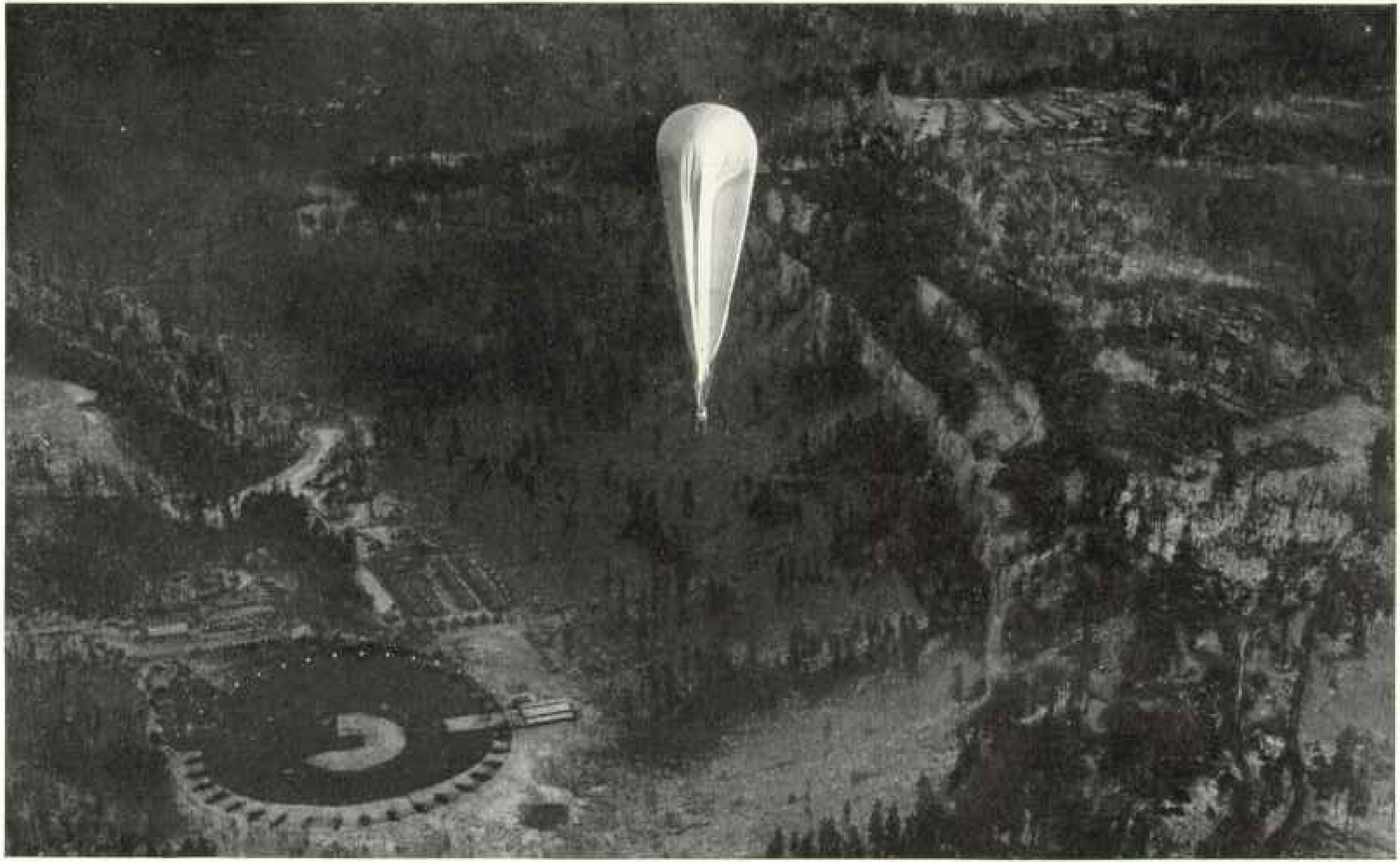
Our gondola was under a pressure of two or three pounds to the square inch, exerted from the inside outward. Later this pressure would grow until it would reach about nine pounds when we attained our maximum elevation. This was because we were keeping the same air pressure inside the gondola, but were rising into regions where the outside pressure was falling lower and lower.

We could have raised the pressure inside artificially by vaporizing liquid air at an even greater rate, until the pressure inside would have been equal to that at sea level. But it required less liquid air to work at the reduced pressure corresponding to 13,000 feet of altitude. We used a liquid-air mixture that was double strength in oxygen richness.

The gondola easily could have withstood greater pressure inside. In fact, it had been tested with air to 18 pounds per square inch, and with water pressure to 42 pounds per square inch.

The porthole glasses, carefully made and annealed by the Bausch and Lomb Optical Company, had been tested in our laboratory to a pressure of 100 pounds per square inch. We had no concern whatever about our gondola, its manholes, or its port glasses.

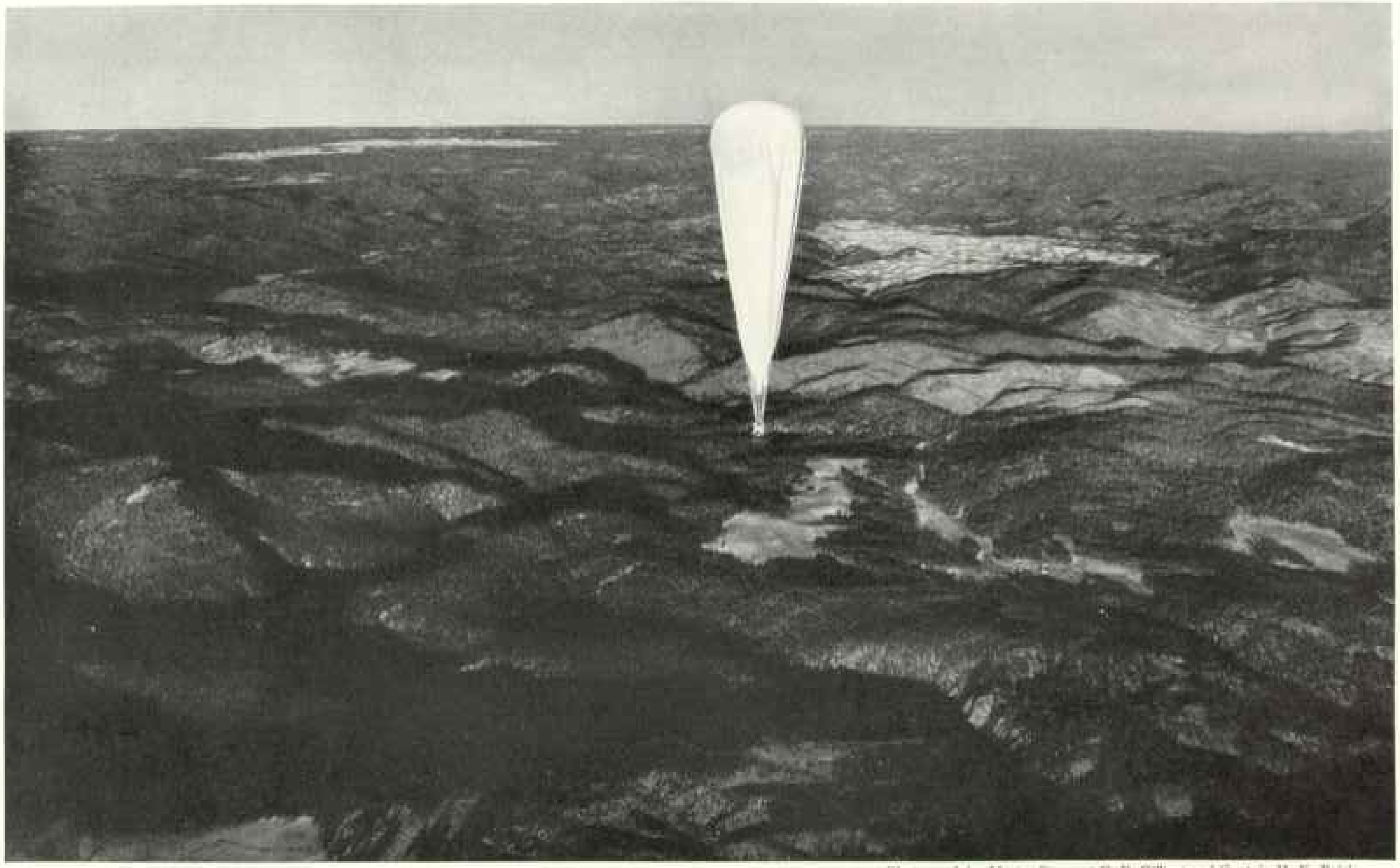
Steadily our ascent continued and at 10:30 o'clock (MST), just 3 hours and 29 minutes after our take-off, we had reached pressure height! That is, our great balloon was actually full, and overflowing from the bottom as the sun's rays warmed



Photograph by Master Sergeant G. R. Gilbert and Captain H. K. Baisley

THE BALLOONISTS' MOST DANGEROUS MOMENT LIES JUST AHEAD

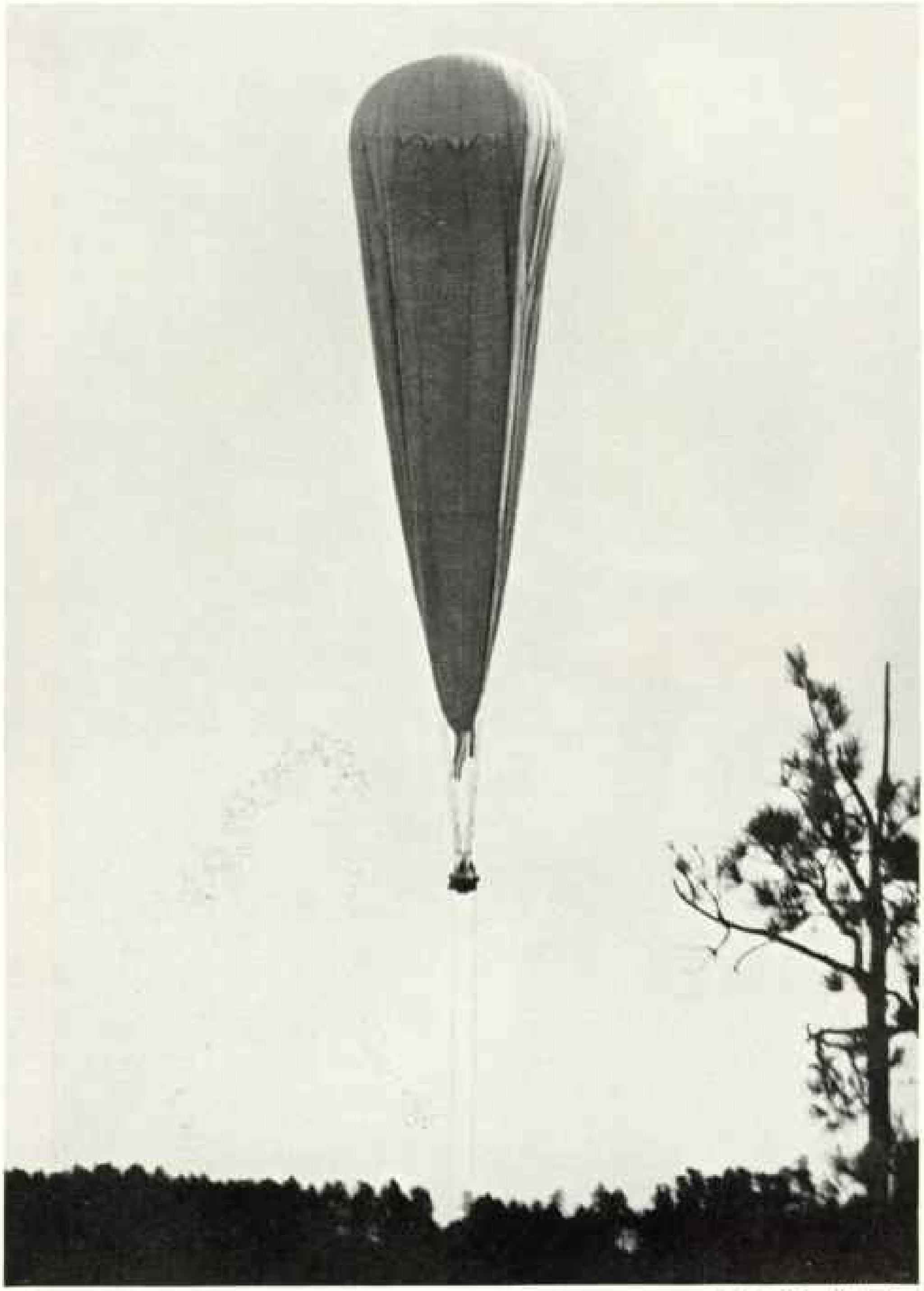
The bag, semitransparent in the dawning sunlight, shines like a golden pear against the dark green of the bowl. Just as this picture was taken, a sudden downdraft struck the balloon, leveling it off and forcing it down toward the cliff at the right. Quick action on the part of Captain Anderson in dumping 750 pounds of lead dust in a few seconds saved the balloon from disaster (see page 78). Within 50 feet of the trees the downward drift stopped and the *Explorer II* again began to climb rapidly towards the heavens. The gondola's microphone happened to be connected with the sending stations of the National Broadcasting Company at the moment and the brief but expressive remarks of the balloonists were heard by radio listeners in many parts of the country (see text, page 69).



Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Bailey

THE "EXPLORER II," GAINING ALTITUDE RAPIDLY, IS ABOUT TO SAY GOODBYE TO THE SNOW-PATCHED BLACK HILLS

In this photograph from an accompanying Army plane, the big bag floats southeast near the edge of the forested Black Hills. Shortly afterward it swung over the plains. Hoarfrost on the fabric and rigging glistened in the early morning sunlight. Later this frost evaporated and freed the balloon of considerable weight.



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STREAMS OF LEAD DUST POUR FROM "EXPLORER II," SAVING IT FROM A CRASH

The balloon had risen more than a hundred feet above the wooded edge of the Stratobowl, when a strong down current of air caused it to drop suddenly toward the spectators on the eastern rim. When this photograph was made, immediately after the take-off, Captain Anderson had just released electrically ten 75-pound sacks of fine lead shot ballast, which fell in thin streams. The fall of the balloon was checked and it again started to rise (see page 77).

the gas inside. This was at 65,000 feet, as calculated by the designers. To go higher we must discharge ballast, so Captain Anderson methodically tripped sack after sack of fine lead shot, while with stop-watch he calculated the rate of rise.

Looking up into the interior of the balloon, we could see the special small meteorograph of the Bureau of Standards hanging 40 feet below the top. It had been placed there to record conditions inside the balloon. Between the two valves, and a few feet below, inside the balloon, was a thermometer of circular design, three feet in diameter. The unaided eye could not read the position of the thermometer hand, so we brought our ten-power binoculars into use, and found that the temperature of the helium gas in the balloon was four below zero, Fahrenheit.

Outside the balloon, the air temperature varied from 70 to 78 degrees below zero, Fahrenheit.

We had some 74 degrees of superheat already. Superheat is the term that describes the excess in temperature of the gas inside a balloon over the outside air temperature. At high altitudes, the amount of heat received by the balloon from the sun is very great. This heat expands the gas inside and gives greater lifting power.

As we watched, the thermometer hand inside the balloon climbed steadily. Soon it was five degrees above, and then 14 degrees above. In less than an hour it got to 32 degrees, Fahrenheit.

This thermometer was important to us, for every degree that it registered higher meant that we must reserve a certain extra amount of ballast for the descent, if we were to land the balloon without crashing it.

One cannot prevent the gas from acquiring superheat in sunlight; one cannot avoid cooling of the gas and loss of superheat on the descent—and loss of it is loss of lift.

On the way down, ballast must be discharged to compensate for this loss just as, on the ascent, it must be discharged to permit the balloon to rise.

Near the top of our ascent Captain Anderson discharged bag after bag of ballast, sending us higher and higher.

AT THE TOP!

When we had discharged all the ballast deemed advisable, the balloon stopped rising, and began moving gently up and down, each vertical oscillation being less than the preceding one. The huge appendices gently closed—opened—closed again.

Finally, at 11:40 a. m. (MST) came the big moment when we were at the top. Our precision altimeter registered 27½ millimeters of mercury.

I opened the case of the Factograph (which automatically photographed the instrument readings) to look at the mercury column to see whether it could really be true that we were floating in air so thin that it would hold up only a little more than an inch of mercury. I opened the door quickly, for I did not dare let any moisture form on the barometer tube lest it spoil the photographic records. And, sure enough, the difference in the levels of the two arms of the U-shaped barometer was only a little over an inch.

At sea level our atmosphere holds up a column of mercury approximately 30 inches high; here the air pressure was only enough to support a column less than a twenty-fifth as high. This meant that 24 of 25 parts of the total atmosphere of the world was beneath our level—only one twenty-fifth above us.

Reference to the correction table showed that the altimeter had a 2-millimeter correction at the part of the scale now reached, and that our altitude should be that corresponding to 29½ millimeters, or 73,000 feet.

This correction was a rough and ready one which could give us only an approximation of the truth. We knew that we would have to await the calibration of the instruments after the flight and corrections because of temperature in order to learn our true altitude (see text, page 74).

It was a temptation to both of us to discharge more ballast and see the altimeter hand move to 26 or 25. At great altitudes it takes only a little more than a millimeter of mercury to cover a thousand feet of rise.

We knew we could dump another thousand pounds of ballast and go 2,000 feet higher. But would we have enough ballast left to keep us from crashing on landing?

We could not afford to overlook the fact that the most vital function of ballast in a balloon flight, in so far as the safety of an expedition is concerned, is its release during the downward trip, and, especially as the earth is approached, to reduce the speed of descent and bring the craft gently to its landing.

Photograph courtesy Standard Oil Company of California

"HELLO! CALLING STRATOSPHERE BALLOON!" SAYS A VOICE FROM OVER THE PACIFIC

On the famous air liner *China Clipper*, 3,500 feet aloft and 15 miles off the California coast, radio contact was established with *Explorer II*. Here W. Burke Miller of the National Broadcasting Company and Captain Edwin C. Musick, chief pilot of Pan American Airways, converse, while in flight, with Captains Stevens and Anderson in the stratosphere. To the listening public this two-way conversation was one of the most remarkable features of the flight (see page 85).

We counted our remaining sacks inside the gondola, counted the unused spaces on the electric ballast-firing device, added up the weights of the batteries that hung from pins on the outside of the gondola, and reluctantly agreed that we had expended all the ballast we should. Reference to the curve sheets of Dr. L. B. Tuckerman and Mr. F. D. Swan confirmed the soundness of this decision. It was now nearly noon (MST). We had been near or at ceiling since 10:30 o'clock. Soon we must start the descent.

Observations of the earth and sky were made at the top of the flight, 13.71 miles above sea level.

The earth could be seen plainly underneath through the lower porthole and hundreds of miles in every direction through the side portholes. It was a vast expanse of brown, apparently flat, stretching on and on. Wagon roads and automobile highways were invisible, houses were invisible, and railroads could be recognized only by an occasional cut or fill. The larger farms were discernible as tiny rectangular areas. Occasional streaks of green vegetation showed the presence of streams.

Here and there water could be seen in the form of rivers or lakes, especially if the sun was reflected from the water's surface. No sign of actual life on the earth could be detected. To us it was a foreign and lifeless world. The sun was the one object that commanded our attention; we were temporarily almost divorced from Mother Earth.

SUNLIGHT BLINDING; SKY NEARLY BLACK

Overhead, the great balloon blocked our view of the sky above us. How I wished at this time that we could have a central tube in the balloon through which we could look at the zenith! I am sure that the sky would have been so dark directly overhead that we could have seen the stars at noonday.

As it was, we could see the sky, beyond the sides of the balloon, at an angle of about 55 degrees above the horizon.

The horizon itself was a band of white haze. Above it the sky was light blue, and

perhaps 20 or 30 degrees from the horizon it was of the blue color that we are accustomed to. But at the highest angle that we could see it, the sky became very dark. I would not say that it was completely black; it was rather a black with the merest suspicion of very dark blue.

In the rigging hung a new flag of the United States. This flag was in full sunlight and I compared the blue of the field of this flag with that of the sky. Now the blue of our regulation flag is quite deep in shade, but it appeared a much lighter blue than the blue of the stratosphere sky.

We remained at our ceiling for an hour and a half, our instruments clicking away as if to make the most of their unique opportunity. Then Captain Anderson opened one of the valves to start the balloon into descent. Nothing happened at first, and he valved again and again. Finally the balloon started into positive descent.

SPORES AT HIGH ALTITUDE

When we were absolutely sure that it was in descent, I pulled the release that caused the spore-collecting apparatus to fall free of the gondola. It was returned in excellent condition to Washington by its finder, Mr. Frank Brtna, of Academy, South Dakota. Dr. L. A. Rogers, at the Department of Agriculture, found that it had worked satisfactorily and had gathered spores on its descent from the upper air, before the sylphon-actuated device had closed its orifices at a high altitude.

We also took with us from the earth several kinds of spores,* supplied by Mr. Fred C. Meier, of the U. S. Department of Agriculture, enclosed in tiny quartz tubes. These were hung on the outside of the gondola, exposed to sunlight and stratosphere temperatures and pressures to determine whether they could survive such conditions. The specimens consisted of millions of spores far too small to be seen with the naked eye, representing seven types of fungi, some of which cause plant diseases.

Despite the rigorous conditions to which the spores were subjected, five of the seven types germinated and grew normally when brought back to the laboratory, showing that apparently they were not injured by the ordeal.

The sixth type germinated only to a limited extent and tests on the seventh type have not been completed.

We carried the package of Drosophila (fruit flies), furnished by the University of Wisconsin, throughout the flight in the hope of finding whether their exposure to the bombardment of the cosmic rays that entered the sphere would affect the characteristics of their descendants.

The package was sent on to the University of Wisconsin shortly after we landed, and it has been found that only three of the larvae of the flies survived. Generations of young will be bred from these three individuals and will be carefully studied. The results will not be known for several months.

TAKING SAMPLES OF AIR

When we were assured that we were falling constantly, I broke the seals on the previously evacuated air-sample flasks and opened all three inlet valves. Ten minutes later I closed them, replaced the protecting caps, and sealed the caps with lead seals.

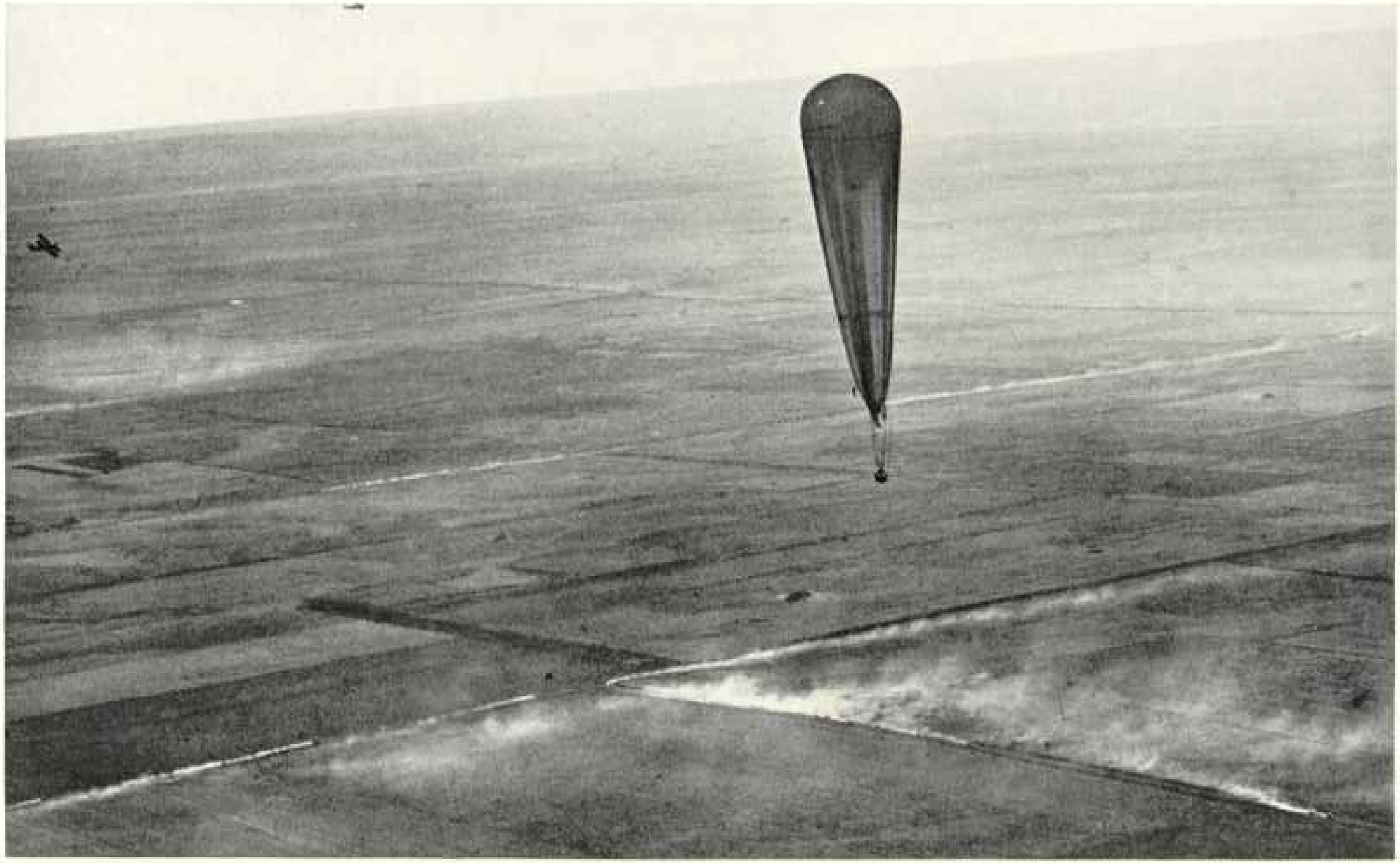
During the flight, especially at the higher altitudes, we saw through our portholes that vapors were forming in considerable quantity around the gondola. These vapors appeared to come from the gondola on all sides. At times they were so thick as to give the appearance of heavy smoke clouds from something burning on the outside of the gondola.

Since our ballast bags had been fireproofed, it was unlikely that the dynamite caps could have ignited them. It is more than likely that the vapors came from evaporation of battery liquid in the storage batteries that hung from our gondola, and from moisture contained in parachute bags and in ropes of the rigging. These vapors were seen only at the higher elevations.

It was during the descent, when a pronounced upflow of air passed the gondola, that our air samples were taken. There may be possibility of contamination of the samples with a trace of water vapor, but the effect on the percentage of oxygen, nitrogen, and argon should be nil.

At this time we were moving slowly but steadily downward. It was necessary for Captain Anderson to open the valves repeatedly in order to keep the balloon moving downward. Whenever he ceased valving the balloon tended to stop.

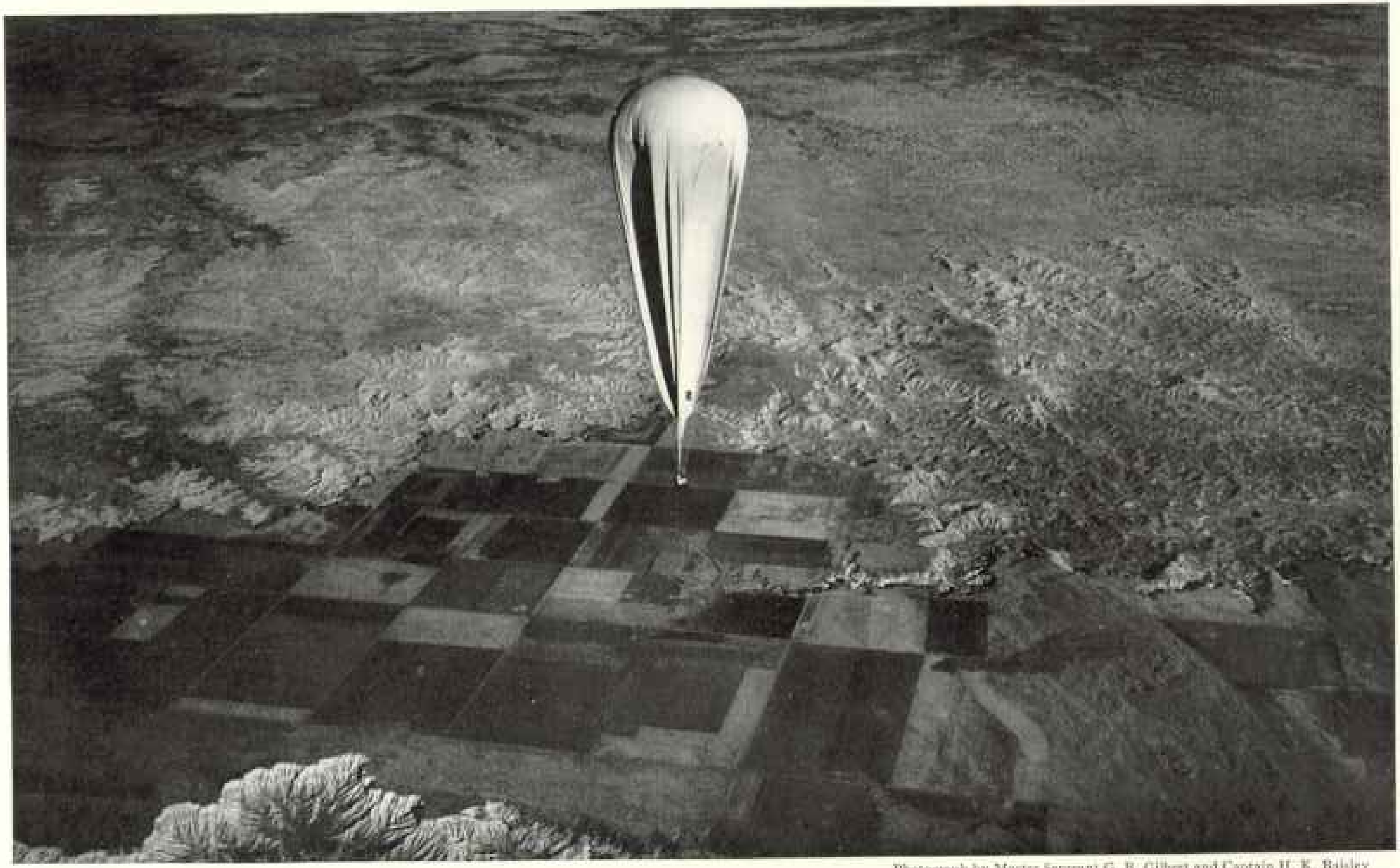
*Spores taken aloft were mold spores. Such spores are microscopic bodies which, while not seeds, bear much the same relation to the mold organisms that seeds do to the higher plants. Each of the mold organisms produces a number of spores at maturity, and each spore is capable of growing into a new mold organism.



Photograph by Richard H. Stewart and Captain James Hazlip

THE DESCENDING "EXPLORER II" FAILED TO BAFFLE PURSUERS

Every section-line dirt road was etched in dust clouds as hundreds of automobiles attempted to follow the world's largest balloon to its landing place in south-central South Dakota (see Plate VIII). Newspaper men who followed the balloon from the Stratobowl to its landing place said that when the *Explorer II* had reached its ceiling 13.71 miles above the earth, it resembled the pearl on a stickpin held at arm's length. Roads in this part of South Dakota are laid north and south or east and west and the lack of diagonals made it more difficult to chase the balloon in cars.



Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Baisley

"EXPLORER II" FLOATS OVER AN OASIS IN SOUTH DAKOTA'S BAD LANDS

How once fertile land has been washed away during past ages is strikingly depicted in this photograph from one of the airplanes following the balloon. The level, cultivated tableland beneath the gondola breaks away abruptly into small-scale mountains and canyons. A tongue of erosion, like a licking flame, reaches into the checkerboard farm land from the right. The balloon here is at an elevation of about 16,000 feet and has filled out slightly.

Later on in the flight, when the balloon was in the cold and comparatively heavy air around 40,000 feet, the gas cooled rapidly; whereupon the balloon fell, without being valved, with ever-increasing speed.

The vertical aerial camera had been clicking and winding regularly since the start of the flight. Pictures had already been made of the earth and horizon with another Fairchild aerial camera, loaded with Eastman infra-red film. Now, as the balloon rotated slowly while descending, more pictures of the horizon were made.

Aerial motion pictures of the earth were made with a Bell and Howell Eyemo camera loaded with infra-red film. Color pictures of the earth, the sky, and the balloon were made with an Eastman Ciné-Kodak loaded with Kodachrome film. A National Graflex was used at the top of the flight while the balloon was nearly stationary to make negatives of an instrument for indicating a change in gravity.

On the descent the almost black aspect of the sky did not change materially until we had dropped about four miles. Our balloon was shrinking in size and therefore we could look more toward the vertical as we lost elevation.

The great bag slowly commenced to fold together at the bottom, and soon it was apparent that all four appendices were closing so tightly that no air was entering the balloon.

INSTRUMENT RECORDS ON 9,600 FILMS

The cosmic ray apparatus, installed in the gondola by Dr. W. F. G. Swann and Mr. Oscar Steiner, of the Bartol Research Foundation of the Franklin Institute, had been started an hour before we reached our maximum ceiling. The cameras of the Stoss chamber and the Geiger counters, for recording effects and direction of cosmic rays, continued to run throughout most of the descent, up to the time when we were forced to cut loose the operating batteries for ballast on parachutes.

At the higher elevations the clicking of electrical devices, which we could hear plainly, told us that cosmic rays were passing through the instruments at a rate roughly between 100 and 150 times the rate at ground level.

Throughout the descent our four Graflex Factograph cameras operated continuously, making at 15- and 90-second intervals records of pressure, temperature, gondola position, sky and sun brightness. The total number of exposures in the four Factographs was 9,600; films when developed proved to be perfect.

The film records of temperature in the stratosphere are regarded by the Bureau of Standards as being most valuable additions to meteorological knowledge.

The electrical thermometer, partly constructed by the National Bureau of Standards and partly by Wright Field, proved to be an instrument far more sensitive to temperature changes than any that has previously recorded the temperature of the stratosphere. The records, both on ascent and descent, conclusively prove that there are decided changes in temperature at different levels of the stratosphere that have previously been undetermined by the ordinary type of thermometer.

The films made by the two spectrographs have been developed and it has been found that they afford complete records. Study of the films will give information about the amount of ozone present in the atmosphere. These instruments, made by the Bausch and Lomb Optical Company under the direction of Dr. Brian O'Brien, of the University of Rochester, and Dr. F. L. Mohler, of the Bureau of Standards, carried camera mechanisms made by the Graflex Corporation, and operated throughout the entire flight, making spectrograms through optical systems of quartz.

Throughout the flight the apparatus of the Department of Terrestrial Magnetism, of the Carnegie Institution of Washington, made a record of the electrical conductivity of the air. This record was delivered to Mr. O. H. Gish, who designed the apparatus, and Mr. Kenneth L. Sherman and Mr. G. L. Churchwell, who built and installed it.

RADIO WORKED PERFECTLY

Of the many items of apparatus, none functioned more perfectly than the radio apparatus of the National Broadcasting Company. At frequent intervals I talked to Mr. Robert M. Morris, Mr. C. P. Sweeney, and Mr. J. A. Wies, engineers of the National Broadcasting Company, at Rapid City.

The transmission and reception were faultless; the outgoing speech level was kept constant by an ingenious "gain control" installed this year by Mr. Morris. Substantially, this device had the effect of making the microphone less sensitive when one was

near it and more sensitive when one was farther away. It was largely because of this feature that listeners with short wave radio sets could hear us working and talking in the gondola even when we had no intention of addressing the public.

THE ETERNAL QUESTION

If any difficulty existed, it was in reception, because I was sometimes careless in tuning in or in the use of the volume control on the receiver. Sometimes the clatter of instruments made repetition necessary.

Even at 10 miles above the earth Andy, the married member of the crew, was not beyond his family's voice.

Mrs. Anderson, in the National Broadcasting Company tent at the Stratobowl, asked her husband, "How is everything? Where are you now?"

"Very good, Muddy," was the reply.

"Where are you?"

"I am up in the air," said Andy, dryly, adding that our altitude was about 54,000 feet and that we were on the way to our ceiling.

"Fine, and best of luck!" said Mrs. Anderson, far below us, completing a call that had been put through as readily as a telephone call to the corner grocery.

Again I was amused when I overheard the instructions, given on short wave, of an eastern announcer to his fellow announcers.

"Don't play up this record business, boys, until we are sure that they have gotten down safely," he suggested. "There is still plenty of chance for them to crash and they have to come down alive to make it a record."

HEARD AROUND THE WORLD

Reports received by the National Geographic Society and the National Broadcasting Company show that our voices were heard directly over the short waves which we were sending out from the gondola from California to New York and North Carolina, and from Calgary, Canada, to Texas. We were heard, too, all over England and pretty generally over Europe and South America, but these more distant stations may have been picking up the rebroadcast short waves from the Bound Brook, New Jersey, transmitter of the National Broadcasting Company.

Word has not yet come to us concerning the reception of our short wave broadcast in Australia and New Zealand, but it is likely that our voices were heard there, because high-frequency signals ordinarily pass from America to those countries with great ease.

After we had reached our peak altitude and had started preparations for the descent, we were tremendously pleased to hear the N. B. C. announcer tell us that General Westover, Dr. Grosvenor, and Dr. Briggs, at the National Geographic Society headquarters in Washington, wished to talk with us. It was particularly to the loyal and steadfast support of these three that we owed our flight, and we were glad for the unusual opportunity to thank them from the highest point from which a voice had ever been heard.

A HISTORIC RADIO HOOK-UP

A high spot of the afternoon was at 2:15 (MST) when I was permitted to talk directly to the giant *China Clipper* flying over the Pacific Ocean between San Diego and San Francisco. We conversed briefly with Captain Edwin C. Musick and with William Burke Miller of the National Broadcasting Company, aboard the air liner. It was pleasant to talk to Burke, for he had been closely associated with us on our previous stratosphere expeditions (see page 80).

Then Burke arranged for me to talk to London, and shortly I heard an Englishman, Mr. Hugh Chevins, asking me questions about the balloon, particularly about a rip in the envelope which had occurred during inflation and its repair (see text, page 91).

It seems that news of the accidental rip already had reached England, but apparently our friend in London thought that it had occurred while we were *in flight*, and that we had succeeded in repairing it ourselves.

I did not grasp the situation and started to tell him how the rip was repaired by our *ground crew*. The result was a conversation which must have been extremely funny to listeners-in.

I was interested in the comment on the editorial page of the *New York Times* about this incident, from which I quote the following extract:

"Two men in the metal gondola are hurtling down through the South Dakota skies from a height of 72,000 feet. At the same time they are talking to a reporter in a

Photograph by Richard H. Stewart

OFF ON A HISTORIC JOURNEY

Explorer II had just left the floor of the Stratobowl when this photograph was taken—almost straight upward. Extending from the right side of the gondola is the instrument for measuring electrical conductivity of the air (p. 74). The rip cord dangles from the right side of the balloon. The heavy load of equipment, including ballast bags and batteries hanging on the outside, is shown plainly by the roughness of the lower edge of the gondola.

newspaper office in London. But listen to a bit of the conversation:

"'What about the rip in your balloon?'

"'What about it?'

"'What happened?'

"'We fixed it.'

"'You fixed it?'

"'Yes, we patched it. It was a rip about 17 feet long.'

"'What exactly did you do?'

"'What did we do?'

"'How did you fix it?'

"'We simply cemented it. We put a patch on.'

"'Most extraordinary. But *how* did you do it?'" (Conversation ends.)

"Could anything be simpler? We build gas bags and gondolas with extraordinary skill. We fill the bag with rare gases. We fill the gondola with instruments of amazing ingenuity to measure the stratosphere's light, air, heat, cosmic rays, magnetism, microbes, what not. We install radios by which we can talk from beyond the Dakota clouds to London; and then, when the bag rips at the last moment, we borrow some cement and patch it up, and climb to 72,000 feet."

Unfortunately, it was absolutely necessary to tear off the headphones and go to work before the conversation was concluded with our London friend, for Captain Anderson had repeatedly reminded me that it was nearly time to open the hatches.

"CRACKING THE MANHOLE"

Our elevation was now 16,000 feet. Our inside pressure still held at 13,000 feet; as I cracked the manhole on my side of the gondola, a hiss of air marked the equalization of pressure, and immediately we felt the sudden pressure change on our eardrums. When the hatches were swung open, air from the outside started to circulate through the gondola (see text, page 75).

The first thing was to get rid of the liquid air and the chemicals of the air-conditioning outfit. Together, Anderson and I struggled with these bulky and cumbersome containers and shortly we had hooked them to one of the parachutes, provided for such a purpose, that hung outside the gondola just above a manhole (see illustration, page 74). We let them go, and immediately the parachute opened, letting the heavy objects float gently to the ground. They were recovered by local peo-

ple probably not more than 15 minutes later and were brought to the landing place within an hour or so. Next consigned to a parachute was a sack full of oxygen cylinders.

Under the direction of Captain Anderson, who was watching our rate of fall, I released battery after battery by pulling metal pins from sockets in the wall of the gondola. The releases worked perfectly and quickly; at one time there were three parachutes in the air at the same time.

Around us flew several airplanes, but we paid them scant attention. Below us the roads in all directions were white with clouds of dust, as scores of automobiles converged on our probable point of landing (see page 82).

Other batteries followed by parachute, and sack after sack of lead shot was spilled. No solid object was discarded except by parachute.

A PERFECT LANDING

Andy climbed outside, unlashed the end of the rip cord and brought it within the gondola opening. He then cut one end of the dragrope loose, and as the loose end fell and whipped about, it jarred the gondola momentarily.

We donned our football helmets, borrowed from the team of the Calvin Coolidge High School of Rapid City, and hooked across the inside of the gondola a strong linen strap to which we could hold if necessary. The balloon, traveling at 12 miles an hour, also was settling slowly. The dragrope was touching the ground. Its tip trailed through an isolated patch of woods, and then it dragged half its length through a field. Ahead of us was a ravine, and beyond it a large field that looked promising as a landing place.

We shouted again and again to men following us almost directly underneath in automobiles to get out and seize the dragrope. As the rope trailed along a road one automobile actually straddled it. Shortly afterward, one man ran beside the rope and caught hold of it, only to drop it immediately.

Apparently people were in awe of the towering structure of the balloon, and had no confidence that they could retard its progress. Had 20 men succeeded in grabbing the dragrope they could have stopped the drift of the balloon. In this case, we could have valved the balloon down, thereby avoiding the need of ripping it. But it was apparent that we could not obtain help from the spectators who were trailing us, and so we resolved to rip the balloon as we touched the ground.

Andy instructed me to discharge a couple of small sacks of lead shot to hold the balloon off, and then he shouted, "Make ready for the landing!"

I scrambled across the gondola just in time to help him with the rip cord. As I glanced through the porthole, we were not more than a foot or two above the ground. Andy's weight was already on the cord, and as we pulled we felt the steel cable tear through the fabric and sensed that the top of the balloon had opened. We grabbed for the linen strap and simultaneously the gondola struck the ground (Plates III, IV).

Held by the drag of the 500-foot rope, and released from the support of the bag, the gondola stopped practically at once, and immediately turned over on its side. A quantity of lead shot that had been previously accidentally spilled on the floor came in a shower all over us.

The air was momentarily filled with flying clothing, empty cans, ballast sacks, small cameras, tools, and other objects. We swung onto the linen strap and our feet touched things that we could stand upon. I looked down and found that Andy was standing on the spectrograph, while I was standing on the Geiger counter apparatus!

We took a brief look around and then started to climb out. To our amazement people were already looking in one of the manholes. Lieutenant B. S. Kelsey and Lieutenant B. B. Talley had guessed our landing place, and had landed with their airplane. Talley had actually made two exposures, on the ground, of our landing, and was at the gondola before we could get out.

In less than five minutes we were surrounded by scores of automobiles and hundreds of people. In a short time the crowd had increased to thousands and it became a problem to hold them back. Fortunately, it was an amiable crowd and no damage was done to the gondola or the balloon.

AIRPLANES CONVERGE AT LANDING PLACE

It was only a short time before airplanes piloted by Captain R. P. Williams, Captain H. K. Baisley, Captain J. F. Phillips, Captain James G. Haizlip, and Mr. R. E.

THESE TRACES HAULED TWO MEN IN A METAL CHARIOT UP TO A WORLD RECORD

The 40 linen-webbing tapes attached the gondola to the ropes that hung from a girdle on the balloon. The photograph was taken only a few minutes after the landing, but already a large crowd of spectators had arrived. The sphere lies on its side, the top towards the camera. Lieutenant R. R. Talley has an arm in one of the manholes. In front of him, hatless, stands Captain Stevens.

Photographs by Richard H. Stewart

CAPTAIN ANDERSON INTRODUCES A NEW STRATO HEADGEAR!

The pilot of the *Explorer II*, pictured just after he had climbed out, wears a football helmet loaned by the Rapid City High School squad. He and Captain Stevens wore these padded head coverings to protect them from sharp corners of the many pieces of scientific apparatus on landing.

Photograph by Richard H. Stewart

LIKE THE TUMBLED SHEETS ON A GIANT'S UNMADE BED

Here the huge fabric of the balloon lies deflated and spread over the prairie a short time after it had made a perfect landing in a pasture. Spectators, gathering quickly, helped the flyers push the gondola back to an even keel. So dense became the crowd that automobiles were hastily enlisted to form a circle around the sphere and bag to protect them from damage. The balloon fabric was folded and packed for shipment to Washington, D. C.

Nelson, from the Sioux Skyways, arrived, bringing our own Air Corps men of Scott Field and the Goodyear-Zeppelin balloon crew.

Shortly afterward Major C. D. McAllister, who had been delayed by mechanical trouble, arrived, bringing other technical assistants.

Aboard Captain Haizlip's airplane, which had followed the balloon throughout the flight, was Mr. Thomas W. McKnew, of the National Geographic Society, who had so capably taken care of the administrative duties of our expedition and materially contributed to its ultimate success.

About 50 men of the Civilian Conservation Corps from the Lake Andes Camp arrived by truck and assisted in guarding property and collecting equipment.

Soon afterward the cavalry guard arrived from Fort Meade by truck, and two trucks, sent by Maj. Gen. Frank C. Bolles, Corps Area Commander, appeared from Fort Omaha and Fort Robinson, Nebraska. A guard was placed overnight, and the next day, with all the help available, everything was loaded for transfer east.

Our flight, successful beyond our hopes, was made possible in large part by the months of careful preparation that preceded the take-off. Our balloon, our gondola, and all our equipment were made and handled with such care that we had absolute confidence in them throughout our flight.

We were confident that the calculations of the Bureau of Standards, and those of the Goodyear-Zeppelin Corporation, mak-

Photograph by Richard H. Stewart

NEW SECRETS OF THE SUN AND AIR WERE TRAPPED IN THIS BASKET

The delicate spectrograph, which was carried on top of the gondola during the ascension, is here surrounded by spectators, just after the landing. A self-recording instrument inside made records of the light of the sun. From these records scientists expect to discover new facts about what sunlight is like before it penetrates the earth's thick shell of air, and about the ozone in the stratosphere, which is believed to form a screen protecting the earth's surface from certain rays of the sun that might make life impossible.

ers of the balloon, were entirely correct, and that the minimum factor of safety of the envelope on this flight was four and one-half.

In other words, the balloon had at least four and one-half times the strength it needed to carry its own weight and that of the gondola.

The cloth was made of specially selected long-staple cotton and, to keep the gas from filtering through, the fabric was rubberized in 30 separate operations.

The envelope of July, 1935, was almost identical in construction, and it would not have failed then had it not been for stresses set up at the upper end of the rip panel. Neither in the balloon of 1934, *Explorer I*, nor in the balloon that tore during the inflation of July, 1935, was there the slightest indication of poor workmanship or material.

All that can be said now is that we then did not know enough about the problems of design of such a tremendous envelope—an envelope more than four times the volume of any balloon that had previously been built.

Following the collapse of the balloon last July, an investigation was made immediately by a committee composed of Brigadier General Oscar Westover, Acting Chief of the U. S. Army Air Corps, Dr. Lyman J. Briggs, Director of the National Bureau of Standards, Dr. Karl Arnstein, Vice President of the Goodyear-Zeppelin Corporation, Mr. Thomas W. McKnew, Assistant Secretary of the National Geographic Society, and the flight personnel.

When it became evident that the trouble was solely in the design of the rip panel, it was decided to abandon the conventional panel.

In its place was provided a device in the

Photograph by Edwin L. Wisherd

A WORLD ALTITUDE RECORD IS BROUGHT TO THE SOCIETY'S OFFICES "IN THE BOX"

William R. Enyart (left), secretary of the Contest Board of the National Aeronautic Association, and Dr. W. G. Brombacher, special representative of the Association for the flight, display the official meteorograph, its seals still unbroken. Dr. Brombacher followed the balloon by airplane and took possession of the meteorograph within a few minutes after the gondola came to earth. Others, left to right, are Captain Anderson, Captain Stevens, Dr. Lyman J. Briggs, Chairman of the Scientific Advisory Board for the flight, and Captain Randolph P. Williams, ground officer and alternate pilot.

form of a thin, flexible steel cable for ripping a 25-foot hole in the top of the bag on landing (see page 71).

The balloon used on the flight was the same one used last July; to it the manufacturers had fitted a new top and a new upper catenary band.

In the balloon, as received from the factory, we had the greatest confidence. But during the process of inflation, a very disconcerting accident happened.

The partially inflated balloon had been kept in its box inside a tent at a temperature of 50 degrees Fahrenheit. On the afternoon of inflation it was quite flexible, and our ground crew had no trouble in getting it out of the box. But when they started to spread it on the "ground cloths," or canvas floor, difficulty began, because the balloon fabric cooled quickly to almost zero temperature.

It became difficult to stretch the stiffened fabric into position for inflation, and some of the coils of fabric in the pile under the balloon were cramped more than we wished.

A RIP DURING INFLATION

As inflation proceeded, most of the gas went directly upward into the bag and raised it. Some gas, however, formed a pocket in the pile of fabric underneath. The heavy folds of fabric blocked the flow of gas upward in such a way that a ball of gas, half as big as an automobile, formed and was submitted to practically the full pressure of the helium coming through the 10-inch canvas hose.

Mr. J. R. Kelley, of the Goodyear-Zeppelin Corporation, saw the pocket lifting the fabric above it and shouted to the inflation crew to stop the flow of gas. It was impossible to shut the gas off quickly

Photograph by Acme

SURROUNDED BY MEMENTOS OF THE SEA, PRESIDENT ROOSEVELT CONGRATULATES THE CONQUERORS OF THE AIR

Standing behind the President and between Captain Stevens and Captain Anderson are General Malin Craig, Chief of Staff of the Army (left center), and Brigadier General Oscar Westover, Acting Chief of the U. S. Army Air Corps.

enough to save the envelope, for in less than half a second there was a faint pop, and we knew that a burst had occurred somewhere in the mass of fabric.

The balloon was allowed to rise slowly while we hurriedly made a search for the rip, which we visualized as being perhaps two or three feet long. It was now midnight, and fully an hour was lost in searching for the rupture. Finally it was found, and the tear proved to be 17 feet long!

A hasty conference followed, and Captain Anderson and I decided to go ahead. Mr. J. F. Cooper, builder of the balloon, Mr. Kelley, and our noncommissioned officers from Scott Field immediately started to repair the long fissure.

It was indeed a difficult situation. The temperature was down almost to zero, and these men had the task of cementing a patch at that low temperature over a comparatively long stretch of fabric in such a way that the patch would bear, throughout the flight, its share of the great weight of the fabric below and the gondola.

Our Army sergeants lined up on each side of the rent, a piece of balloon cloth was thrown over their heads, thereby making a sort of tent, and a huge 1,500-watt bulb and reflector were brought inside to heat the air of the tent and to radiate heat on the patching material.

Working together under these uncomfortable and awkward conditions, the Goodyear-Zeppelin and Army men cemented first a 2-inch strip of tape along the fissure and then covered it with a 5-inch cemented patch. Unlike any other part of the balloon, the seam was reinforced wholly on the outside of the balloon.

It is to the credit of these men that this patch held perfectly, and that an examination of the balloon after it landed showed the cement had not given in the least degree. It was our confidence in these men that made us go ahead with the flight. Had

we had less confidence in them, we would have stopped the flight then and there.

Too much credit cannot be given to Captain Randolph P. Williams, of the Air Corps. This officer, qualified to fly airplanes, dirigibles, or balloons, was ready to take the place of either Anderson or myself had we for any reason been unable to make the flight. In addition, he was charged with the duties of ground operation officer and also with that most important position of meteorological officer.

In the early days at camp, a no-inflation decision was received good-humoredly, for everyone felt, from records of past years, that another good day would come within the next week or two. Later we came to watch the approach of winter with some concern. Week after week passed, and although some pessimism might have been justified by the disappointing weather, the morale of the camp remained high.

WATCHING THE WEATHER

The weather men, receiving faint praise, went methodically about their tasks. Early in the morning they drew the midnight and six o'clock surface weather maps. At noon and again in the evening at six they drew the third and fourth maps of the day. The direction of winds at various levels was plotted and curves showing the dryness of the air aloft were drawn.

Maps showing changes in atmospheric pressure every three hours were constructed twice daily. Once a day a map of the eastern Pacific Ocean was prepared in order to study the source of the air masses coming toward Rapid City.

The problem of these meteorological men was much more difficult than that of the average weather station, for they were charged with predicting more than a day ahead the condition that would positively insure absence of gusts of wind in the Stratobowl on the entire night of inflation, a cloudless day for the flight itself, and a ground wind of not more than 15 miles per hour in the area of landing.

High-pressure area after high-pressure area moved across the country, but each time the Stratobowl was too far from the center of high pressure to justify inflating the balloon. Mr. V. E. Jakl of the United States Weather Bureau and Sergeant W. F. Bernheisel of the Army Signal Corps shared a large part of the worries of the weather station. Day by day they became more serious and the hours they spent over the maps increased.

One can imagine, therefore, our relief when the weather maps of November 9 showed the high-pressure area forming at a point that made it likely that it would move over Rapid City. The early-morning weather maps of November 10 so strengthened our belief that a good inflation day was at hand that preparations were started even before the noon map was drawn. Telegrams were dispatched and telephone calls brought additional soldiers from the Fourth Cavalry, commanded by Colonel Robert McC. Beck, Jr., at Fort Meade, 30 miles north of Rapid City.

As expected, the temperature had already dropped 20 degrees, and it was certain that during the night temperatures approaching zero would exist. Every one—scientist, soldier, and spectator—knew that he faced a cold, uncomfortable night. But, strange to say, no one seemed to consider seriously his approaching hardships. No one of our ground crew, some of whom actually suffered during the night, complained. There was a certain excitement, caused by the extraordinary spectacle of a tremendous envelope rising majestically in the center of a huge circle of lights, that kept everyone on the alert.

The lighting engineers, who were from the Homestake Mining Company, of Lead, South Dakota, kept their engines running to furnish power to our huge battery of lamps. Had their machinery once failed, we would have been in darkness, but it was perfectly installed and functioned constantly. A newspaper could be read anywhere within the circle of lights, 360 feet in diameter, at any time during the night.

Under the direction of Fort Meade officers, the cavalrymen carried out their unaccustomed duties as balloon crew practically as perfectly as if they had received long training in balloon work. Then came the time when our Air Corps men attached the gondola to the balloon and when, shortly afterward, the last ropes that ran to the top of the balloon were cast off.

THE FUTURE OF STRATOSPHERE FLIGHTS

With the experience we have had, it is believed that with hydrogen as a lifting gas, with knowledge of the flight characteristics of this huge balloon, and with provision for certain of the heavy items of apparatus to be carried in releasable form on the out-

side of the gondola, we could fly the same balloon, with the same load of scientific apparatus, to at least 78,000 feet.

However, no plans for another flight exist at this time. It is necessary first to make a study of the scientific data obtained to determine whether another flight to a greater altitude would be justified.

If in the future it should be desirable to take instruments to a still higher altitude—possibly to 95,000 feet—this may be made possible by constructing a somewhat larger balloon with an envelope of rubberized silk instead of rubberized cotton, thereby reducing the weight of the bag forty per cent.

It is problematical whether a much larger balloon than the *Explorer II* should be built, because of the difficulties of handling and inflating, the increasing cost and the decreasing factor of safety. Furthermore, there are few places in the world where it is safe to inflate such huge bags, for they tower into the air until they encounter strong air currents unless protected by a wall such as that of the natural bowl at Rapid City.

Our meteorologists have found, from a study of data of several years past, that even on nights when there is a dead calm on the ground, there is, in open country, almost always a wind of six to eight miles an hour at 300 feet. It is evident that inflation of these very lofty bags in the open is a far more hazardous problem than inflation of smaller balloons.

We should keep in mind that these stratosphere balloons come down with the gas, which filled them at high altitude, squeezed into a relatively tiny ball in the top of the envelope. A comparatively small area of the top then bears the total weight of the envelope and the gondola, and a portion of the top must be made stronger to prevent it from bursting or tearing. As we go higher and higher, our "gas bubble" becomes relatively smaller and smaller on the landing, and, unless the balloon be properly designed, we may find that we have made a flight to very great altitude, only to crash when almost on the ground. It is evident that the problems of stratosphere ballooning should be studied very carefully.

To get still more altitude, the balloon may be flown to a maximum ceiling by dropping all ballast, and saving none for descent; the gondola may be cut away at the top of the flight on a large parachute, leaving the balloon to go still higher with light automatic instruments while the gondola floats to earth with the men and the major portion of the scientific apparatus. The fall of such a gondola on a parachute in the extremely thin upper air of the stratosphere would be for tens of thousands of feet before the parachute would really retard it. That *would* be a ride!

THE SCIENTIFIC ADVISORY COMMITTEE

On the scientific Advisory Committee of the 1935 flight were: Chairman, Dr. Lyman J. Briggs, Director, National Bureau of Standards; Dr. Gilbert Grosvenor, President, National Geographic Society; Brigadier General Oscar Westover, Acting Chief, U. S. Army Air Corps; Dr. Frederick V. Coville, Chairman, Research Committee, National Geographic Society; Dr. W. F. G. Swann, Director, Bartol Research Foundation, Franklin Institute; Captain R. S. Patton, Director, U. S. Coast and Geodetic Survey; Mr. Willis R. Gregg, Chief, U. S. Weather Bureau; Dr. Floyd K. Richtmyer, Cornell University, and Research Council, National Academy of Sciences; Dr. L. B. Tuckerman, National Bureau of Standards; Dr. Charles E. K. Mees, Director, Research Laboratory, Eastman Kodak Company; Dr. John Oliver La Gorce, Vice President, National Geographic Society, and Mr. Thomas W. McKnew, National Geographic Society, secretary to the Committee.

The following collaborators, arranged alphabetically, gave valuable assistance, which is gratefully acknowledged by The National Geographic Society:

Secretary of War George H. Dern, United States Department of Agriculture, Bausch and Lomb Optical Company, Bartol Research Foundation, Bell and Howell Company, Black Hills Associated Commercial Clubs, Mr. William A. M. Burden; Department of Terrestrial Magnetism, of the Carnegie Institution, Washington, D. C.; Chicago, Burlington & Quincy Railroad Company, United States Coast and Geodetic Survey, Dow Chemical Company, Col. Edward A. Deeds, Eastman Kodak Company, Mr. Sherman Fairchild, Fairchild Aerial Camera Corporation, Fairchild Aviation Corporation, Ford Motor Company, Folmer Graflex Corporation; Fourth U. S. Cavalry, Fort Meade, S. D., Col. Robert McC. Beck, Jr., U. S. A., Commanding Officer; Goodyear-Zeppelin Corporation, Hamilton Watch Company, Homestake Mining Company, Mr. Philip G. Johnson, Mr. C. F. Kettering, Linde Air Products Company, National Broadcasting Company, National Bureau of Standards, Rapid City Chamber of Commerce, Dr. A. Hamilton Rice, University of Rochester, Shell Petroleum Corporation, Sioux Falls Chamber of Commerce, Sioux Skyways of Sioux Falls, S. D., South Dakota School of Mines, Sperry Gyroscope Company, State of South Dakota (Hon. Tom Berry, Governor), South Dakota National Guard, United Air Lines, United Aircraft and Transport Company, United States Weather Bureau, Mr. Cornelius V. Whitney, Mr. George D. Widener, and the University of Wisconsin.

BIRDS OF THE NORTHERN SEAS*

By Alexander Wetmore

Assistant Secretary, Smithsonian Institution

Author of "The Eagle, King of Birds, and His Kin," "Seeking the Smallest Feathered Creatures," etc., in the National Geographic Magazine

GRAY, misty fog over a restless sea, land concealed somewhere in the haze, an occasional clumsy, heavy-bodied bird indistinctly seen as it blundered away from our ship—this was my introduction to the Aleutian Islands of Alaska, and to one of the most interesting groups of sea fowl that I have known.

The revenue cutter *Tahoma* moved at half speed, with all hands watching for some landfall ahead that might direct our course through Unimak Pass. The air came damp and cold against our faces.

Suddenly the fog lifted to reveal Tigalda Island, the desired landmark, and on all sides endless thousands of birds scattered near and far to distant horizons.

Large-billed puffins in pairs sat near one another on the water, tiny auklets rested in flocks, and occasional groups of dark-backed murres swam over the lifting swell. As the ship bore down upon them, some, after momentary hesitation, dived with hastily beating wings and darted away in submarine flight. Others spattered off, striking the water with broad, webbed feet, until their heavy bodies had sufficient momentum to allow them to rise in the air, when the feet were drawn back beneath the tail and the birds flew swiftly away.

SHEEPLIKE, THEY FOLLOW THE LEADER

If one bird of a group started across our bow, its companions followed, this follow-the-leader course continuing until those in the rear were forced to dive to avoid striking the steel side of the ship.

In the background were huge, black cliffs, and towering, snow-capped mountains rising from rocky shores or grassy slopes of vivid green. In the thrill of anticipation of what lay before us, the momentary discomforts of the stormy passage that had brought us across the Gulf of Alaska were forgotten.

The auks, murres, and puffins (family Alcidae) are found only in the Northern Hemisphere and are most abundant in the subarctic area. Some range south into regions of temperate climate, principally in the Pacific Ocean, but none penetrates as far as the Tropics.

Twenty-three species are known, with 14 additional subspecies or geographic races. Most of these various kinds are found at some season in North American waters, only a few being restricted entirely to the shores of the Old World. All are maritime and come to fresh water only by chance.

Without exception, members of the auk family have heavy bodies, small wings, and broadly webbed feet set far back on the body. The plumage is dense and waterproof, and the birds are among the most expert divers, using both wings and feet in progression beneath the water. Their food, taken entirely from the sea, includes small fish and crustaceans.

BODIES BUILT FOR DEEP-SEA DIVING

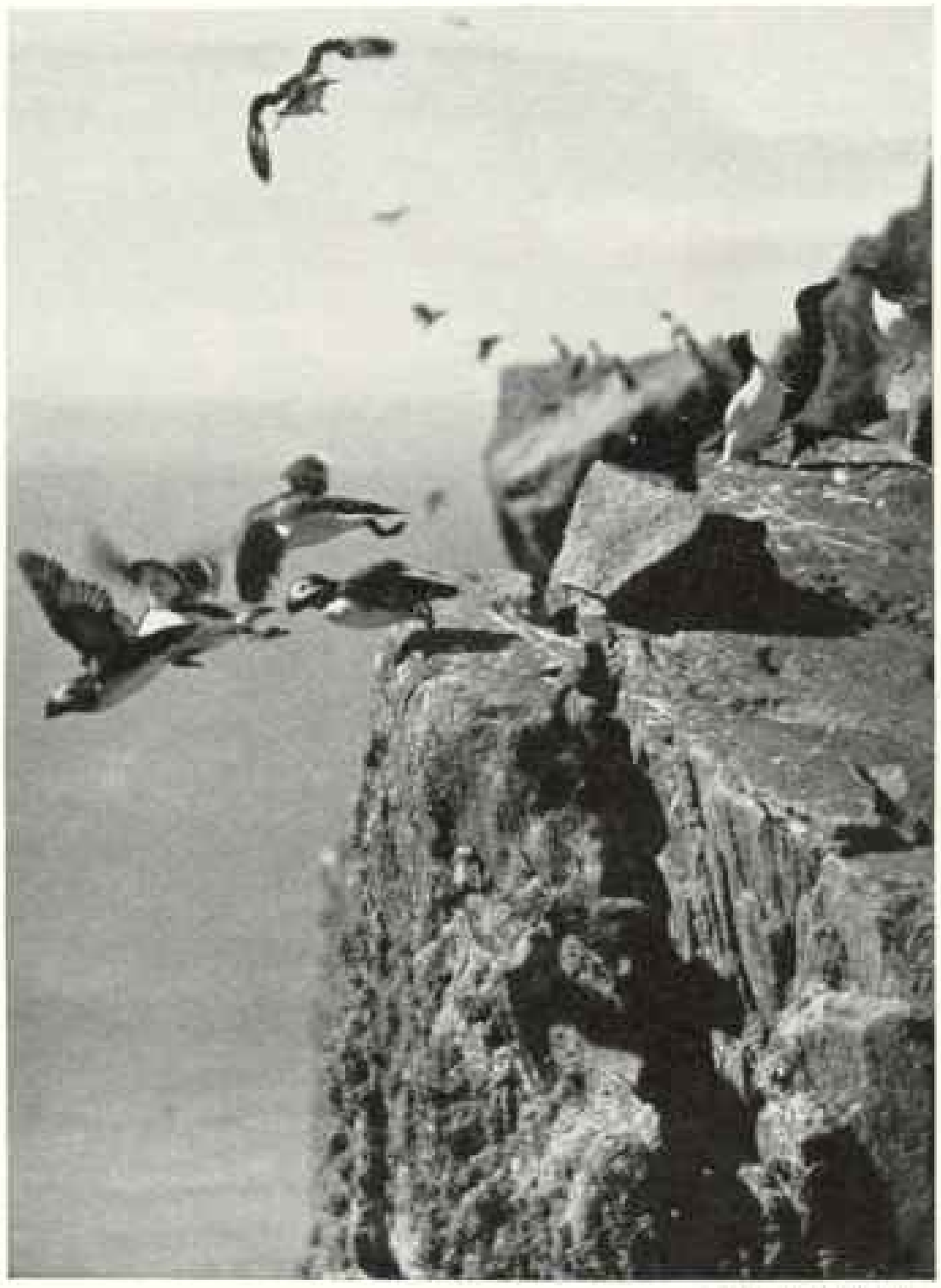
In search of food they often dive to considerable depths, where the heavy salt water of the sea subjects them to powerful pressure. To protect the vital organs against this, the lower margin of the breast bone is extended in a flat plate of bone and cartilage over the upper part of the abdomen to serve as a buckler.

Birds of this group are true mariners, and for much of the year they live at sea, feeding and sleeping on the water. Only in the nesting season do they resort regularly to land; then they frequently gather in extensive colonies.

Rocky coasts and lonely islands form their haunts at this time, as there they have a better chance to escape their natural enemies. The murres and guillemots nest on open ledges. Others, such as the puffins and auklets, prefer underground burrows, or crannies deep in piles of rock. Sometimes they nest in caves or under bushes.

Many of the auklets are nocturnal, and they may be so retiring that their abundance is often unsuspected by those who visit their breeding places only by day.

* This is the twelfth article, illustrated by paintings by Maj. Allan Brooks, in the important Geographic series describing the bird families of the United States and Canada. The thirteenth article, with color plates from paintings by Major Brooks, will appear in an early number.



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THE TAKE-OFF! A "SLOW-MOTION MOVIE" IN A SINGLE PICTURE

This unusual action shot shows four puffins at different stages of launching themselves from a ledge on the Norway coast. Heavy-bodied, they push off in a slanting dive to gain momentum before rising in full flight. Razor-billed auks at the right hold their ground. Overhead a neighbor flies homeward on swiftly beating wings, feet trailing behind.

To the Eskimo and Aleut of the North, birds of this group are important because they furnish valuable additions to the food supply. The return of puffins and their cousin auklets to their breeding haunts on the rocky coasts of the North after the long winter is a time of rejoicing. Eggs, young, and adult birds, all are eaten, and the skins of the old birds, properly tanned with the short, dense feathers in place, are made into warm parkas and other articles of clothing.

Puffins and dovekies especially swarm in thousands about their nesting grounds and are easily captured. Dovekies alight on projecting rocks in struggling masses, each individual intent on obtaining a perch without regard to its neighbors. A stone cast into such a group may kill half a dozen.

NATIVES NET THEM ON THE WING

Netting is a more profitable means of pursuit, and, considering the number of birds taken, it is astonishing that any remain. With their heavy bodies and small wings, members of the auklet tribe cannot swerve quickly to avoid obstacles, though they fly with great rapidity. On certain days in early summer, hundreds and thousands of the birds are in restless flight over the rocky islands and headlands that form their breeding grounds. Native hunters lie concealed on points and ridges, and as puffins, auklets, or dovekies pass swiftly, thrust up long-handled nets into which the birds crash headlong. Quickly biting the head and neck with his strong teeth, the hunter kills the struggling bird and then is ready for the next one (see pages 118, 119, 121).

The flesh of these birds is eaten fresh as a welcome addition to the monotonous diet of seal or other meat of winter, and hundreds are stored for use later.

It is only in the Far North, where men are few, that murres, puffins, dovekies, and their kind can maintain their abundance under such conditions. With the coming of white men and the advance of white settlements along the southern edge of their range, the birds have been too greatly harassed and have not maintained themselves

against specialized modern methods aimed at their destruction.

The great auk early became extinct (Color Plate I). Razor-billed auks, murres, and others in southern parts of their range on our northeastern coasts have been much reduced in numbers. In recent years they have been afforded protection through the Migratory Bird Treaty in effect between the United States and Canada and through other means, so once more there has been a slow increase among them.

Photograph by J. D. Rattar

FOUR SOLEMN PUFFINS RULE A ROCKY ROOST IN THE SHETLAND ISLANDS

Puffins generally arrive there about the first of April and leave around the twenty-third of August. About the third week in May they lay a single egg in a hole from eighteen inches deep to beyond the reach of a man's arm (see text, page 103). They often nest in rabbit burrows, which are numerous in the vicinity, but for the most part the birds dig the holes themselves with their strong claws.

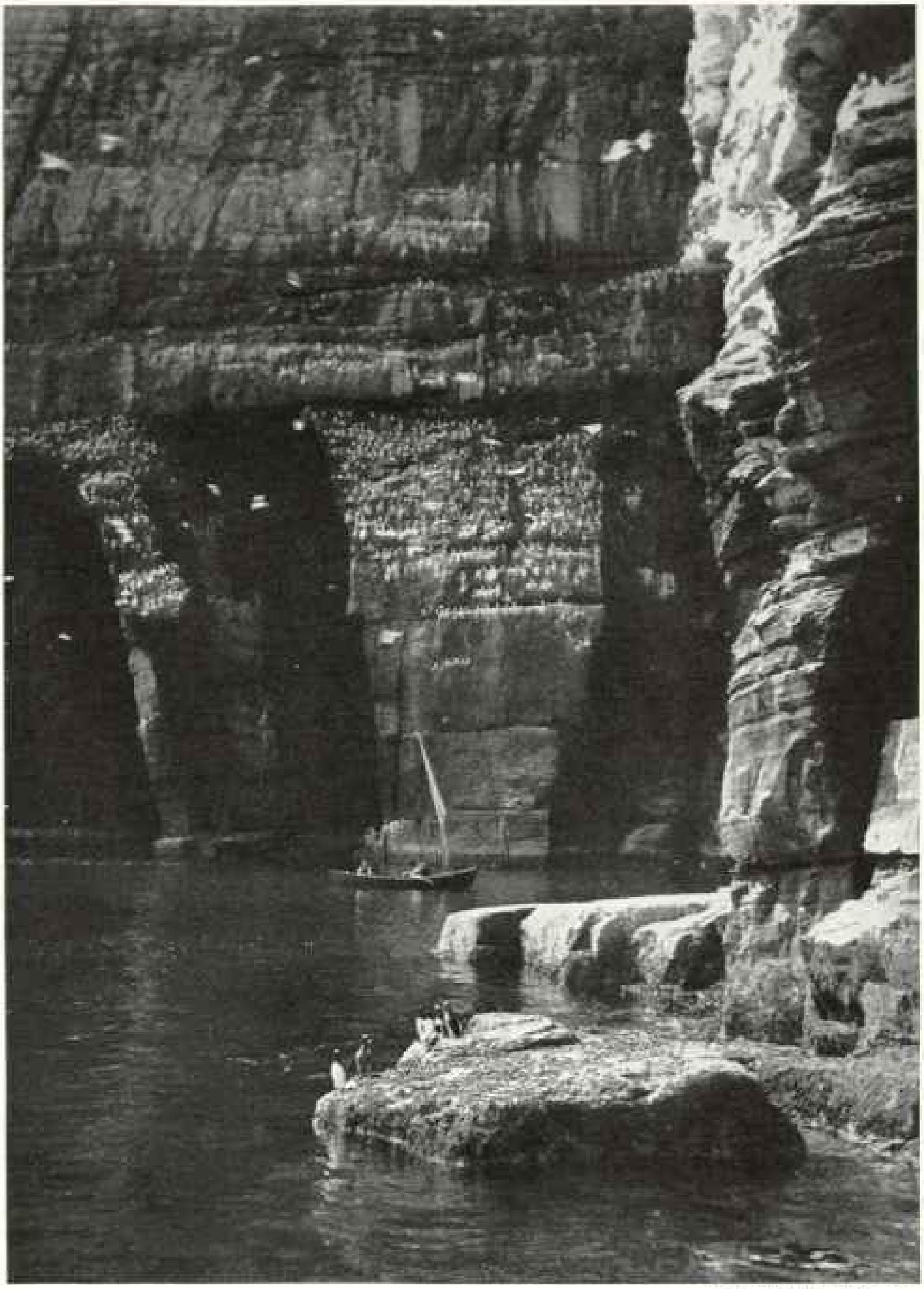
SOME WEAR BIZARRE PLUMES AND BRILLIANT BEAKS

Black, gray, and white are the predominating colors in the plumage of members of the auk group, with the markings often contrasted and highly attractive. Many, such as the tufted puffin, and some of the auklets in breeding dress, have plumes and tufts of feathers about the head that give a bizarre appearance (see Plates IV, V, and VII). These plumage oddities usually are ornaments of the breeding season and are shed in fall. Most species lack them in winter.

The bill of the puffin is one of the most curious and unusual among birds. In the nesting season it is large and brilliantly colored, giving the bird the appearance of a grotesque mask (see Plates III and IV). In fall the horny plates are shed in several pieces, and in winter the bill is not only more plainly colored but is actually smaller than in spring.

The horned puffin and the common puffin also shed the curious horny spike above the eye, and the rhinoceros auklet loses the projecting horn on the base of the bill (see Plate VII).

Birds of the auk group have their existence remote from the lives of most of us and are little known at first hand, even among naturalists. To see them one must go to northern seas or visit lonely places. The auks as a whole seem to occupy in the North the place taken by the penguins of Antarctic regions, but the similarity lies merely in habit and in manner of life, as the two groups are only remotely related.



Photograph by J. D. Ratcliff

SHOUT "HALLOO!" AND THE CLIFF INSTANTLY BLOSSOMS WITH WHITE AS MURRES ABOUT-FACE

When the birds are incubating, their dark backs generally are turned toward the sea. If disturbed they face about as one, the myriads of white "shirt fronts" appearing in sudden contrast. When murres are frightened from their ledges their flight is often accompanied by a shower of eggs. Here their attention has been attracted by two men in a small boat, who are exploring the recesses under the cliffs at Noss, Shetland Islands (see text, page 102, and Color Plate II). The birds on the rock in the foreground are murres; those flying are kittiwakes.

Photograph by Alfred O. Gross

MILLIONS OF MURRE EGGS ONCE WERE SOLD IN SAN FRANCISCO MARKETS

Nature seems to have made them small at one end so that they will roll in a circle and not off flat nesting ledges. The ground color varies from white or cream to bright green and blue. Scrawls and blotches of gray, brown, and black form intricate patterns which evidently are the "trade-mark" of the individual, as eggs laid by any one bird are more or less alike from year to year. Murres lay only one egg for a set: these were deposited by five different Atlantic murres.

Great Auk

(Plautus impennis)

In late May, 1534, the French voyager, Jacques Cartier, came to Funk Island, off the northeastern coast of Newfoundland, and found there a horde of birds so vast that "in less than half an hour," he wrote, "we filled two boats full of them." These were the great auks, whose destruction continued until, a little more than 300 years after Cartier's visit, the last one was gone (see Plate 1).

Fishermen voyaged to Newfoundland waters near the close of the 15th century, and as early as 1517 forty Portuguese, French, and Spanish boats were engaged in the codfishery. Hakluyt informs us that in 1578 the fishing fleet included 400 vessels.

Many of these boats depended upon the great auk colony for their supplies of meat. The birds were killed with clubs and carried aboard ship, where some were eaten fresh and the remainder salted as provisions for the voyage. Eggs also were taken.

When the weather permitted, planks or sails were laid from the rocky shore of Funk Island to small boats, and the birds were literally herded aboard, floundering and scrambling, until no more could be loaded. In addition to supplying food for the fishermen, it was said that the great auks were used for bait.

When Newfoundland was colonized, the great auks became a source of meat supply for the early settlers, who for years visited their breeding grounds to kill them and salt them for winter use. Richard Whitbourne, in considering this, wrote in 1622: "God made the innocencie of so poor a creature to become such an admirable instrument for the sustentation of man."

With white settlement of the New World there came demand for feathers to make feather beds. Men camped on Funk Island throughout the summer to kill and pluck the great auks. Stone corrals or compounds were constructed, into which the birds were driven. As needed, they were killed and thrown into kettles of hot water preparatory to removing the feathers.

GREAT AUKS EVEN USED AS FUEL

Wood was scarce on this barren island, and the bodies of the auks themselves, covered with a thick layer of fat, were said to have been used as fuel to feed the flames for scalding their companions.

Against this commercial destruction the birds were helpless. Early in the 19th cen-

tury the great auk had disappeared, and the large colonies in which it bred were no more.

The last great auks of which there is certain record were two captured alive on June 3, 1844, on the rocky islet of Eldey, on the southwest coast of Iceland. There is report of one seen on the Newfoundland Banks in 1852, and of one found dead in 1853 in Trinity Bay, Newfoundland, but neither account has been verified.

In the Old World the great auk, also known as the garefowl, nested in the Faeroe Islands, on Papa Westray in the Orkneys, and on rocky islands near Iceland. As recently as 1753 it came regularly in May to nest on the island of St. Kilda, and the last known in this general area, aside from Iceland, was one killed on St. Kilda in 1821.

Possibly in prehistoric times the great auk had a more extended range. Its bones have been found in deposits on the coast of Italy, and it is one of the species depicted by Stone Age artists on the walls of caves on the northern coast of Spain. In the United States its bones have been found abundantly in shell heaps remaining from ancient Indian feasts on the coast of Massachusetts. Other remains have been identified from shell mounds as far south as the east coast of Florida.

FLIGHTLESS, LIKE PENGUINS

Though the great auk's wings were so small that it could not fly, it was strong and powerful in the water. On land it stood with the body erect, resting on the full length of the foot and tarsus, the leg being located rather far back on the body. It walked or ran with short steps and plunged from heights of 10 or 12 feet into the water.

The bird swam with neck drawn in and head lifted. Diving with ease and progressing beneath the water by means of wings and broad, webbed feet, it moved so swiftly that it was able to escape pursuit by rowboats. Though flightless, it seems to have performed extensive migrations by water.

Its notes were harsh and croaking. Although inoffensive, the birds bit savagely with their heavy bills when handled.

The great auk laid one egg on bare ground or rock without a nest. The shell was white or yellowish white, blotched, lined, and spotted with black, drab, and varying shades of brown.

According to present record, there have been preserved in museums and private collections 80 skins and 75 eggs of the great auk. The National Museum in Washington has a large collection of great auk bones secured years ago on Funk Island, and bones are preserved in other museums.

Specimens are so much in demand that recently $3,500 was asked for a mounted bird. At an auction in London in 1934, six eggs were sold at prices ranging from $525 to $1,575 each, the amount depending on the condition of the egg. At this same sale two mounted birds brought $4,615.

Razor-billed Auk

(*Alca torda*)

On a cold December morning, as I walked along the beach near Ocean City, Maryland, a bird with white breast and black back swam through the surf, intent on a point on the sand out of reach of the waves. I recognized it as a razor-billed auk, a northern species of rare occurrence so far south (see Plate II).

Without seeming to notice my presence, it moved, prostrate on its breast, by aid of wings and legs beyond the wash of the sea. After a moment, thinking that the auk was injured, I stepped forward to pick it up. To my astonishment it became suddenly alert and, with feet striking the sand, flew swiftly back to alight in the surf, where it rested buoyantly and swam steadily out to sea.

In summer, in their northern breeding grounds, razor-billed auks may be found with murres resting on ledges or points of rock. At rest the razor-bill is marked by compact, thick-set form and shortened neck, so that it is readily picked out from its companions, even where the shape and markings of the bill cannot be seen. On the wing it travels swiftly, with rapid strokes, swaying slightly from side to side. The head is drawn in, and bill, body, and feet present one straight line.

Early travelers to the coast of Labrador found the razor-bill in abundance. But in modern times, hunted for its flesh, eggs, and feathers, it has been much reduced, and many colonies destroyed. The birds now nest only on inaccessible cliffs.

The best-known colony of razor-bills on our northeastern coast today is that on Great Bird Rock, in the Gulf of St. Lawrence. Here, as elsewhere, the single egg

 Painting by Allan Brooks

THE LAST SURVIVING GREAT AUK PERISHED MORE THAN 80 YEARS AGO

Only in the artist's imagination does this bewildered, solitary bird remain to walk the bleak, rocky shores of little Funk Island, near Newfoundland, while wheeling gulls scream a requiem. "Here lies the victim of man's thoughtlessness," might read the epitaph of his clan, which once bred in amazing numbers here. Small-winged and flightless, penguinlike in their helplessness, the luckless great auks were slaughtered by the thousands for food and featherbeds — even for bait and fuel. Their eggs were stolen. Inevitably they became extinct, and today a mounted bird is worth thousands of dollars, while a dozen eggs would almost ransom a king.

is placed on a rock ledge, sometimes in the open, but more often in some crevice or cavity where it is sheltered by overhanging rock. No nesting material is used.

The eggs are buffy, bluish, or greenish white, spotted, blotched, and scrawled with brown or black, with occasional markings of gray or lilac.

After thirty days of incubation the eggs hatch, and the helpless chicks, covered with down, remain for some time in the care of their parents. Fish, small mollusks, and crustaceans form their food.

When the young are about three weeks old, the parents entice them from their cliff homes into the sea, sometimes pushing them off or carrying them when they are reluctant to take the leap. Many are killed by falling short and striking on the rocks.

Young birds have a bill much smaller than an adult's; birds in winter have more white in the plumage of head and neck.

The razor-billed auk nests from the coasts of New Brunswick to Greenland, Iceland, the British Isles, Norway, and Lapland. In winter it comes south to the middle United States and the Mediterranean Sea.

Murre

(*Uria aalge*)

The murre, named perhaps from its low, murmuring calls, is a common tenant of the large sea-bird colonies of the North (see Plate II and page 98).

Approach its cliff apartments in the nesting season and you will see lines of dark-backed birds resting in rows on narrow ledges, each one covering its single egg.

At an alarm all about-face quickly, their white breasts appearing in startling contrast to the somber color of the previous instant. When disturbed, they drop off their ledges in a steep slant to gain momentum, then rise in rapid flight.

The murre has suffered equally with other colonizing birds from the coming of the white man, and on our northeastern coasts many rookeries have been decimated or destroyed. Only with the protection afforded in recent years have these birds been able to maintain themselves.

EGGS ONCE SOLD AS DELICACIES

It is reported that between 1850 and 1856 more than three million of the eggs of the western murres were brought to San Francisco markets from the immense colonies on the Farallon Islands. As delicacies they sold for from 12 to 20 cents a dozen. In one season, 1886, two men are reported to have gathered 108,000 eggs.

This practice continued until the birds were greatly reduced in numbers, and in 1897 the Lighthouse Board barred out the eggers, leaving the birds in peace except for their natural enemies.

The single egg, much larger than the ordinary hen's egg, varies remarkably in color and in marking. Ground colors range from blue, green, and buff to pure white; markings, from eggs that are entirely plain to those that are blotched and scrawled with intricate and overlapping patterns of gray, brown, and black. No two seem exactly alike (see page 99).

No nest is made, the eggs being placed on bare rock or earth. All are strongly pointed at the small end, a characteristic supposed to be a protective feature, so that the egg when disturbed may roll in a small circle and not fall off its ledge. Although this may be of help, in actual fact, when murres are frightened suddenly from their cliffs, their flight is accompanied by showers of eggs that fall to destruction.

When nearly grown, the young murres are enticed by their parents to scramble down over the rocks to the water. If they are on cliffs the parents gather below and call, until the young, excited by their notes, tumble over and fall in with a splash. Here parents and young swim about and soon leave for the open sea (see page 120).

Murres are agile and active in the water, diving with half-opened wings with which at once they begin subaqueous flight. Their swiftness beneath the surface is such that their food of fishes is obtained with ease.

The Atlantic murre (*Uria aalge aalge*) nests from southern Greenland to Nova Scotia and the Faeroe, Orkney, and Shetland Islands. In winter it ranges south to Maine and the coast of Morocco. The California murre (*Uria aalge californica*), differing in larger size and in form of bill, is found from Bering Sea south to California and Kamchatka.

Brünnich's Murre

(*Uria lomvia*)

Thicker, shorter bill, darker head, and a light stripe at the base of the bill distinguish this species from the common murre, the differences being ordinarily easily per-

ceptible with the birds near at hand (see Color Plate II).

It nests in large colonies on cliffs and rocky headlands, often with related species.

Long lines of the birds rest on narrow rock ledges, while others, returning from excursions in air or water, crowd in continually, squabbling over favored places. Fire a gun, and the birds rush out in a hurtling cloud, often followed by a shower of eggs or young.

The large eggs of this murre are relished by natives, who also eat the birds, and on the northeastern coast of North America the species has suffered much destruction. In the Bering Sea area it is more abundant and in places has tremendous colonies.

Begoslof Island, in Bering Sea, has been a regular breeding ground in spite of periodic volcanic eruptions that have at times submerged the entire island. When I first saw this island in 1911 a plume of smoke from its summit indicated such activity, and I was told that one of its peaks had been blown away during the winter.

The great destruction to the birds at such times is readily imagined, but murres, like humans, seem little troubled by such misfortunes and crowd back to their old haunts as soon as the disturbance has ceased.

With the end of the nesting season Brünnich's murres retire to the open sea for the winter. Only the closing of the water by ice drives them south, and then they do not go far beyond the ice floes. Fish and small crustaceans are the food of these birds, and they feed entirely at sea.

Of the two races of this species, the true Brünnich's murre (*Uria lomvia lomvia*) is found from Hudson Strait and adjacent islands, and Spitsbergen and Novaya Zemlya, to Long Island and the North Sea. The western race, called Pallas's murre (*Uria lomvia arra*), is larger and ranges from Wrangel and Herald Islands through Bering Sea to Kodiak Island and Japan.

Puffin

(*Fratercula arctica*)

By their grotesque bills, suggesting the exaggerated noses of masquerade masks, the puffins are set apart from all other North American birds. The odd form of the common puffin is accentuated by its air of solemn gravity and by the brilliant colors of its bill and feet. Male and female are alike in markings (Plate III).

In the air the puffin flies swiftly, with rapidly beating wings, veering at times from side to side like other members of its family. In the water it swims on the surface like a little duck, often with tail held up at an angle. When alarmed it dives as often as it takes to the air, and flies beneath the surface with quickly beating wings, trailing the feet behind as in aerial flight. On land it ordinarily stands erect, ducklike, not resting back on the leg, as do murres and auks (see pp. 96-7).

The puffin nests in burrows, which it digs in loose soil with its strongly clawed feet, or in crevices beneath stones. The single large egg, plain white, or faintly marked with lilac and brown, is placed in a slight nest of dried grass, herbage, and feathers.

HEAVY BILL DEALS SAVAGE BITE

Searching for eggs is fraught with some excitement. In occupied burrows one of the pair is always at home, and the usual indication that eggs or young may be found, as one explores with the hand the dark recess that may conceal them, is a savage bite from the sharp-edged bill of the parent. Seizure of the bird is accompanied by vigorous scratching with the sharp claws. Gloves are recommended for such investigations (see page 122).

After the breeding season the horny covering of the bill is shed in nine separate strips, leaving it smaller and without brilliant color.

The puffin, with its heavy feathering and its coat of oily fat between skin and body, is impervious to cold, so that its winter range is largely governed by the presence of open water. Puffins come south in cold weather to Massachusetts and, rarely, to Long Island, but many remain in the Far North throughout the year.

Their food is composed of small fish and crustaceans that are caught expertly during diving forays beneath the surface. Several fish of small size may be held side by side in the seemingly clumsy bill, causing speculation as to how the puffin seizes such agile prey without allowing the escape of those already captured.

In the southern part of their range puffins have been reduced from persecution by eggers and hunters. The northern race, however, according to the Eskimo, has increased on the northwestern coast of Greenland, though Eskimo women capture many for food in their bird nets.

RAZOR-BILLED AUKS AND MURRES GO FISHING IN NATTY "FULL DRESS"

On the higher rock squats a full-grown razor-bill of the Atlantic in summer garb, while overhead flies its immature offspring in winter's whiter plumage. Sometimes parents teach chicks to swim by pushing them off cliffs. In the foreground, wearing summer attire, sits a murre, so named from its murmuring call; and rising from the water is another in winter feathering. On the surface rests an immature Brünnich's murre in cold-weather costume.

THE SOLEMN PUFFIN HAS A HUGE, VIVID BEAK LIKE THE NOSE OF A CLOWN

After the summer breeding season the old puffin on the rock will shed the bright bill covering and look like the one in winter plumage, flying. Red feet are a characteristic shared with the black guillemots, or "sea pigeons," one of which (left foreground) is a young bird, and the other (center) an adult in summer dress. Two more are flying low. The little quail-size dovekies (right, showing summer and winter coats) are prized as food by Eskimos.

Two races of the common puffin are known from North America, of which the Atlantic puffin *(Fratercula arctica arctica)* is found from Norway and southern Greenland to Maine, coming in winter as far as Massachusetts and New York (rarely). The large-billed puffin *(Fratercula arctica naumanni)*, distinguished by larger size, including the bill, is found from northern to central Greenland, Spitsbergen, and Novaya Zemlya.

Black Guillemot

(Cepphus grylle)

From Maine to northern Greenland the guillemot is one of the common birds of the sea, being found in sheltered bays and about rocky headlands (see Plate III).

Known as the "sea pigeon" from its trim and dovelike form, it rests buoyantly on the water, floating high when at ease, but with body partly depressed below the surface when about to dive.

Approach in a boat, and the bird rises after momentary hesitation with rapidly beating wings and pattering feet, to swing in a great arc that finally brings it to rest again on the water far astern. As it flies, the black body, white-marked wings, and red feet make a pattern of flashing color.

Winter has no terrors for these hardy birds, and only when the seas are completely icebound are they driven south. The northern race, called Mandt's guillemot, marked by pure-white greater wing coverts and slightly smaller size, remains far to the north in Hudson Bay, James Bay, and on the coast of Greenland, wherever there is open water in which to obtain its food.

In nesting time, guillemots select their mates with somewhat clumsy antics and much display of red-lined mouths, then repair to some rocky island or cliff-bound headland to make a home.

The nest is placed in a rock crevice, often difficult of access, the two eggs resting on the bare rock or soil, or on accumulations of small pebbles or shells. The eggs are white to greenish or cream-buff, handsomely and boldly marked with various shades of brown and lilac. They are large and are excellent eating, being much relished by natives in the areas where they are found. Where nesting sites abound, the guillemot gathers in colonies, often of considerable size, but elsewhere it may be scattered in pairs over a fairly large area.

The food of this species is composed of small fish, crustaceans, and mollusks, obtained by diving, often to a considerable depth. The birds are so expert in the water that, like grebes, they may dive so quickly at the flash of a gun that they escape the charge of shot. Wounded birds have been known to pass under small icebergs, coming up to safety on the other side.

The black guillemot *(Cepphus grylle grylle)* breeds from Labrador and Norway to Maine and northern Scotland, coming in winter to Cape Cod and northern France.

Dovekie

(Alle alle)

Occasionally, during terrific gales in winter, small black and white sea birds appear in numbers in the northeastern section of our country, cast up dead or bewildered on the beaches by the titanic waves, or driven far inland by the tremendous force of the winds. These are dovekies, Arctic sea birds no larger than quail, with thick, dense plumage and heavy, compact bodies (Plate III).

Dovekies breed north to 78° North Latitude and have been recorded at 82°. They are found in almost incredible numbers, and return to their Arctic homes far in advance of other species that nest in these localities.

To the northern Eskimo the dovekie is a gift of the gods, as it is a source of food supply without which he could hardly hope to live. Men, women, and children greet the return of the dovekies in spring with wild excitement, as the fresh food after the long winter is most welcome.

The birds come to the rocky slopes where they nest in tremendous abundance, congregating on bowlders in fluttering crowds. Boys kill them with stones and, seizing them, literally eat the warm bodies out of the skins. Men and women armed with long-handled nets crouch in depressions among the rocks, and, as the dense flocks sweep past, scoop in bird after bird, often half a dozen at a time (pp. 118, 119, 121).

The net is brought in swiftly and held down with one hand while the birds are withdrawn, one at a time, to be killed by a swift bite with strong teeth on head or neck. The wings are locked across the back to prevent the birds from fluttering and pitching away down the steep declivities.

Thousands of dovekies are stored by the natives in frozen ground for winter. Foxes

find in this bird their principal summer food. The eggs are devoured by Eskimos and foxes. Ravens and gulls eat the birds, and at sea they are captured by killer whales. In spite of these enemies, the dovekie survives and maintains its enormous numbers. Living beyond the haunt of the white man, it is not subject to his mass destruction and so has persisted in the face of persecution.

The natives sew dovekie skins into warm shirts. The abundance of dovekies also allows a greater population of foxes, whose skins help clothe the natives and afford an article of trade by means of which the Eskimo acquires goods otherwise unobtainable. The dovekie undoubtedly is the most important bird of the Far North.

The nests are mainly in crevices and crannies amid the stones of talus slopes, above or near the sea. Where conditions are favorable the bird congregates by thousands. The single egg is plain bluish white, rarely with a few indistinct spots and markings of brown about the large end.

The food of the dovekie is composed mainly of the small crustaceans that abound in northern waters. Beneath the bird's tongue is an opening leading into a pouch in the throat in which this food is accumulated for its young.

The dovekie flies readily and also dives, usually using its wings in progression beneath the water. Except in the nesting season, it is found at sea, far from land.

The dovekie nests on Arctic coasts from Greenland to Novaya Zemlya, in winter coming south to New York and the British Isles, casually farther. There are many records of storm-driven individuals in the interior.

Tufted Puffin

(Lunda cirrhata)

In climbing the steep and slippery grass-covered slopes of a small island near the western end of the Alaska Peninsula, I found numerous holes as large as small rabbit burrows driven into the stony soil.

Exploring these one by one with a long arm, I was rewarded finally by a savage bite that gashed my fingers, and with some difficulty I seized and dragged out a struggling tufted puffin (Plate IV).

Flowing yellow plumes over the light-colored eyes, and a viciously heavy bill characterize this "sea parrot," also known as the "old man of the sea." Its bill and strong clawed feet command respect, and its capture by hand is attended by cuts and scratches.

To the fisherman of southeastern Alaska the boldly audacious tufted puffin is anathema. Fond of fish, it follows his boat and cleans his hooks of bait as fast as he can drop them into the water, even diving to considerable depths. Few lines escape.

The northern natives of the Alaskan and Siberian coasts, however, hail the coming of this puffin to its breeding grounds with delight, as puffin meat, though dark and heavy, is a welcome change from the seal and other foods of winter.

The birds gather in flocks and fly back and forth across the grassy banks of their nesting grounds. Although they travel swiftly, their short wings and heavy bodies make it difficult for them to turn or swerve quickly. Aleuts, hidden on the slopes, thrust up long-handled nets into which the puffins crash headlong, to be drawn rapidly in and killed by a bite on the head or neck or by a blow on the back.

The nest is composed of a few bits of herbage, ordinarily placed in a burrow, but occasionally, in the southern part of its range, beneath the shelter of bushes. The single large egg is white, sometimes plain and sometimes with a few spots or scrawls of gray and pale brown.

Where conditions are suitable, tufted puffins assemble in large colonies for breeding, often in company with other birds. In the south there are two broods in a season. The young birds feed voraciously and grow rapidly. After the nesting season adults molt and in the winter plumage lack the white markings and plumes about the head. The covering of the bill also is shed and the bill is actually smaller than in summer. Adults and young range the open sea, far from land, until the next nesting season.

The tufted puffin is found from northern Alaska and northeastern Siberia south to the Santa Barbara Islands, California, and to Japan. Casual individuals have been reported from Greenland and Maine.

Horned Puffin

(Fratercula corniculata)

The horned puffin of the northwest coast is similar to the common puffin in pattern of color and general appearance. It differs from that species principally in having the cheeks white instead of gray, the impressed

A ROBBER OF FISHLINES IS THE TUFTED PUFFIN, "OLD MAN OF THE SEA"

The weird creature, with its yellow plumes, light eyes, and heavy, colored beak, is dubbed "sea parrot" by Alaska fishermen, and often is called stronger names when, diving deep, it cleans their hooks. The young in first plumage (right) and adult in winter (left background) lack the tufts and white face. The formidable bill and claws can deal savage blows. In the foreground swims a full-grown horned puffin of the northwest coast in summer splendor. Its "horn" above the eye can be raised or lowered.

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SMALL, STRAIGHT-FLYING AUKLETS FALL EASY PREY TO ALEUTS AND ESKIMOS

Natives lie flat on the rocks and reach up long-handled nets into which the birds crash headlong. Quickly the hunter finishes them with a bite on the head and neck. Many northern birds are caught in this way, but specially relished is the crested auklet, sitting on the highest rock, and flying. The whiskered auklet at the right is rare and little known. Smallest of the family is the least auklet (center). The paroquet auklet in the foreground has a peculiar upturned bill. All are adults wearing their summer suits.

Photograph by Maynard Owen Williams

DOVEKIES RETURNING IN THE SPRING FILL THE AIR LIKE FLIGHTS OF LOCUSTS

Enormous numbers of these solid, compact birds, about the size of quail, are killed with stones or nets by the natives for food (see pages 118, 119, and 121). Here they whirl in huge circles above a rocky nesting slope at Etah, Greenland. "They have one-way traffic," says an observer. Such tireless circular "flights to nowhere" on the birds' arrival from the south seem to be a part of the mating display.

lines on the bill spaced and placed differently, and the black of the neck coming up on the throat (Plate IV).

The "horn" above the eye, which gives the bird its common name, is in reality merely an elongated, fleshy papilla that can be raised and lowered at will. A similar structure, of much smaller size, is found in the related species.

The horned puffin ranges usually about cliffs and small, rocky islands, where it digs its nesting burrow in the soil. From two to ten feet from the entrance there is a slight accumulation of herbage on which the spotted egg is laid. Beyond this point the tunnel ordinarily continues to the surface, so that the nest has two entrances.

The young puffins leave the nest before they are able to fly, and at any danger hide in crevices among the rocks. The parents frequently entice them into fluttering down to the water where they can be easily fed. To see the parents carrying three, four, or five small, slender fishes, held side by side in the great bill, is laughable indeed. At the same time one wonders how, after one fish is caught, the others are captured.

The horned puffin nests from the islands of Bering Sea and the adjacent Arctic Ocean south to Forrester Island, Alaska.

Crested Auklet

(*Aethia cristatella*)

Fallen rocks from the black cliffs of the headland at the entrance of Kiska Harbor, on Kiska Island, in the Aleutians, lay in bare, jumbled confusion above the rocky beach, with only occasional mats of grass pushing out over them where a little soil had accumulated.

As I clambered cautiously over this rough terrain, the scraping of my heavy hobnailed walking shoes brought forth harsh calls from birds concealed beneath my feet in subterranean crevices. I could not see them or reach them, and only when one suddenly shot out like a little bomb did I learn they were crested auklets.

Dark-plumaged birds, rough, black rock, and a leaden sea, with a haze of fog into which the auklets disappeared almost instantaneously—all this forms the background for my memory of this curious and interesting bird (Plate V).

At sea the crested auklet usually is found in little flocks that rise from the water with celerity and fly swiftly away, their dark bodies, coupled with their size, marking them from most of the associated species.

These birds nest on the coasts and islands of Bering Sea and the North Pacific. They nest always amid masses of stones and bowlders, the single white egg being concealed in recesses where it is safe from enemies.

Least Auklet

(*Aethia pusilla*)

Rock-bound headlands of black volcanic stone, and, beyond, a sandy beach before a green, open valley where ptarmigan cackled and crowed—such was our harbor on Kiska, in the Aleutian Islands of Alaska.

Pushing off from the ship in a small skiff, we moved quickly over a smoothly undulating sea and in a few minutes were lost in a world of fog where we seemed entirely cut off from any human contact.

Suddenly there appeared around us little groups of small, heavy-bodied birds. They either rose with rapidly vibrating wings and darted about in swarms, or dived to fly away beneath the surface. These were least auklets, the smallest of their family (Plate V).

Ashore, we found them nesting in crevices and crannies among cliffs and bowlders where their twittering, squealing calls came from beneath our feet, but where their eggs were entirely protected.

In suitable places the least auklet breeds in large colonies and, like others of its family, is captured in nets by the natives. Where stones are small enough to be moved aside, the single white egg may be discovered in some concealed crevice, while the birds scuttle away to safety in remote crannies, or fly quickly out when their cover is disturbed. No nest is made, the egg being placed on pebbles and stones without protection.

The food of this bird is composed of small crustaceans on which it thrives immensely.

Least auklets remain far north during the winter, but at that time are little known, as they range at sea where they have slight contact with man. At this season the breast feathers are entirely white.

We can understand how the bodies of these and other northern sea birds, incased in feathers, skin, and heavy layers of fat, can endure the rigors of severe winter weather. But the bare feet and tarsi, immersed constantly in water that is only a few degrees above freezing and mercilessly cold to the human hand or body that penetrates it, offer a problem, and I have frequently wondered how the birds kept active. The blood supply in the foot necessarily is slight, as there is no room for large veins and arteries.

We may suppose that a lack of the delicate nerves sensitive to cold that might cause crippling or discomfort, and the possession of a smooth, oily surface to which water does not adhere and freeze when the birds rise in flight, give these creatures their immunity. The least auklet nests on the coasts and islands of Bering Sea.

Whiskered Auklet

(*Aethia pygmaea*)

This curious bird is little known, as it has been seen by few naturalists. Most of our knowledge of its mode of life comes from the observations of Dr. Leonhard Stejneger, who found it common many years ago about the Commander Islands (Plate V).

The whiskered auklet feeds on small crustaceans secured at sea. After nesting it spends its time in the open ocean.

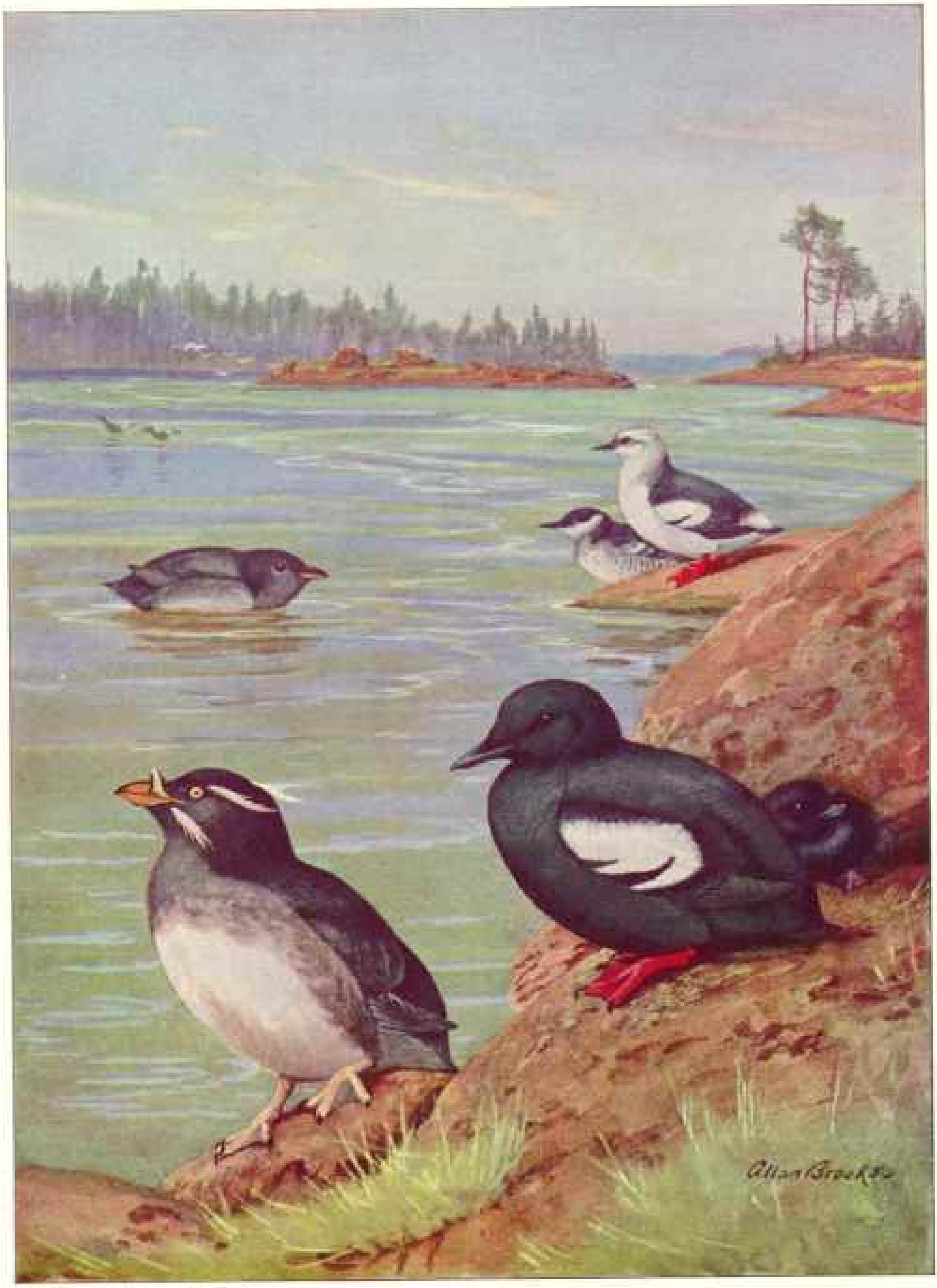
Paroquet Auklet

(*Cyclorrhynchus psittacula*)

This auklet, marked by white breast in conjunction with its comparatively large

THE ANCIENT MURRELET TAKES ITS NAME FROM ITS "GRAY HAIR"

White head markings of this bird (in flight) are fancifully supposed to resemble the hoary locks of age, hence the word "ancient." Numbers are killed by natives with clubs as they nest in the Aleutian and near-by islands. Sometimes found in company with them are Kittlitz's murrelet (right, in winter plumage), and the alert, shy, marbled murrelets (left, in winter dress; center, in summer).



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THE RHINOCEROS AUKLET WEARS ITS "HORN" ONLY FOR ORNAMENT

After the nesting season this strange northwestern bird (left foreground) sheds the bill protuberance, along with its nuptial plumes. Beyond, its young rests on the water like a block of wood, but can dive in a flash if alarmed. Pigeon guillemots of the Northwest (right) also are excellent divers. Behind the somber old one in summer dress hides a downy nestling. Farther away are a guillemot in cold-weather clothes (right) and its young in its first winter coat.

size, is a summer inhabitant of Bering Sea and adjacent waters, where it lives about rocky cliffs and islands in company with its relatives (Plate V).

In the Pribilof Islands the paroquet auklet arrives on its nesting grounds in early May. It lives unobtrusively, being quiet and rather solitary when compared with the least and crested species. Often it is seen resting on ledges, perhaps in little groups, and when startled flies out to circle about to another perch or pass out to sea. The curiously upturned bill marks it instantly.

The single white egg is deposited in some rock crevice on bare stones or pebbles, usually in some inaccessible spot.

Paroquet auklets feed at sea on small crustaceans and the other animals that form the association of creatures known popularly as "whale food." Like the crested auklet, they have beneath the tongue a pouch or sac in which they store food for later consumption or to carry to their young.

In winter these auklets remain at sea and then travel southward through parts of the North Pacific, so that they have a wider range than the related species, coming at this time even to the northwestern coasts of the United States.

The paroquet auklet nests from the coasts and islands of Bering Sea to Kodiak and eastern Siberia. In winter it is found south to the Kurile Islands and California.

Ancient Murrelet

(*Synthliboramphus antiquus*)

As our ship entered sheltered bays in the Aleutian Islands during early summer, we were certain to see little groups of these curious birds, resting quietly or swimming rapidly in line, one directly behind the other.

When I approached them in a small boat, they sometimes dived with a flirt of the wings and rowed away with quickly moving pinions beneath the surface, or rose to fly a short distance and then alight again.

Ordinarily they were tame and unsuspicious, and on close approach I never tired of admiring their beautifully contrasted markings. The name "ancient" is from a fanciful resemblance of the white head markings to gray hair (Plate VI).

The ancient murrelet gathers to breed on rocky islands, usually in company with other auklets and petrels. The birds are found in places in considerable numbers. They nest in a variety of situations, ranging from crevices and crannies in rock to burrows in masses of tangled grass, where they sometimes penetrate for several feet to form a little chamber neatly lined with grass blades. Elsewhere the eggs are placed on bare rock or earth, or even on ice in some abandoned puffin burrow.

The eggs, of good size, are whitish to buffy brown, marked evenly with spots and lines of dark brown, lilac, and lavender.

Within a day or two after hatching, according to Professor Harold Heath, the young birds, active as ducklings, come down to the shore, enticed by the calls of their parents, and boldly plunge into the ocean. Through the surf, breaking heavily on rocky coasts, they swim and dive with ease.

About their breeding colonies these birds are most active at night, and, when they are abundant, caution is sometimes necessary not to tread on them. Natives visit the rookeries for food and kill the birds with clubs. They also gather the eggs, in all stages of incubation, and the young.

Though I found the ancient murrelet in quiet bays in the Aleutian Islands, elsewhere they range the roughest waters and in winter live entirely at sea. At this season they migrate considerably, coming south to the coast of California. Here they may be found feeding on small crustaceans and other aquatic creatures about beds of kelp, or in similar quarters.

Off our northwestern coasts in winter they frequent sheltered coves or the open sea indifferently, though little noticed except by observant naturalists, as they remain in the water and seldom fly. At this season they are entirely quiet, though noisy and calling frequently in summer.

This species nests from the Aleutian Islands to Kodiak, the Queen Charlotte Islands, Forrester Island, and northern Japan. In winter it ranges to Baja California and Japan, being of casual occurrence at various interior points in the United States.

Kittlitz's Murrelet

(*Brachyramphus brevirostris*)

Though abundant in certain areas, Kittlitz's murrelet is so local in its range in American waters that few persons have seen it (Plate VI).

Specimens have been obtained in the Aleutian Islands, where in certain localities it is fairly common, and scattered individuals may be found in summer along the Pacific shores of the Alaska Peninsula. In Glacier Bay, Alaska, at the northern end of the inside passage, it is abundant.

This species is frequently found in company with the ancient and marbled murrelets, but is wilder and more difficult to approach. It flies or dives with celerity, and in the air moves with great swiftness.

To nest, the Kittlitz's murrelet flies inland and places its single egg on bare rock amid patches of snow on the high mountains. Often these are distant from the sea, the location being so unusual that the egg, olive or buff, spotted with brown, was not discovered until 1913. Then one was found near Pavlof Bay, on the Alaska Peninsula.

In winter this murrelet seems to retreat to Asiatic waters, though it is also possible that it frequents the open sea.

Marbled Murrelet

(Brachyramphus marmoratus)

Traveling up the inside passage to Alaska, the sharp-eyed observer may see small black and white birds flying swiftly just above the quiet surface of the water. They are shy and alert, and ordinarily take wing when the ship is still at some distance. Seldom are they seen near at hand.

These are the marbled murrelets, common and widely distributed along our western coasts, but birds of mystery so far as much of their life is concerned (Plate VI).

The marbled murrelet feeds mainly on small fish, taken skillfully by diving, and also eats small mollusks. In the water it is quick and graceful, diving with ease and often traveling some distance under the surface. It rises on the wing with equal facility and darts away swiftly, attaining high speed immediately.

In collecting specimens needed for the National Museum, I have found it difficult to approach.

In spite of the fact that the marbled murrelet is a common bird, its home life is still largely unknown, though many naturalists have devoted much time to an attempt to solve the riddle of its breeding.

In the Queen Charlotte group on the coast of British Columbia, nests have been reported 200 feet above the sea in burrows six feet deep or in deep crevices in rock, where the single egg rested on dry grass and leaves.

An egg ready to be laid, taken from a bird captured near Prince of Wales Island by George G. Cantwell and now in the National Museum, is pale yellow, spotted rather finely with black.

It appears that most of these murrelets may make their nests amid inland forests in hilly country back from the sea, though little is definitely known concerning this. Marbled murrelets have been seen at dusk headed inland high above the water, but in the darkness it has not been possible to follow them. Again, their calls have been heard at night in inland localities.

A young bird, only recently from the nest, was found dead in a road six miles inland from the coast of Oregon in 1918, and there are various similar reports.

After nesting, this murrelet comes south and then can be found in rough or quiet waters wherever food is abundant.

The marbled murrelet ranges in summer from Unalaska and Kodiak to northern California. In winter it occurs from Bering Sea to southern California.

Pigeon Guillemot

(Cepphus columba)

As a western representative of the black guillemot (Plate III), the present species is distinguished in life mainly by the wedge-shaped bar of black extending into the prominent white patch on the wing (Plate VII).

In the hand it is found to be larger, to have the under wing-coverts brownish gray instead of white, and to possess 14 tail feathers instead of the 12 of the black guillemot of the Atlantic coast.

Throughout the rocky coasts of southwestern Alaska, from Unga to far-distant Attu, I saw the pigeon guillemot along rough shores and in every harbor that we entered. Pairs or small companies rested on the water or perched on rocks.

As I came near, they rose with whistled calls and swung away in quick flight, deceiving in its rapidity. On land they stood upright, or relaxed to rest on the breast. The dark plumage, red feet, and bright red-lined mouth made a pleasing contrast of color.

The nests of this species may be placed in caves, crevices, or crannies, or, where waves have cut caverns that penetrate beyond the reach of light, on open ledges.

HUNGRY HAWKS TAKE HEAVY TOLL OF THESE LITTLE WEST COAST MARINERS

Xantus's murrelet, shown below with a downy chick, finds the best way to escape the marauders is by flying straight out to sea at terrific speed. These are more southerly members of the generally subarctic auk tribe. After severe storms California beaches are sometimes littered with the bodies of Cassin's auklet, pictured at the top with a fluffy offspring.

Elsewhere they utilize secure retreats beneath rough stones above the beaches, or may excavate burrows in clay banks above the water. The sites selected are secure and ordinarily may be reached, if at all, with difficulty. The two eggs vary from green to white and are marked boldly or finely with black, brown, and lilac.

Both parents assist in incubation, which is said to last three weeks. The young come into the world completely covered with soft down, black above and brown below.

Small fish taken by diving form the principal food. The birds are as expert beneath the surface as any of their companion species, flying under water with rapidly rowing wings and with red feet held straight out behind.

This species ranges from Bering Sea to Japan and southern California.

Rhinoceros Auklet

(Cerorhinca monocerata)

Even in a group of birds that seems to specialize in peculiarities of the beak, the rhinoceros auklet is strange and unusual (Plate VII).

The bill is fairly strong and arched, while from the base, like the front sight on a gun, projects a narrow, compressed plate that can have no other function than that of ornament. This is shed at the close of the nesting season, to grow again as the bird assumes its nuptial plumes the following spring.

Only for part of the year, therefore, does this strange bird warrant its name.

The rhinoceros auklet rests on the water like a block of wood, with neck drawn in and head on a line with the body, presenting a most curious appearance. Approach it by boat, and ordinarily it dives like a flash, traveling far beneath the water before showing itself again at the surface. Only seldom does it fly.

Through most of the year rhinoceros auklets are solitary and feed at some distance from shore. In the breeding season they gather in populous colonies, among which may be mentioned Destruction Island, on the coast of Washington, and Forrester Island, at Dixon Entrance, on the southern boundary of Alaska. Thousands of pairs come to nest in company on these steep-sided islands. About its colonies the rhinoceros auklet is active mainly at night, and the birds are seldom seen by day except when taken from their burrows.

They are reported to arrive at their breeding grounds en masse. One evening in spring the island may be silent, while on the next there is steady commotion as birds blunder heavily to the ground through the branches of trees and bushes, or, when safely landed, call and wail about the affairs of love that bring them thither.

They nest in burrows excavated from 8 to 20 feet through the earth, often ending at some depth in a chamber a foot long by seven or eight inches in diameter, lined with whatever vegetation may be at hand. From the main tunnel there are usually one or more short lateral passages, the use of which is not known. The large egg is white, sometimes plain, but more often spotted with brown, gray, and lavender.

Birds and eggs are eaten by Indians.

On Destruction Island the natives are said to thrust a wad of grass to the length of the arm down the nesting hole at dusk. As the birds arrive after dark and scuttle into their burrows, they are caught in this trap and hauled forth to be killed.

The food of this auklet consists of fishes and crustaceans. Though some forage near their colonies, others travel 60 miles or more to favorable feeding grounds.

The rhinoceros auklet nests from the Aleutian Islands to Washington and Japan, in winter ranging to Baja California.

Cassin's Auklet

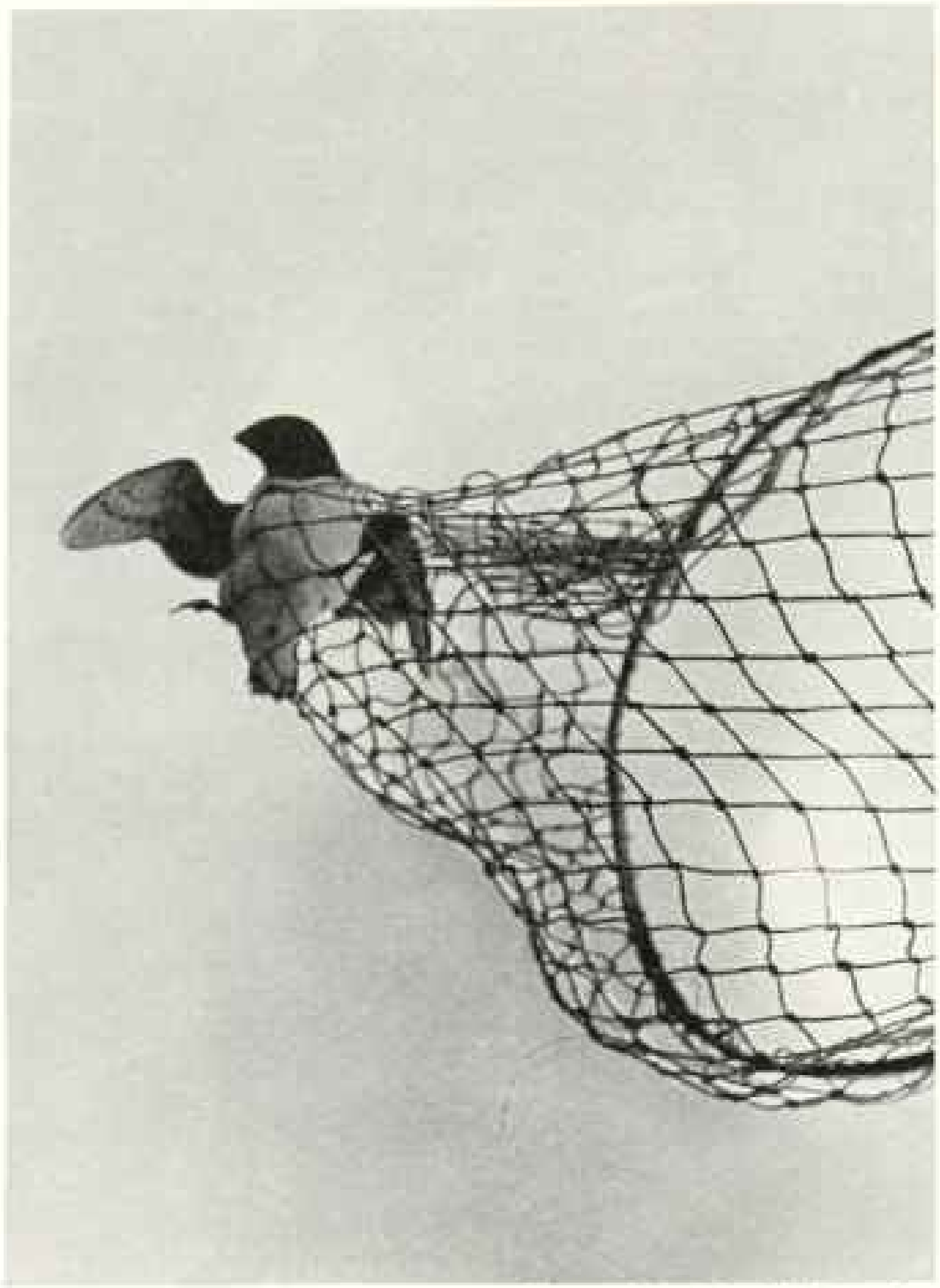
(Ptychoramphus aleuticus)

Landing on North Coronado Island, Mexico, southwest of San Diego, one morning in early May, I climbed the steep slopes and found a family of well-grown duck hawks huddled in a little hollow at the base of a rock near the summit. The parent falcons wheeled overhead, cackling angrily at my intrusion.

Meanwhile, other members of our party had scattered over the slopes below, where there were populous colonies of Cassin's auklets (Plate VIII).

Disturbed, these birds began flying out of their burrows to dash swiftly down to the sea. Instantly one of the duck hawks was after them, hurtling down from above and venting its anger by striking one after another until a dozen auklets had been killed.

On the coastal islands of California Cassin's auklet is one of the most common birds. It gathers in large colonies to nest



Photograph by Edward M. Weyer, Jr.

CAUGHT IN FULL FLIGHT! A SPEEDING DOVEKIE HITS THE UPSTRETCHED NET LIKE A FEATHERED BULLET

Once in the mesh, the bird has little chance of escaping. Wings and feet become tangled and the native netter kills his quarry with a swift bite on head or neck. The natives eat them without plucking, cleaning, or cooking (see illustration, page 121, and text, page 106).

and places its single egg in any cover that may offer, from a burrow specially excavated for the purpose, to a crevice in rock or a hollow beneath a board or stone. On its nesting grounds the bird normally is active at night, possibly to avoid hawks and similar dangers, so that one may look over slopes known to house many without seeing a single one.

At nightfall all this changes and the auklets come and go swiftly. The partners of each pair change places on the nest, and there is a constant buzzing and croaking from hosts of birds at rest.

As the nesting season is considerably prolonged, it is probable that more than one family is reared each year, accounting thus for the abundance of this species. After nesting the birds do not seem to travel far, as they are common in the vicinity of their breeding grounds. They seem, however, to remain mainly at sea.

Cassin's auklets suffer heavily during tempests. After severe storms hundreds may be found cast up, dead or dying, on southern California beaches.

This auklet nests from the Aleutian Islands to Baja California. In winter it is found north to Puget Sound.

Xantus's Murrelet

(Endomychura hypoleuca)

This interesting bird is named for the Hungarian naturalist, John Xantus (also known as Louis de Vesey), who found the first recorded individual at Cape San Lucas, Baja California, in 1859, while collecting specimens for the Smithsonian Institution. In recent years this murrelet has become better known, and its metropolis has been found to be in the islands off the coast of southern California (Plate VIII).

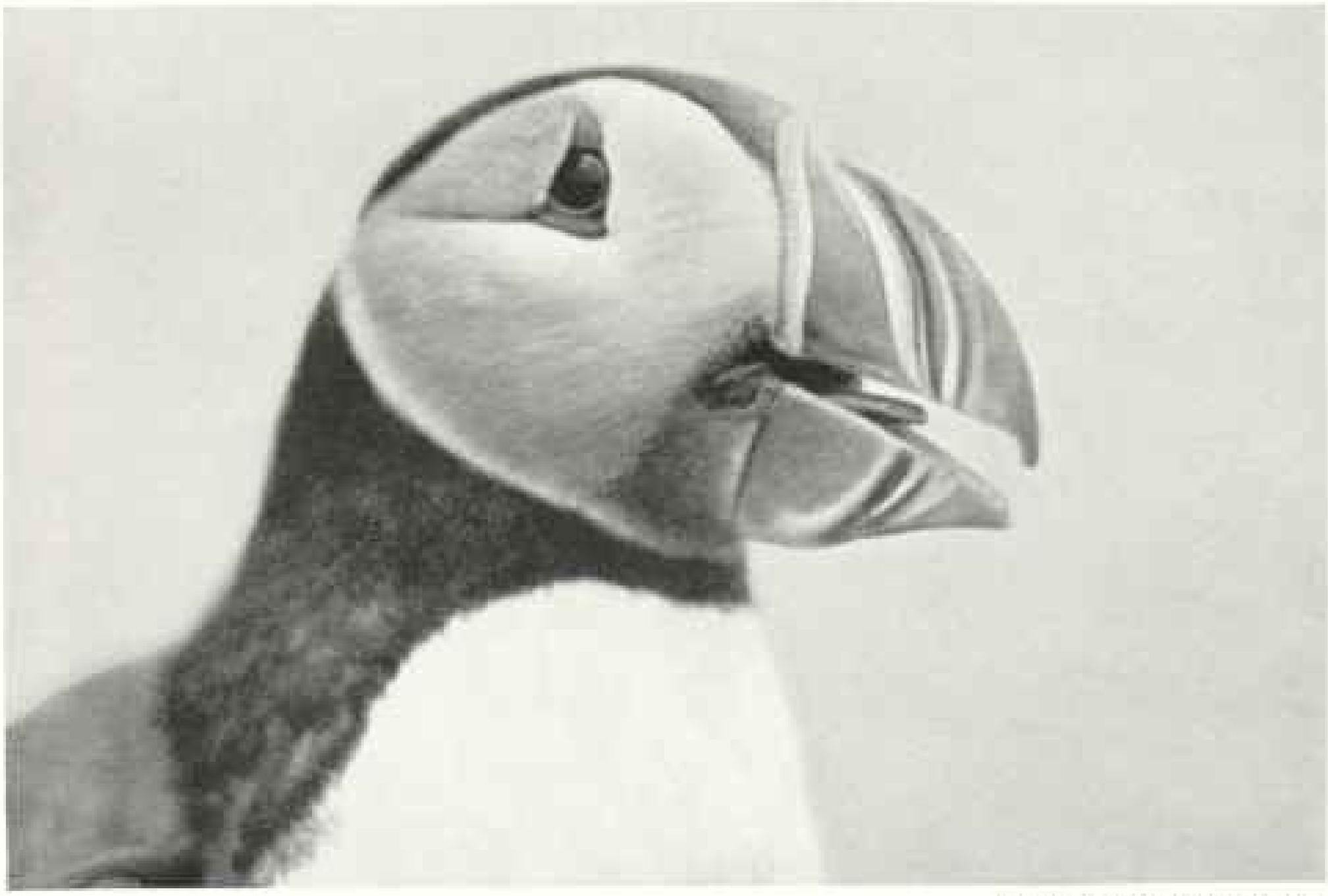
These birds are active about their nesting grounds only at night, when their twittering notes are heard. At other times they are seen only when frightened out. They fly with tremendous velocity straight to sea, as there they can escape the duck hawks that seem to be their worst enemies about their breeding grounds.

Nests of this bird are placed in caves, in

Photograph by Edward M. Weyer, Jr.

A HUNGRY ESKIMO BOY CATCHES ONE COURSE OF HIS DOVEKIE DINNER

The birds swarm past the crags along the sea in vast numbers, and fly so swiftly that they cannot easily dodge a net swung up suddenly in their path. Here at Cape York, Greenland, even the youngsters are marvelously adept at catching them. For an expert the "net-profit" is almost one hundred per cent. The "spare" is used in case the other net is broken.



Photograph by Alfred O. Gross

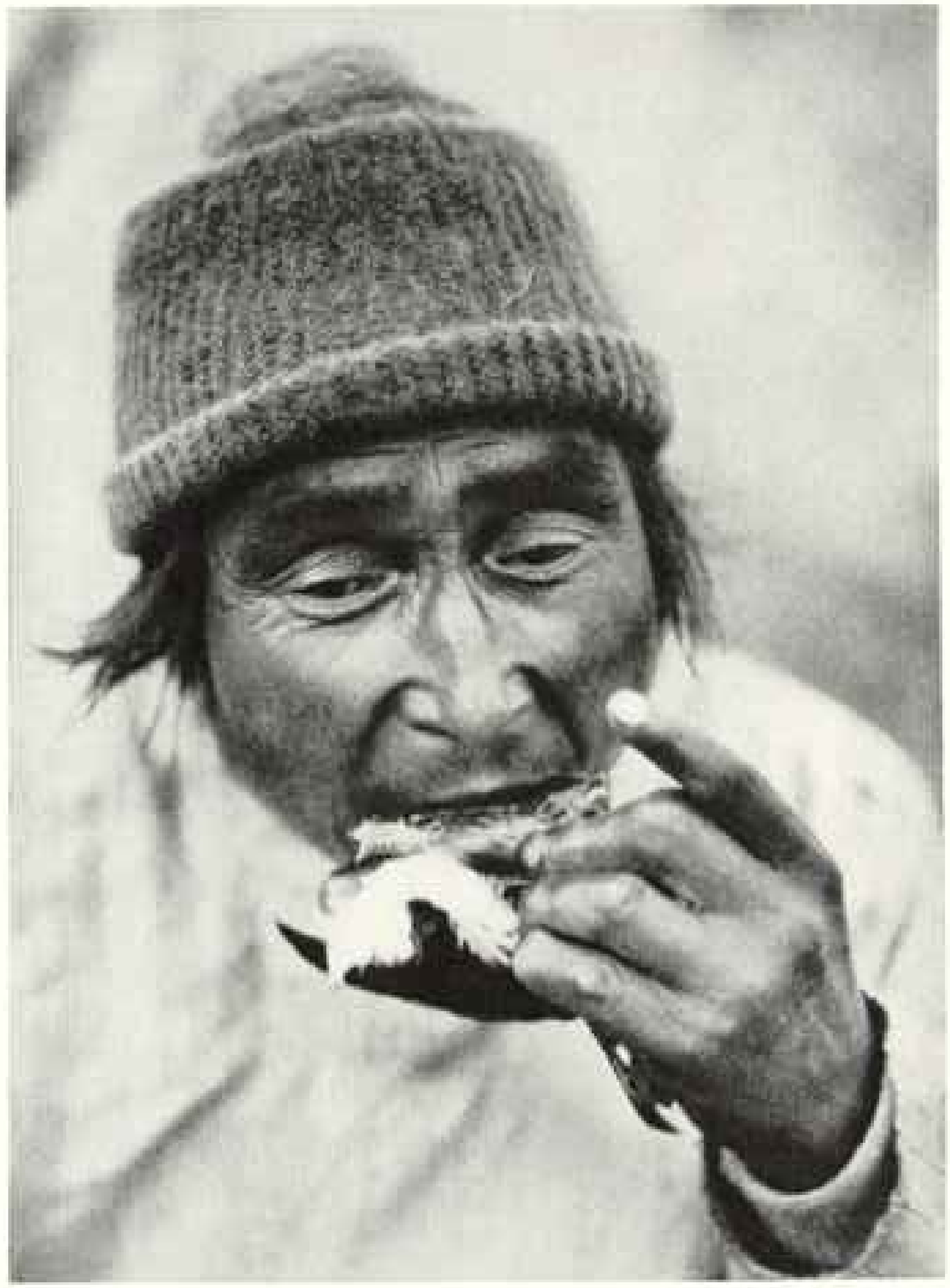
PRIDE AND PUGNACITY ARE REFLECTED IN THIS PUFFIN PORTRAIT

Several small fish can be caught and held side by side in the seemingly clumsy bill. Here it is slightly ajar, with the curious thickened tongue showing. Strong, heavy, and sharp-edged, the deeply ridged parrotlike beak makes a formidable weapon which can wound a man's hand severely. In summer the bill is colored yellow, grayish blue, and vermilion (see Color Plate III). After the nesting season the bright covering is shed in nine separate strips.

Photograph by Merl La Voy

PROUD MURRE PARENTS LEAD THEIR OFFSPRING DOWN OVER THE ROCKS TO THE WATER

On lonely Walrus Island in the Pribilofs is heard the low, deep-throated "murre" of myriad birds and the higher-pitched note of the youngsters. Soon young and old will be swimming about together and heading for the open sea. These murres appear tame, but if the man should approach them too closely or make a sudden threatening move they would scatter quickly.



RAW BIRD MEAT IS AN ESKIMO DELICACY—THE FEATHERS A NAPKIN

A native of Igloodahoury, Greenland, shows how the epicures of his people devour a dovekie (see illustrations, pages 118 and 119). He eats the breast and throws the rest away.

Photographs by Maynard Owen Williams

AT THE CONVENTIONAL RATE OF EIGHT BREASTS TO A PERSON, THIS GROUP NEEDED 48 BIRDS FOR A MEAL

Meat and eggs are eaten by these Etah, Greenland, natives, and the skins make warm shirts. When the little black and white dovekies come north in spring they seem to fill the sky (page 110).

Photograph by Alfred O. Gross

THIS PUFFIN IS EIGHT YEARS OLD—HOW DO WE KNOW?

The aluminum band on its leg tells the story (see "Bird Banding, the Telltale of Migratory Flight," by E. W. Nelson, NATIONAL GEOGRAPHIC MAGAZINE, January, 1928). Puffins bite and scratch so savagely that gloves need to be worn in handling them. The lighthouse keeper on a little Canadian island, where the bird was banded, says it has returned to the same nesting hole year after year. There are many such places, but that crevice is claimed and defended against all comers.

rock crevices, or in hollows under stones. Two eggs are laid, which vary widely in color, ranging from those with light-blue background, and a few spots of brown, to others so heavily marked that they present an almost uniform chocolate color.

The young, as soon as hatched, are active and alert, and within four days are led down the steep slopes by their parents to tumble finally into the sea. Here they swim and dive, being able when they first reach the water to travel several yards beneath the surface, and even to elude the rushing attacks of large fishes.

It seems marvelous that such tiny creatures can withstand the buffeting of the open seas. Yet young only a few days old have been found swimming with their parents several miles from land.

The adult birds suffer much on land from falcons, and on some islands cats have destroyed them. They are about their nesting grounds for several months in spring and summer, and it is believed that two broods of young are reared each year. After breeding the adults remain mainly at sea, but the majority do not wander far.

Xantus's murrelet is found along the western shores of Baja California, and on coastal islands of southern California north to Anacapa. Stragglers have been taken as far north as Mendocino County.

SPECIAL NOTICE

Members of the National Geographic Society are advised of the publication of a new musical composition entitled "The National Geographic Society March," composed and dedicated by Captain Thomas F. Darcy, leader of the United States Army Band, Washington. Copies of this stirring march, for piano, orchestra, and band, may be obtained from J. Fischer & Bro., musical publishers, at 119 West 40th Street, New York, N. Y.

THE NATIONAL GEOGRAPHIC SOCIETY AND ITS MAGAZINE

By Gilbert Grosvenor

President, National Geographic Society

THE National Geographic Society has just issued a Cumulative Index which reveals the vast store of information concerning the world, its peoples and creatures, published in the brilliantly illustrated pages of the National Geographic Magazine from 1899 to the past year.*

Almost unbelievable is the growth in the number of members of the National Geographic Society and the readers of its Magazine in that 36-year interval. When your present Editor and President was asked by Alexander Graham Bell to take charge of The Magazine, in April, 1899, The Society's membership was so small that he could carry the entire edition of one month on his back.

Today a single issue would form a pile more than five miles high, rivaling Mount Everest, or 50 piles, each as tall as the Washington Monument. The ink alone used in printing each issue weighs five and a quarter tons—as much as 70 men could carry.

In those early days it was customary to print in The Magazine the names and addresses of the members. To do so today in small type allowing 50 names to a page would require 20,000 pages, filling solidly more than 12 years of Geographics, without another word or a single picture.

Read by Five Million Persons

A welcome guest in a million homes, The Society's Magazine, with its appeal to all members of the family, is estimated to have reached each month during the last 15 years an average of 5,000,000 readers.

To collect, print, and distribute on such a scale the enormous reservoir of valuable geographic knowledge is a publishing labor of Hercules which no individual or small group of individuals would even undertake. The method by which it has been accomplished is as unique as the material itself, and the story is the remarkable history of the National Geographic Society.

Nowhere in the world is there another magazine exactly like the National Geographic. In its conception, contents, and policy it differs from any other publication. It is published and owned by a society of a million members organized for "the increase and diffusion of geographic knowledge." Its purpose is and always has been to promote science and education, and it educates in the most effective way by portraying this thrilling world and its life in clear, vivid, comprehensible manner, stripped of dull, technical verbiage, and mirrored in many striking pictures.

Who can even begin to estimate the cultural results of distributing this readable, easily understood, humanized, and picturized knowledge among millions of people, not only of the United States, but of foreign lands, decade after decade?

The Product of Many Minds

Some of the ablest minds in America have contributed their talents to the organization and building of The Society. Graduates of 35 colleges and universities now carry on its researches and editorial work.

The many millions of dollars required to publish these 36 years of Geographics have been supplied year after year by the dues of the members of the National Geographic Society, who have increased from 1,000, in 1899, to more than 1,000,000 in 1935. Their modest three-dollar annual dues pay for 12 numbers of The Magazine, with frequent maps and other supplements, and also sustain The Society's numerous scientific expeditions and researches.

Thus the National Geographic Society is a cooperative scientific research undertaking. Only by spreading first cost over a large edition could the many expensive and worth-while features have been provided. All The Society's activities, its Magazine, and its expeditions are sustained by the membership fees of its million members.

This extraordinarily large membership in a Society whose objects are entirely scientific and educational, in which the bond is intellectual, not religious or frater-

* The "Cumulative Index to the National Geographic Magazine, 1899 to 1934, inclusive," contains 12,522 entries of subjects, authors, and titles of articles. Thus the volume serves both as a key to the treasure-trove in The Geographic, and as a gazetteer of modern geography. It is obtainable by members at The Society's headquarters for $1.50, cloth-bound, and $1.00 paper-bound.

THIS STATELY STRUCTURE ON HISTORIC SIXTEENTH STREET IN WASHINGTON IS THE NATIONAL GEOGRAPHIC SOCIETY'S HOME

Here in a modern, air-conditioned building are housed The Society's editorial and executive headquarters, its library of 230,000 black and white and natural-color photographs from every part of the world, a completely equipped photographic laboratory, and Explorers' Hall, in which are preserved trophies of Geographic expeditions and enlargements from staff photographers' finest negatives. Hubbard Memorial Hall (extreme right), home of The Society during its early days, was presented as a memorial by the family of the late Gardiner Greene Hubbard, its first President (see text, pages 134, 152). It now houses The Society's fine library of geography and exploration.

nal or social, shows that the spirit of adventure and the desire to learn and help research are fairly universal.

The Society's membership rolls include not only hundreds of thousands of the country's most cultured and substantial people, but also hundreds of thousands of citizens possessing only modest educational and material advantages.

The lonely forest ranger, the clerk tied to his desk, the plumber, the teacher, the eight-year-old boy, and the octogenarian, cannot, like a Carnegie or a Rockefeller, send out their own expeditions, but they do enjoy having a part in supporting explorations conducted by their own Society and reading the first-hand accounts in their own Magazine.

THE SOCIETY'S FLAG BORNE ON ADVENTUROUS JOURNEYS

"Other than the flag of my country I know of no greater privilege than to carry the emblem of the National Geographic Society." With these words Rear Admiral Richard E. Byrd expressed his high regard for The Society's achievements in increasing, humanizing, and diffusing geographic information.

Among The Society's many significant contributions to science and popular education, we mention a few:

Archeological Expeditions. The Society's notable expeditions to New Mexico, by Neil M. Judd and Andrew E. Douglass, have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic, solving secrets that have puzzled historians for 300 years. The Society's expeditions to Peru have given the world much of its knowledge of the Incas.

Solar Radiation. To further the study of long-range weather forecasting, The Society appropriated funds to enable the Smithsonian Institution to maintain a solar radiation station in Africa for six years.

The Valley of Ten Thousand Smokes. After the eruption of the world's largest crater, Mount Katmai, The Society sent five expeditions to this Alaskan volcanic area. An eighth wonder of the world was discovered—the Valley of Ten Thousand Smokes—which has since been created a National Monument.

Saving the Giant Sequoia Trees. The Society and individual members purchased and presented to the Government 2,239 acres of the finest giant sequoia and other trees within the Sequoia National Park.

Carlsbad Cavern. The Society's expeditions explored and revealed to the world this largest and most beautiful known cavern, in New Mexico.

Exploration of the Stratosphere. The Society and the U. S. Army Air Corps jointly sponsored explorations of the stratosphere which have re-

EACH MONTH MORE THAN A MILLION GEOGRAPHICS ARE ADDRESSED AND SENT OUT FROM THE GEOGRAPHIC ANNEX BUILDING

In The Society's Annex, which occupies a city block in northeast Washington, a complete record of each membership is kept, and the huge daily mail of thousands of letters from members scattered all over the world is received and answered. Back numbers of The Magazine and The Society's publications, such as books, pictures, and maps, are preserved here. More than 500 employees, working in the Annex, take care of the membership nominations, mail out Certificates of Membership, and make the thousands of necessary changes of address for members.

sulted in the gathering of scientific data at the world record altitude of 72,395 feet above sea level.

Polar Research. The Society granted funds and scientific aid amounting to $75,000 to Admiral Byrd for his first exploration of the South Polar regions, and also cooperated with the second Byrd Antarctic Expedition. Admiral Byrd first gained experience in Arctic flying on the MacMillan Arctic Expedition, sponsored by The Society and the U. S. Navy. The Society subscribed a substantial sum to the historic expedition of Admiral Peary, who discovered the North Pole, April 6, 1909.

Trans-Asiatic Expedition. In 1931 the Citroën-Haardt Trans-Asiatic Expedition, with The Society cooperating, crossed Central Asia from the Mediterranean to the Yellow Sea. Long-hidden phases of life along 7,370 miles of historic caravan routes were studied and recorded for posterity.

A LIBRARY OF PERMANENT INTEREST

When bound, the 432 issues from 1899 through 1934 form a library of 55 large volumes of considerable monetary value. For a complete set collectors pay hundreds of dollars. Yet a person joining The Society at its formation in 1888 and continuing a member until 1935 would have received this entire collection for $88 in dues; or a life membership might have been purchased in 1888 for $50. It is hard to conceive of a better dividend-paying investment, even when only the financial aspect is considered and the incalculable cultural and entertainment value is ignored.

In collecting GEOGRAPHICS many persons have found an absorbing and sometimes remunerative pursuit. A single number published in the early years may bring from seven to eighty dollars, depending upon its condition and the scarcity of the particular issue.

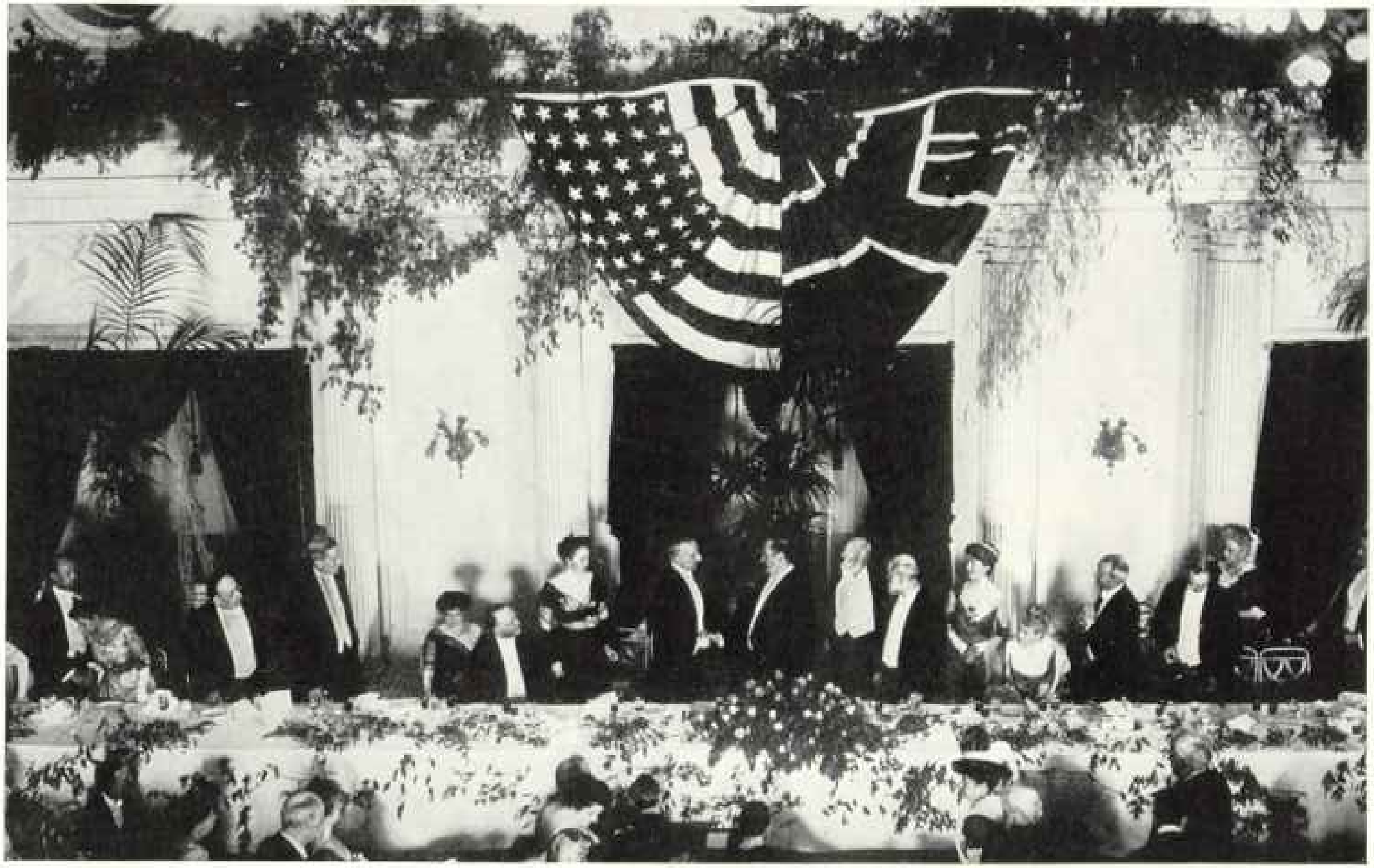
A copy of THE GEOGRAPHIC rarely outlives its interest. Few indeed ever find their way back to the paper mills. The quality of the paper is so excellent that numbers printed more than a quarter of a century ago are still as sound and legible as when they were issued. More volumes of THE GEOGRAPHIC are bound than of any other magazine, and the binding of GEOGRAPHICS has become a big business.

The bound copies are constantly consulted by students, teachers, travelers, artists, scientists, persons in a hundred walks of life. Most large public libraries, schools, and numerous individuals have complete or nearly complete files; and to make the voluminous contents more readily accessible, the Cumulative Index is issued.

The subject matter covers almost the entire range of Nature, from the ant to the elephant, from the humming bird to the trumpeter swan, from tiny tropical fish to the gigantic whale, from the microscopic

THE FIRST MEETING OF THE NORTH AND SOUTH POLES!

On this historic occasion Robert E. Peary, discoverer of the North Pole (4), greeted Roald Amundsen, discoverer of the South Pole (3), at the home of the National Geographic Society, January 11, 1915. Others in the group include J. J. Jusserand, the French Ambassador (2), James Bryce, the Ambassador from Great Britain (31), the Attorney General, George W. Wickersham (13), the Minister from Norway (14), Hiram Bingham, leader of the Yale-National Geographic Society Expedition to Peru (16); Officers and Board of Managers of the National Geographic Society: President Henry Gannett (1), Colonel Henry F. Blount (6), Dr. Alexander Graham Bell (7), Mr. John Joy Edson, Treasurer (8), Rear Admiral John E. Pillsbury (9), Gilbert H. Grosvenor, Director and Editor National Geographic Society (10), George Otis Smith, Director U. S. Geological Survey (11), Rear Admiral C. M. Chester (12), O. H. Tittmann, Vice President, and Supt. U. S. Coast and Geodetic Survey (22), L. A. Bauer, Director Department of Terrestrial Magnetism Carnegie Institution (15), Franklin K. Lane, Chairman Interstate Commerce Commission (18), Rudolph Kauffmann, Managing Editor Washington *Evening Star* (20), Brigadier General John M. Wilson, former Chief of Engineers, U. S. A. (21), C. Hart Merriam (29), Charles J. Bell, President American Security & Trust Co. (23), David Fairchild, Agricultural Explorer (24), George Shiras, 3d, former member of Congress and wild-game photographer (25), John Oliver La Gorce, Assistant Editor NATIONAL GEOGRAPHIC MAGAZINE (26), George R. Putnam, U. S. Commissioner of Lighthouses (27), Frederick B. Eichelberger, Assistant Treasurer National Geographic Society (28), Frederick V. Coville, President Washington Academy of Sciences (31), Dr. S. N. D. North (32), T. L. Macdonald, M. D. (33), Edwin P. Grosvenor, Special Assistant to the Attorney General (30), Peter Stuyvesant Pillot (17), and Julien A. Ripley (19) of New York.



ADMIRAL ROBERT E. PEARY, DISCOVERER OF THE NORTH POLE, PRESENTS TO ROALD AMUNDSEN, DISCOVERER OF THE SOUTH POLE, THE SPECIAL GOLD MEDAL OF THE NATIONAL GEOGRAPHIC SOCIETY, JANUARY 11, 1913

The others in the group at the table, beginning on the extreme left, are: The Chinese Minister, Mr. Chang Yin Tang; Madame Chang; the Bolivian Minister, Señor Don Ignacio Calderon; Hiram Bingham; Mrs. Robert E. Peary; Representative William C. Redfield; Mrs. Walter L. Fisher; Roald Amundsen; Robert E. Peary; the British Ambassador, James Bryce; Henry Gannett, President National Geographic Society; Madame Jusserand; Mrs. Bryce; the French Ambassador, J. J. Jusserand; the Secretary of the Interior, Walter L. Fisher; Mrs. William C. Redfield; the Minister from Norway, Mr. H. H. Bryn.

spores of mold to the mighty eucalyptus and sequoia trees. It deals with nearly every part of the earth, from the teeming pavements of New York and London to equatorial jungle and polar wastes.

Here, in a photograph, a solitary Moslem kneels beside his camel amid the dreary dunes of the desert, turns his face toward far-away Mecca, and strikes his turbaned brow against the sands in obeisance at the hour of prayer. There, a handsome Romanian peasant girl, barefoot, in gaily embroidered dress, strides through the cool waters of a mountain stream, her water pitchers swinging from a stick across her shoulder, the joy of living in her eye and step; perhaps she is in love.

Such pictures leave an unforgettable impression. As an old Chinese proverb has it, they are more eloquent than 10,000 words!

EXTRAORDINARY PICTORIAL RECORDS

Even more important than their esthetic appeal is the educational, scientific, and historical value of THE GEOGRAPHIC's pictures, which contribute not only to current information but also to man's accumulated store of knowledge.

For historians, ethnologists, and scientists of future generations, The Society's rich album of natural-color photographs—reproduced for us and posterity in The Magazine by four-color photo-engraving—will constitute a priceless, not-to-be-duplicated record, authentic in proportion and tint, of the dress, scenery, architecture and daily life of the civilized nations and isolated tribal communities of the present age. Already thousands of costumes have been copied from these pages.

In The Society's library is a complete index and cross index to every picture The Magazine has ever printed. It contains nearly 200,000 cards. In another part of The Society's headquarters its priceless collection of more than 208,000 unpublished photographs reposes in 350 asbestos-lined fireproof cases.

Among The Society's pioneering achievements in photography—in the laboratory and in the field—are these:

1. First to make and publish natural-color photographs of Arctic life; first magazine publication of aerial pictures of the North Pole and of aerial photographs of the South Pole.

2. George Shiras, 3d, a Trustee of The Society, made the first flashlight pictures of wild animals in their natural habitats.

3. Capt. Albert W. Stevens, conducting scientific observations for The Society, took the first photograph showing laterally the curvature of the earth, and important aerial photographs of the advancing shadow of the moon on the earth's surface during an eclipse of the sun. On the National Geographic Society-U. S. Army Air Corps Stratosphere Flight of 1934, he took the world's highest altitude photograph of the earth. All were published exclusively in THE GEOGRAPHIC.

4. First successful natural-color photographs undersea, by Charles Martin, Chief of The Society's Photographic Laboratory; the first extensive series of successful natural-color photographs of aquarium fishes in action, by Edwin L. Wisherd, of the photographic staff.

5. First natural-color photographs from the air, by Melville Bell Grosvenor, an Assistant Editor of The Magazine.

6. First to take and publish natural-color photographs of the Valley of Ten Thousand Smokes and the Mount Katmai volcanic region in Alaska, by Robert F. Griggs, leader of six Geographic Society Alaska expeditions.

7. First to take and publish an extensive series of natural-color photographs of the United States, by Clifton Adams, Franklin Price Knott, Jacob Gayer, B. Anthony Stewart, Richard Stewart, and Edwin L. Wisherd, all of The Society's staff.

8. W. Robert Moore, of The Society's staff, made the only natural-color photographs of the coronation of the Emperor of Ethiopia, took the first natural-color photographs of hill tribes of Burma and Siam, and the first extensive series of natural-color photographs of South America ever published.

9. The first natural-color photographs in regions of the Tibetan borderlands, by Joseph F. Rock, leader of Society expeditions.

10. The first progressive series of photographs from the Mediterranean to the Yellow Sea, by Maynard Owen Williams, Chief of the Foreign Editorial Staff.

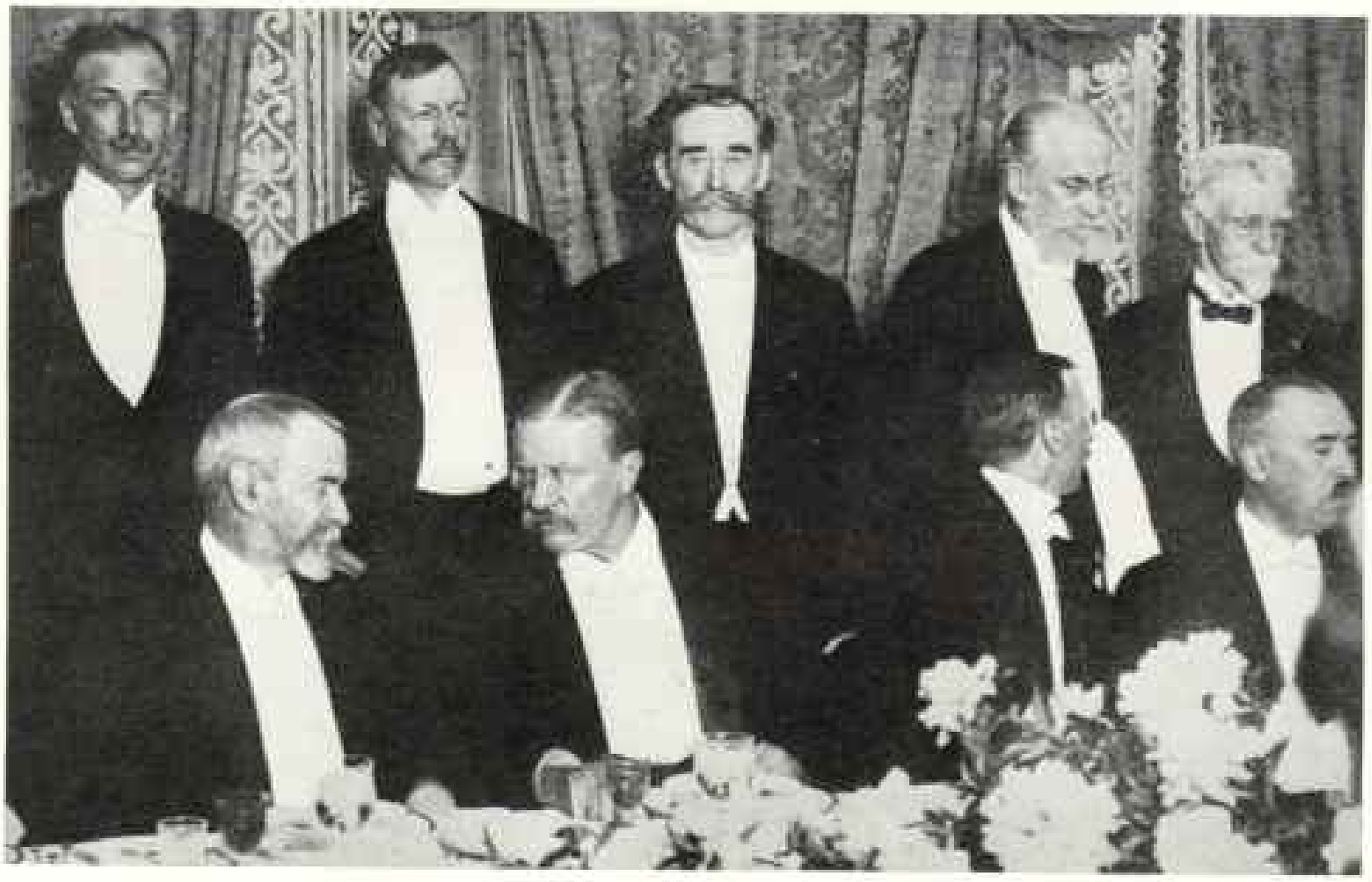
11. The first comprehensive color photographs of European countries, by Gervais Courtellemont, Hans Hildenbrand, Luigi Pellerano, and Wilhelm Tobien.

The NATIONAL GEOGRAPHIC is the only magazine that systematically photographs in natural colors. It reproduces more full-color photographs than any other publication.

One issue may carry the reader up the Andes. Another may show him the splendors of the Taj Mahal, or picture strange, exotic peoples in the fastnesses of Tibet. Opening a volume at random, he finds 800 flags of the world reproduced in color. In another are all the breeds of dogs.

OPENS MILLIONS OF EYES TO NATURE'S WONDERS

In transporting its members in fancy to far places THE GEOGRAPHIC has not lost sight of the wonderland of Nature which lies at every man's door. Through its efforts millions of eyes have been opened to the beauties of the forests and national parks, the birds, wild flowers, and ani-



© Harris & Ewing

A GEOGRAPHIC LUNCHEON IN HONOR OF COLONEL THEODORE ROOSEVELT

On his return from his explorations in Africa in 1910 and again from South America in 1914, Colonel Roosevelt gave to the National Geographic Society in Washington his first public lecture, announcing his discoveries. From left to right, seated—J. J. Jusserand, the French Ambassador; Colonel Theodore Roosevelt; Gilbert Grosvenor, Director and Editor National Geographic Society; Juan de Riano, the Spanish Ambassador. Standing—Frederick V. Coville; George Shiras, 3d; Admiral Robert E. Peary; General A. W. Greely, and General John M. Wilson, members of the Board of Managers (now the Board of Trustees) of the National Geographic Society.

mals, the wonders of plant and insect life. Notable is the current series of paintings by Maj. Allan Brooks of the birds of North America, with accompanying human-interest biographies of these feathered neighbors by persons of wide reputation in this field.

From a page in one of the earlier volumes peers a surprised wildcat, bathed in the dazzling brightness of a photographic flash. His debut in THE GEOGRAPHIC marked the beginning of the publication of the valuable series of photographs made by Mr. Shiras, inventor of methods of taking pictures of wild animals at night by flashlight, and for 10 years the sole photographer to make such pictures.*

As the first successful photographer of wild life by day or night, he did much to popularize the sporting and absorbing game of hunting birds and animals with a camera, and making them take their own photographs.

In another early issue appear the awe-inspiring "monsters of our back yards," mere grasshoppers and other small insects, but fearsome, strangely made, absorbing creatures as pictured in greatly enlarged photographs taken by Dr. David Fairchild, another veteran member of The Society's Board of Trustees.

HISTORIC NARRATIVES OF AVIATION AND EXPLORATION

Beginning with Alexander Graham Bell's historic papers on man-lifting kites and aerial locomotion, THE GEOGRAPHIC has published more about aviation than any other magazine of general circulation.

In its pages are recorded in word and picture the personal narratives of explorers and trail-blazers by land, sea, and air from Peary and Amundsen to Byrd and Lindbergh. Among these gripping first-hand stories are those of Captain Stevens of the National Geographic Society-U. S. Army Air Corps Stratosphere Balloon Ex-

* The Society has just published "Hunting Wild Life with Camera and Flashlight," by George Shiras, 3d, with 950 of the author's remarkable photographs, in 2 volumes, each volume containing 475 pages. The set of two volumes is available to members at The Society's headquarters for $5.

peditions, Dr. Hugo Eckener of the *Graf Zeppelin*, Stefansson, Shackleton, De Pinedo, Nobile, Dargue, Auguste Piccard, Kingsford-Smith, Ross Smith, Macready, Mittelholzer, Alan Cobham, Amelia Earhart, Anne Morrow Lindbergh (page 160).

In the files of THE GEOGRAPHIC you will find General Goethals' account of the building of the Panama Canal.

Here, too, are the travel observations of statesmen — Taft, Theodore Roosevelt, Bryce, Coolidge, Curzon, Jusserand, Root, Grew, Bingham, Castle; of men of letters— Joseph Conrad, Donn Byrne, Scott O'Connor, A. J. Villiers; the work of famed naturalists and scientists—Alexander Graham Bell, S. P. Langley, Ditmars, Beebe, Chapman, Coville, Morley, Shiras, Nelson, Griggs, Jaggar, Rock, Andrews, Abbot, Greely, Allen, Murphy, Mann, Wetmore.

Noteworthy contributions to the understanding of our Nation both by its citizens and by members abroad are THE GEOGRAPHIC's important series of articles on the States and chief cities of the United States. Beginning with John Oliver La Gorce's article on Pennsylvania, the series of State stories now has covered more than half of the 48 Commonwealths of the Union, and represents the most comprehensive task of its kind ever undertaken.

There are many articles on islands, some remote and seldom visited. Among them are Falcon Island, a "hide and seek" spot of land in Polynesia which literally has its ups and downs; Bogoslof, another volcanic jack-in-the-box; lonely Easter Island, with its mystifying statues reared by a vanished people; Juan Fernandez, the Robinson Crusoe island; Yap and the other Pacific islands under Japanese mandate. There are also articles on islands nearer home, "The Isle of Capri," about which so much has been sung, the Channel Islands, Malta, the Orkneys, Cyprus, Guale, etc.

With progress in archeological exploration The Magazine has kept step, year by year.

From Nebuchadnezzar's Palace at Babylon, where the Hand wrote on the Wall, to the tomb of King Tutankhamen, to the ancient Harem of Xerxes at Persepolis, to Maya temples in Mexico, Inca ruins in Peru, and pueblos in our own Southwest dated by the tree-rings in their charred and weathered beams, the story of modern science's steady uncovering of mysterious lost civilizations is carefully recorded.

A clear, up-to-date picture of this changing world is brought to members from time to time by special large map supplements in color, made by The Society's own cartographers with infinite care and ingenious methods. No expense in time, money, or effort is spared to make these maps equivalent to many volumes of reference information. A million copies of each are printed.

Maps are the shorthand of geography, and special processes make it possible to concentrate into those issued by The Society a maximum of material without crowding and with a clarity of lettering that has been the envy of cartographers in other parts of the world. By a specially devised technique place names are photographed onto the map instead of being printed. Paper and inks are carefully selected to insure the perfection and durability of the finished product.

Sometimes the big color presses are stopped in full stride to make a change in the name or the status of an area in the light of last-minute developments on the world stage. Many a place which is of peculiar and particular interest, but too small to be shown on most maps, will be found on those of The Society.

Since March, 1915, this cartographic work has been directed by Albert H. Bumstead. It was Mr. Bumstead who invented the sun-compass which Admiral Byrd used on his polar flights. "Without it," Byrd declared, "we could not have reached the Pole."

Constantly The Society and The Magazine are declaring dividends to their million member-owners in a finer, fatter publication, in worth-while map and pictorial supplements, in the fruits of far-seeing, long-visioned exploration in the stratosphere high above the earth, in the lower depths of the sea where no man before has gone alive, in Antarctica, "the last continent of adventure."

THE GEOGRAPHIC'S GROWTH TO A NATIONAL INSTITUTION

When all this is considered, it is easy to understand why so few members resign from The Society, why membership fell off by only a small percentage during the late depression, and why the roster of members is rapidly mounting again, with the total well beyond the million mark.

Instead of the tiny, one-room office shared with another scientific organization

in April, 1899, The Society's executive staff now is housed in a handsome group of air-conditioned buildings, one of the finest in Washington, and owned by The Society, to which visiting members from all over the world are constantly being welcomed (see pages 124-5). Instead of a single paid employee The Society has some 700. Instead of debts it has a substantial reserve fund for exploration and research, built up by careful business management out of the small annual dues of members, and a valuable asset in its renowned Magazine.

The Editor is now in his 37th year of service as such. He can well remember his first visit, on April 1, 1899, to The Society's headquarters, which was half of a small rented room on the fifth floor of the Corcoran Building in Washington.

The little space of which he, age 23, was to assume charge was littered with old magazines, newspapers, and a few books of records, which constituted the only visible property of The Society. The treasury was empty, and had incurred a debt of nearly $2,000 by the expenditure of its life-membership fees to keep alive.

The National Geographic Society had been organized in 1888. At that time Grover Cleveland was nearing the end of his first administration. Life in Washington moved at a pace attuned to horses' hoofs and carriage wheels instead of speeding motor cars and airplanes. Movies and radio were not yet born.

Among a small group of public-spirited scientists an idea stirred. To other thoughtful, serious-minded men in January, 1888, went the following note, brief, unpretentious, but laden with portent, for it was the first step in formation of a society which one day would extend its membership and its scientific influence around the world:

> "Dear Sir: You are invited to be present at a meeting to be held in the Assembly Hall of the Cosmos Club, Friday evening, January 13, at 8 o'clock, for the purpose of considering the advisability of organizing a society for the increase and diffusion of geographic knowledge.
>
> Very respectfully yours,
>
> Gardiner G. Hubbard
> A. W. Greely
> J. R. Bartlett
> Henry Mitchell
> Henry Gannett
> A. H. Thompson"

General Greely, in his nineties, was still an honored member of The Society's distinguished Board of Trustees when he died, October 20, 1935.

The invitation struck a responsive chord, and 33 men met at the Cosmos Club. The meeting was called to order by Professor Thompson, who stated its objects and nominated Capt. C. E. Dutton as chairman. In the subsequent discussion of the formation of a geographic society, Messrs. Hubbard, Bartlett, Thompson, Mitchell, Kennan, Gannett, Merriam, and Gore took part.

C. Hart Merriam and J. Howard Gore are valued members of The Society's Board of Trustees to this day.

The following resolution, introduced by Professor Thompson, was adopted:

> "*Resolved:*
>
> 1. As the sense of this meeting that it is both advisable and practicable to organize at the present time a geographic society in Washington.
>
> 2. That this society should be organized on as broad and liberal a basis in regard to qualifications for membership as is consistent with its own well-being and the dignity of the science it represents.
>
> 3. That a committee of nine be appointed by the chairman to prepare a draft of a constitution and plan of organization, to be presented at an adjourned meeting to be held in this hall on Friday evening, January 20, 1888."

A committee for formulating a plan of organization was appointed, consisting of Messrs. Hubbard, Greely, Bartlett, Mitchell, Kennan, Thompson, Gore, Tittmann, and Merriam.

In this list appears the name of still another of The Society's present Trustees, O. H. Tittmann.

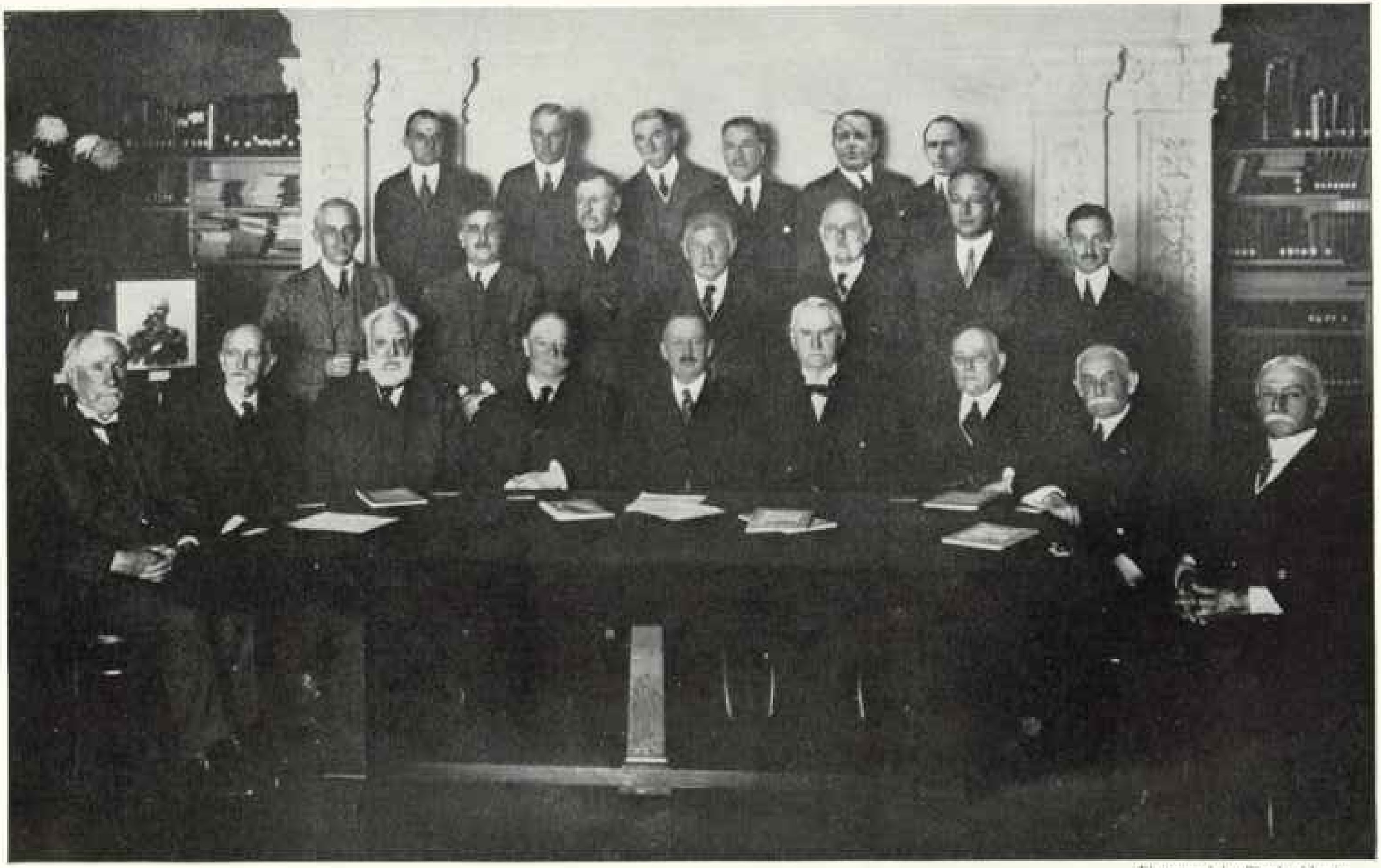
A subsequent meeting was held on January 20, at which it was decided to incorporate The Society, and the same committee was continued to carry out that purpose. On January 27 The Society was incorporated, the following men signing the certificate of incorporation:

Gardiner G. Hubbard	J. W. Powell
C. E. Dutton	Henry Gannett
O. H. Tittmann	A. H. Thompson
J. Howard Gore	A. W. Greely
C. Hart Merriam	Henry Mitchell
J. R. Bartlett	George Kennan
Rogers Birnie, Jr.	Marcus Baker
Gilbert Thompson	

On the same day the first meeting of The Society was held in the Assembly Hall of the Cosmos Club, when it was organized

AT THE MOMENT OF THE UNVEILING OF THE PEARY MEMORIAL IN ARLINGTON NATIONAL CEMETERY, ON APRIL 6, 1922

On the platform from right to left: The Secretary of State and Mrs. Hughes; William Howard Taft, the Chief Justice of the United States, who was President of the United States when the North Pole was discovered, and upon whose recommendation to Congress the explorer was created a Rear Admiral; the Ambassador of France and Mme. Jusserand; Dr. Gilbert Grosvenor, President of the National Geographic Society; the President of the United States and Mrs. Harding; Mrs. Robert E. Peary, Dr. E. W. Nelson, Captain Robert A. Bartlett; Edwin Denby, Secretary of the Navy; and the Reverend Dr. Charles Wood. Partly concealed by the flag (at the right) is Colonel Theodore Roosevelt, Jr., Assistant Secretary of the Navy.



Photograph by Charles Martin

THE BOARD OF TRUSTEES OF THE NATIONAL GEOGRAPHIC SOCIETY AT ITS MEETING DECEMBER 14, 1921, IN HUBBARD MEMORIAL HALL

Front row, reading from left to right: James Howard Gore, O. H. Tittmann, Alexander Graham Bell, William Howard Taft, Gilbert Grosvenor, Henry White, John Joy Edson, C. M. Chester, O. P. Austin. Second row: David Fairchild, George Otis Smith, George Shiras, 3d, Rudolph Kauffmann, Charles J. Bell, Frederick V. Coville, George R. Putnam. Top row: E. Lester Jones, Stephen T. Mather, T. L. Macdonald, Grant Squires, John Oliver La Gorce, George W. Hutchison. (Absent because of illness: A. W. Greely, C. Hart Merriam, S. N. D. North.)

Photograph by Acme

PRESIDENT HOOVER PRESENTS THE NATIONAL GEOGRAPHIC SOCIETY'S MEDAL TO AMELIA EARHART

Mrs. Hoover has been a member of The Society since April 18, 1902. The Society's Magazine followed her on all her travels with Mr. Hoover to India, China, Siberia, Australia, Europe, South Africa, etc. From left to right are: Gilbert Grosvenor, President Hoover, Amelia Earhart Putnam, and Mrs. Hoover. In the back row: George Palmer Putnam and John Oliver La Gorce, Vice President of The Society.

by the election of the following officers and the adoption of by-laws:

President

GARDINER G. HUBBARD

Vice Presidents

HERBERT G. OGDEN — A. W. GREELY
J. R. BARTLETT — C. HART MERRIAM
A. H. THOMPSON

Treasurer

CHARLES J. BELL

Recording Secretary

HENRY GANNETT

Corresponding Secretary

GEORGE KENNAN

Managers

CLEVELAND ABBE — W. D. JOHNSON
MARCUS BAKER — HENRY MITCHELL
ROGERS BIRNIE, JR. — W. B. POWELL
G. BROWN GOODE — JAMES C. WELLING

The number of members who joined The Society at its organization was 165.

"I am not a scientific man, nor can I lay claim to any special knowledge that would entitle me to be called a 'geographer,'" said President Hubbard in his first introductory address. "I owe the honor of my election as President of the National Geographic Society simply to the fact that I am one of those who desire to further the prosecution of geographic research. I possess only the same general interest in the subject of geography that should be felt by every educated man.

"By my election you notify the public that the membership of our Society will not be confined to professional geographers, but will include that large number who, like myself, desire to promote special researches by others, and to diffuse the knowledge so gained among men, so that we may all know more of the world upon which we live.

"By the establishment of this Society we hope to bring together (1) the scattered

workers of our country, and (2) the persons who desire to promote their researches. In union there is strength, and through the medium of a national organization, we may hope to promote geographic research in a manner that could not be accomplished by scattered individuals, or by local societies; we may also hope—through the same agency—to diffuse the results of geographic research over a wider area than would otherwise be possible."

A MODEST MAGAZINE MAKES ITS DEBUT

A few months later, early in 1889, appeared a slim little scientific brochure—Volume I, No. 1, of the NATIONAL GEOGRAPHIC MAGAZINE. Between its paper covers of a terra cotta shade were such articles as these: "Geographic Methods in Geologic Investigation"; "The Classification of Geographic Forms by Genesis." It was earnest, serious, studious, thorough, but it bore little relation to the brilliantly illustrated periodical that it would some day be. It did not even undertake to come out at more than "irregular intervals." On the first two pages was this announcement:

> The "National Geographic Society" has been organized "to increase and diffuse geographic knowledge," and the publication of a Magazine has been determined upon as one means of accomplishing these purposes.
>
> It will contain memoirs, essays, notes, correspondence, reviews, etc., relating to geographic matters. As it is not intended to be simply the organ of The Society, its pages will be open to all persons interested in geography, in the hope that it may become a channel of intercommunication, stimulate geographic investigation, and prove an acceptable medium for the publication of results.
>
> The Magazine is to be edited by The Society. At present it will be issued at irregular intervals, but as the sources of information are increased the numbers will appear periodically.
>
> The National Capital seems to be the natural and appropriate place for an association of this character, and the aim of the founders has been, therefore, to form a National rather than a local society. . . .
>
> But there is no limitation to the number of members, and it will welcome both leaders and followers in geographic science, in order to better accomplish the objects of its organization.
>
> October, 1888.

After several years of irregular publication, the Board decided to issue The Magazine every month, beginning January 1, 1896, and to make efforts to increase the circulation by placing it on the newsstands.

In December, 1897, Gardiner Greene Hubbard died, and his distinguished son-in-law, Alexander Graham Bell, inventor of the telephone, accepted the presidency in January, 1898.

Meanwhile, the plan to popularize The Magazine and increase the subscriptions had failed. By the end of the year The Society was badly in debt, and the Board much discouraged.

But President Bell was not disheartened. He maintained that geography was a most interesting subject and that the public would support a geographic magazine, provided the matter was presented entertainingly. The first step, he asserted, was to engage and pay a person to devote his entire time to the editorial work and to promote the membership. Heretofore, these duties had been performed by a committee of very busy and distinguished men who gave their services without remuneration.

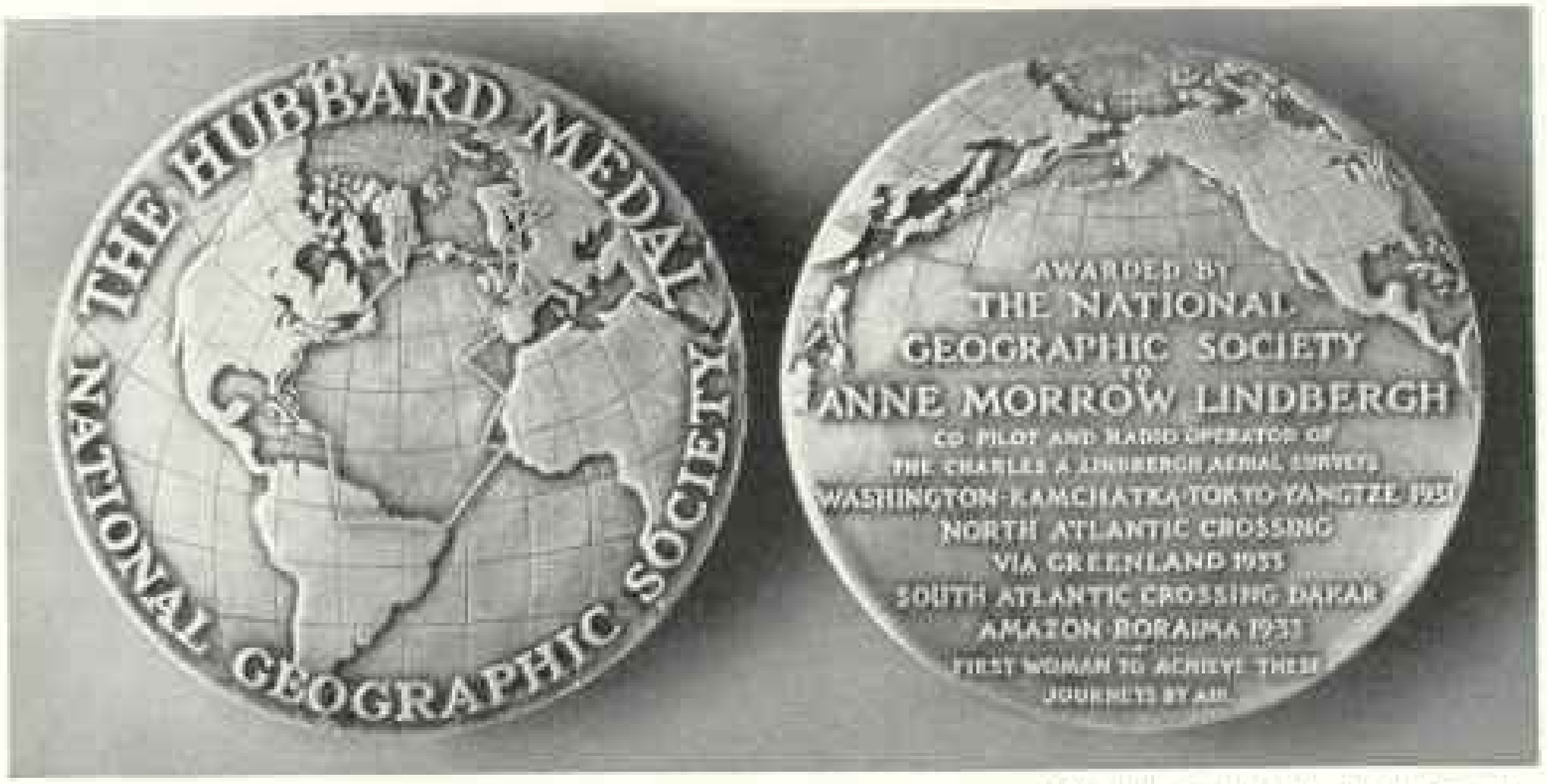
The second step, said Dr. Bell, was to discontinue efforts to obtain subscribers to a magazine. In place of subscribers an effort should be made to get *members* of a society who would believe in the project and help it.

At that time The Society had two classes of members: (a) active or local members who lived in the District of Columbia, paid $5, and attended the lectures and received The Magazine; and (b) non-resident or corresponding members who paid $2, and got The Magazine only. Dr. Bell advised that the distinction between resident and non-resident members be abolished, arguing that people disliked to be classed as non-resident or corresponding members, because of a prevalent feeling that non-resident members had fewer privileges.

At that time, January, 1899, of the 1,000 members, 800 resident in Washington were paying $5 for The Magazine and lectures and only 200 were paying $2, and the Board members were reluctant to make the change. But they welcomed the suggestion that an assistant editor be appointed to assist in the preparation of The Magazine and in promoting the membership, particularly as Dr. Bell offered to pay his salary.

THE INVENTOR OF THE TELEPHONE SEEKS AN EDITOR

Dr. Bell realized that the desire to add to knowledge is wellnigh universal, that hosts of people would like to support exploration and research, as rich men have been able to do. Their pride in National Geographic Society membership is partly due to realization of this wish.



Medal designed by Albert H. Rumstead

TWO FAMOUS FLIGHTS CHARTED IN SOLID GOLD

On the face of the medal (left) is outlined the Lindberghs' circumnavigation of the Atlantic in 1933, during which they flew 29,000 miles over tossing seas, Greenland's ice cap, the European continent, the African coast, and the teeming jungles of South America. On the reverse, above the inscription, is depicted the flight of 1931, across the northern wilds of Canada and Alaska, over the Bering Sea, and down the Siberian coast to Japan and China.

The writer has had the privilege of directing its policies since April, 1899, when he was invited by Dr. Bell, then President of the National Geographic Society, to assume editorial charge of The Magazine and of the effort to increase membership.

To my father, Dr. Edwin A. Grosvenor, professor of European history at Amherst College, author of two magnificently illustrated volumes, "Constantinople," etc., and later President of the United Chapters of Phi Beta Kappa, Dr. Bell wrote the following letter from Washington, on February 19, 1899:

"My Dear Professor Grosvenor:

"As President of the National Geographic Society I am on the lookout for some young man of ability to act as Assistant Secretary of The Society, and manage, under the direction of our Editorial Committee, our monthly publication, 'The National Geographic Magazine.'

"In this connection your two sons recur to my mind. I do not know whether the position contemplated would be in the nature of an advance on the positions they now occupy, or whether it would be consistent with their aims in life—and therefore write confidentially to you before approaching either of them upon the subject. If, as I understand, they contemplate ultimately going into law—the opportunities for study here are unrivalled, and the duties of the position would not be of so exacting a character as to prevent them from pursuing any studies they desire.

"The present Editor of The Magazine, an expert geographer, serves without remuneration, but he finds himself so overburdened with work as statistician to the Agricultural Department that he desires to resign the Editorship. He would remain, however, on the Editorial Committee and give his active assistance to his successor. We are now contemplating the advisability of placing The Magazine in the hands of one only salaried officer, the Assistant Secretary, making him the Managing Editor to get out The Magazine with the assistance of the Editorial Committee.

"I am afraid, however, that our present Assistant Secretary would not be competent to conduct The Magazine. He is a married man, and we pay him a salary of $1,200 a year. I have thought that perhaps for the same salary we could secure an unmarried man of superior ability by applying to the Presidents of our universities. Some bright college graduate just beginning life would probably find in this position a stepping stone to something better, and be able, while

here, to pursue some postgraduate course of study while earning his livelihood.

"Under the proposed plan the members of the Editorial Committee would provide the original material for The Magazine, the Managing Editor simply applying to them for material as needed. The chief duties of the Managing Editor would be the *arrangement* of the material and the reading of proof—but he must also have sufficient literary ability to be able to write himself in an emergency, and sufficient judgment to use the *scissors* with discrimination in quoting from our exchanges. Of course, in all this he would have the assistance of the experts upon the Editorial Staff who would always be glad to be consulted. Either of your sons would, I am sure, have sufficient ability for the position, but of course I do not know what their present prospects are, or whether such an opening would prove attractive to them.

Photograph by Keystone-Underwood

"IN RECOGNITION OF YOUR COURAGEOUS AND SKILLFUL WORK"

Anne Morrow Lindbergh receives from President Gilbert Grosvenor the Hubbard Gold Medal of the National Geographic Society. She is the first woman to be awarded the medal. Nine men, including Colonel Lindbergh (page 138), have received it for extraordinary geographic achievements, since it was first struck, in 1906, for Admiral Peary. In the background is the historic flag which has been carried on numerous expeditions sent by The Society to far places of the world. Its colors are green, brown, and blue, representing the sea, the earth, and the sky.

"We shall make no change for some months yet, and in the meantime no harm can come from consulting you upon the subject. . . .

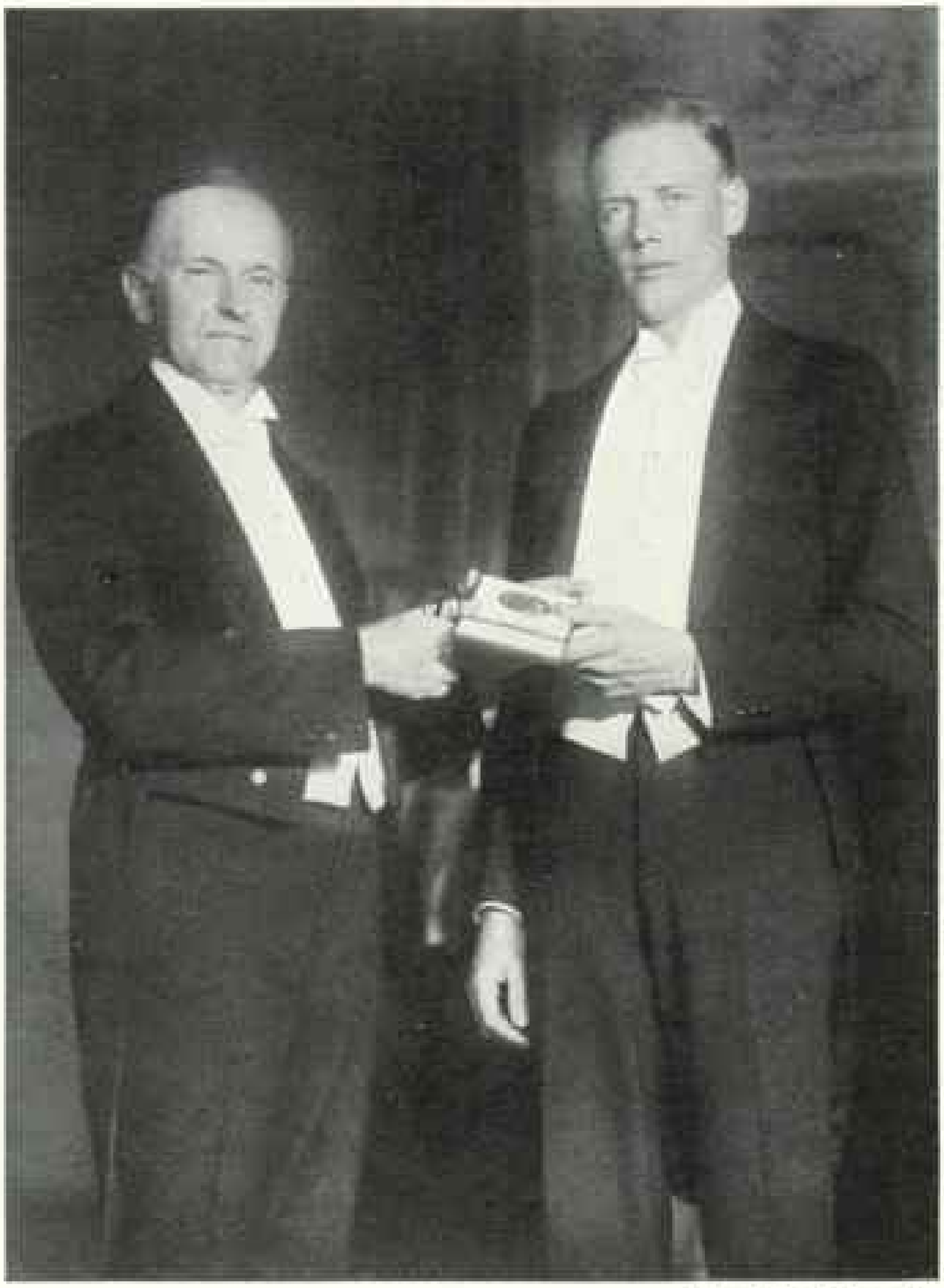
"P.S.—I forward by this mail a specimen copy of The Magazine."

To my twin brother, Edwin Prescott Grosvenor, and to me, teaching in New Jersey, Dr. Bell wrote as follows:

"MY DEAR FRIENDS: Will you kindly look over the enclosed communication to your father and let me know whether either of you would consider the proposition to become Assistant Secretary of the National Geographic Society, and Managing Editor of The Magazine if such a proposition should be made to you."

I have already spoken of the poverty-stricken state of The Society when I first visited its cramped and littered headquarters. The Society was not so poor as it seemed, however, for its management had a revolutionary idea:

Why not popularize the science of geography and take it into the homes of the people? Why not transform The Society's Magazine from one of cold geographic fact, expressed in hieroglyphic terms which the layman could not understand, into a vehicle for carrying the living, breathing, hu-



International Newsreel

PRESIDENT COOLIDGE PRESENTS THE HUBBARD MEDAL TO COLONEL LINDBERGH

The presentation was made in the presence of 6,000 members assembled in the Washington Auditorium. The medal bears the following inscription: "Awarded by the National Geographic Society to Charles A. Lindbergh for his heroic service to the science of aviation by his solitary flight from New York to Paris, May 20-21, 1927." Calvin Coolidge accepted membership on The Society's Board of Trustees in April, 1929.

man-interest truth about this great world of ours to the people? Would not that be the greatest agency of all for the diffusion of geographic knowledge?

Behind the idea was an unusually strong Board of Managers, who had faith in the new policy, and who have always been willing to help and give liberally of time and suggestion. To evolve a magazine that would not lower the dignity of The Society and that would win popular support was the task that was entrusted to me.

Dr. Bell personally for five years contributed my salary as Assistant Editor and Editor, making a total gift of $6,900 to The Society for this purpose.

The Society was so poor that it could employ no clerical assistance, and for a time I was even obliged to address The Magazine envelopes myself. The names of the members were then printed on long slips, and it was the practice to cut these slips up with a pair of scissors and then paste them on the envelope. After addressing one edition of 900 copies in this way, my first investment in office furniture was the purchase of an addressing machine for $20.

Magazine men who were consulted said it was impossible to develop a circulation for a geographic magazine, because the subject of geography was too technical. And no doubt this was true, for we should remember that at that time geography was to the layman an unknown quantity, and meant boundaries, moraines, erosion, glaciers, wind belts, etc.

From the very inception of our revolutionary plan, a new era in geographic education dawned. The National Geographic Society found the whole world ready to enrich the pages of its Magazine with the best things that travel, research, and exploration could bring, and it found the people eager for the knowledge those pages brought them. From that day to this there has been growth, growth, growth.

Near the end of my first month with The Society, I received under date of April 29, 1899, the following letter from Dr. Bell:

International Newsreel

PRESIDENT COOLIDGE PRESENTS COMMANDER BYRD WITH THE HUBBARD GOLD MEDAL

This medal was awarded to Commander Richard Evelyn Byrd, first man to fly to the North Pole, before a distinguished audience of members and friends of the National Geographic Society on June 25, 1926 (see "Commander Byrd Receives the Hubbard Gold Medal" in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1926).

"DEAR MR. GROSVENOR:

"At the request of the Editorial Committee I wrote to you on March 20, 1899, offering you the position of Assistant Editor of the NATIONAL GEOGRAPHIC MAGAZINE for three months, beginning April 1st, stating that a more permanent engagement would be made at the end of that time if the appointment seemed satisfactory to the Committee and to you. I am happy to inform you that the Editorial Committee have been so much pleased with you and appreciate so highly the benefits already derived from your assistance that they consider it unnecessary to wait for the expiration of the three months before making a more permanent engagement with you. Mr. Hyde, on behalf of the Editorial Committee, brought the subject before the full Board of Managers at the meeting today, and you may be pleased to know that the suggestion of the Editorial Committee met with the unanimous endorsement of the Board, and I now have great pleasure in confirming your appointment as Assistant Editor of The Magazine, for one year, instead of three months, dating from the first of April, 1899, your salary to be one hundred dollars per month.

"I trust that you will accept and that you have as high an opinion of the members of the Board as they have of you.

"I have written to Mr. Hyde suggesting that your name should appear in the June issue of The Magazine as Assistant Editor under his.

"Congratulating you upon the good beginning you have made, and wishing you every success in the future, I am

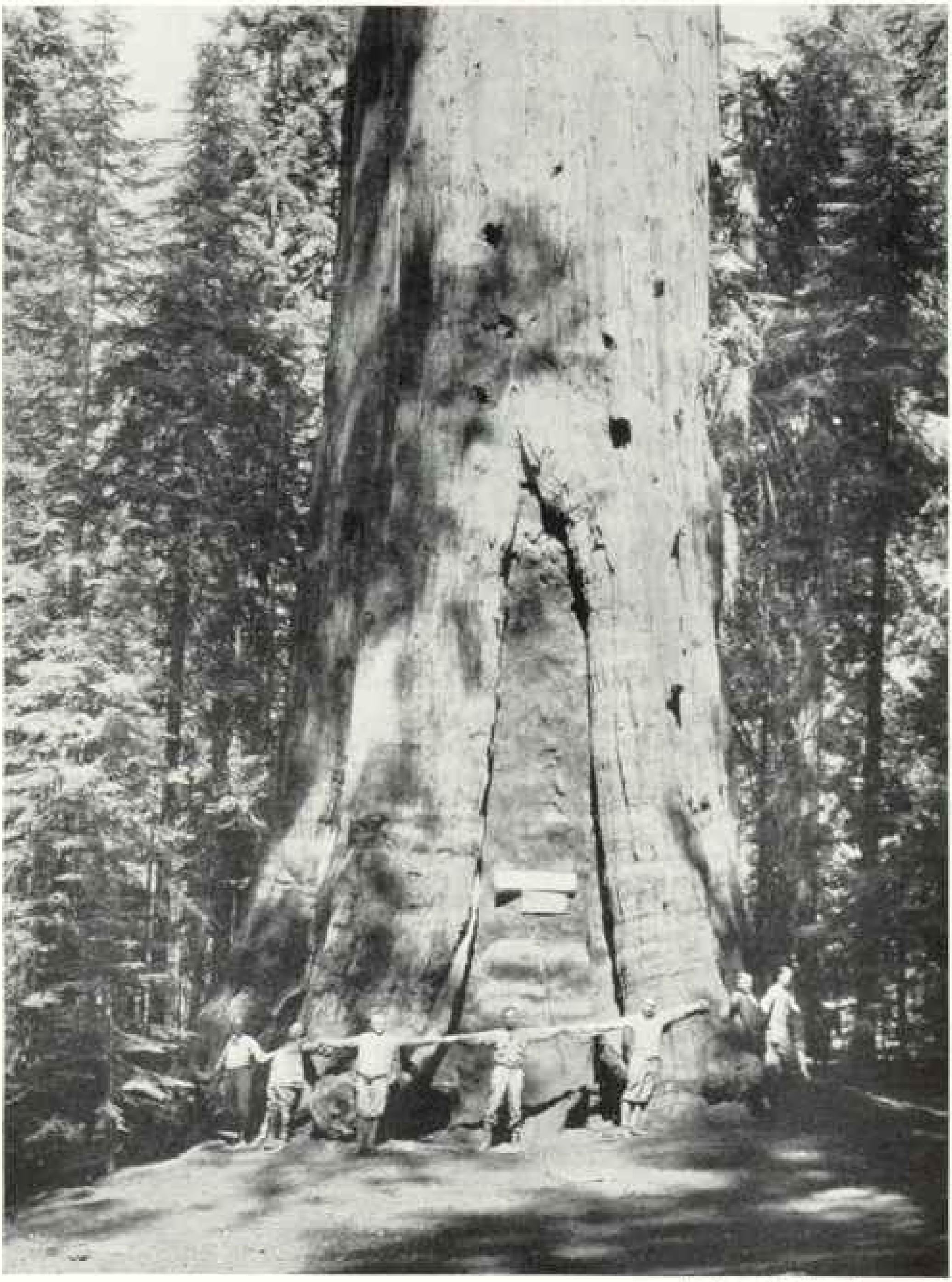
Yours truly,

ALEXANDER GRAHAM BELL,

President, National Geographic Society."

On the next day I received from Dr. Bell's private secretary a note which said:

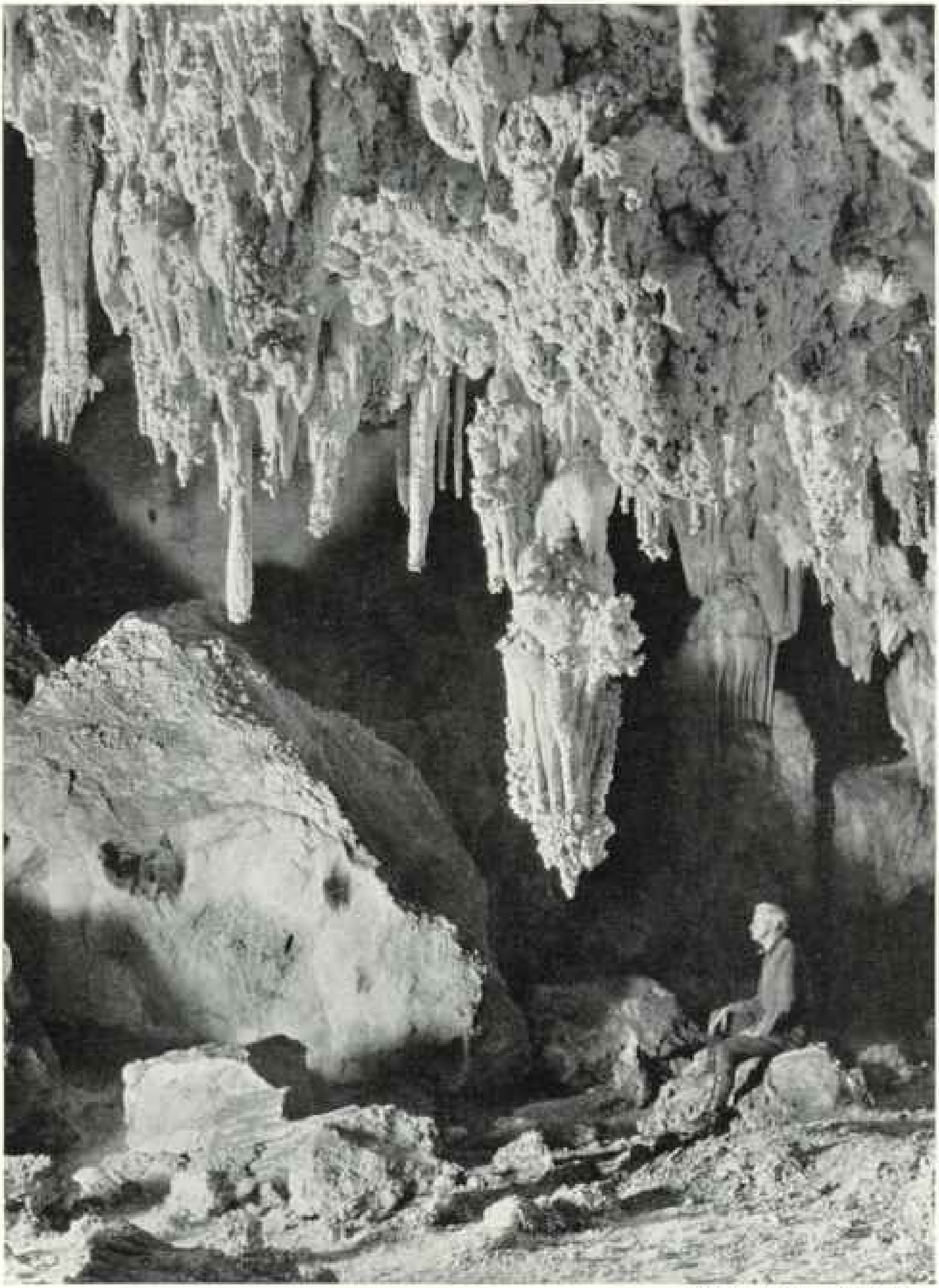
"On leaving, Mr. Bell asked me to say to you that the Editorial Committee passed a resolution giving you great scope in the matter of securing Corresponding Members and pushing The Magazine—therefore go ahead and do what you think best in that



Photograph by Gilbert Grosvenor

GENERAL SHERMAN, KING OF ALL TREEDOM, RULES SEQUOIA NATIONAL PARK

It takes 20 men with arms outstretched to encircle this giant tree. Dr. A. E. Douglass estimated its age to be between 3,500 and 4,000 years. The trunk, 36½ feet in diameter, contains enough lumber to build a good-sized village. A plaque in this park reads: "The tract of land on which this tablet has been erected, together with four other tracts of land, all within the heart of the Giant Forest, was purchased from private owners with funds subscribed by the National Geographic Society, together with an appropriation by the Congress of the United States. These areas were deeded to the United States on December 30, 1916, for the benefit of, and to serve, the people of the Nation."



Photograph from Willis T. Lee

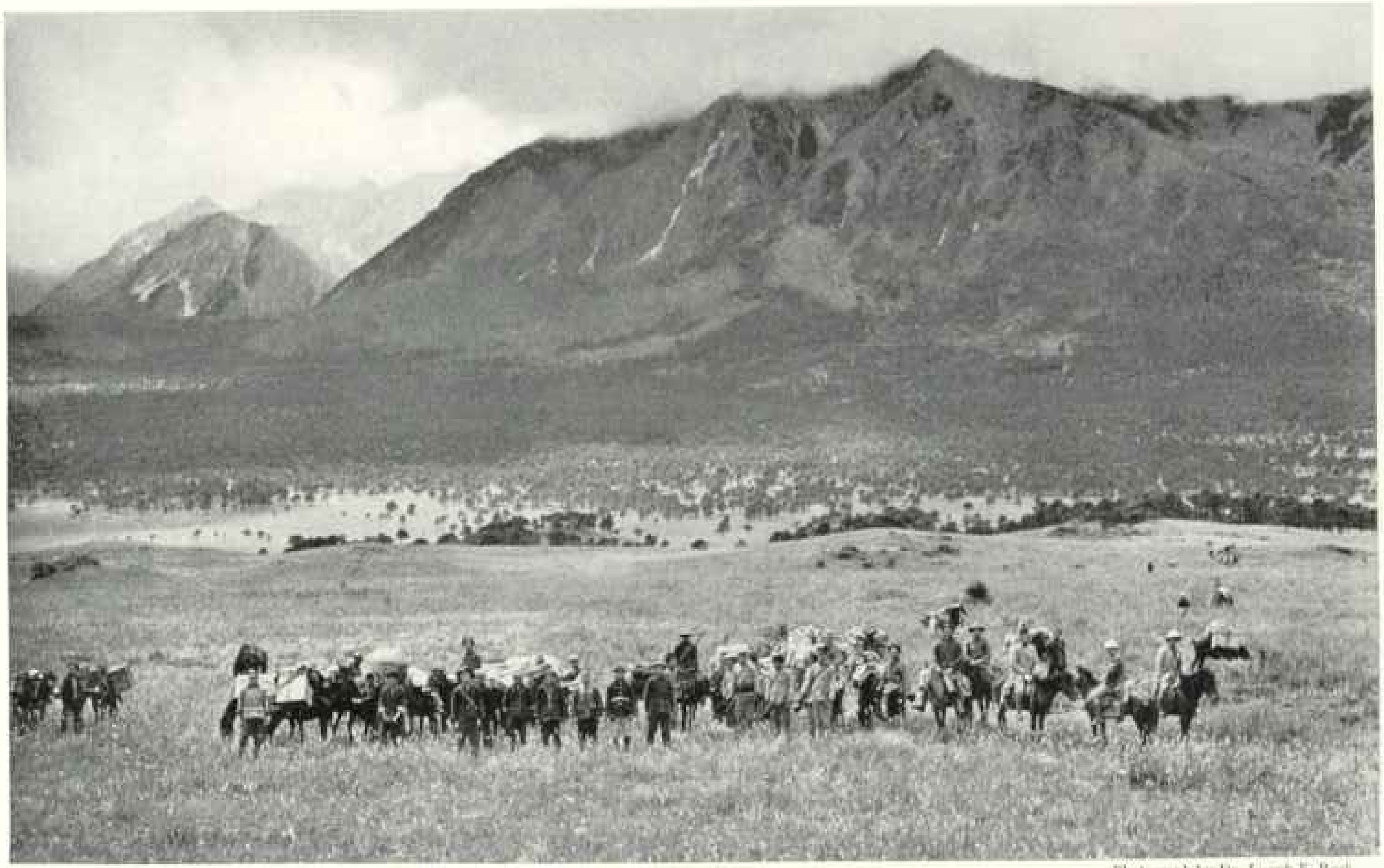
THE ARMORY AND SHINAV'S WAR CLUB IN CARLSBAD CAVERN, NEW MEXICO

This vast subterranean chamber is the most spectacular underground wonder in America. Long known locally, it was first disclosed to the public through the pages of the NATIONAL GEOGRAPHIC MAGAZINE ("A Visit to Carlsbad Cavern," January, 1924, and "New Discoveries in Carlsbad Cavern," September, 1925). The Society sent an expedition to explore the cavern and the mountains near it. As a result of these explorations, which discovered the vast extent and spectacular nature of the cave, President Coolidge set it aside as a national monument. Dr. Willis T. Lee, leader of the expedition, is seated at the right in the picture.

Photograph by Capt. A. W. Stevens

THE FIRST PHOTOGRAPH EVER MADE SHOWING LATERALLY THE CURVATURE OF THE EARTH

This unusually interesting photograph of the Andes, including Mount Aconcagua (identified by a white line below the base), at a distance of 287 miles, was made from an airplane, at an elevation of 21,000 feet, by Captain Stevens in the course of his camera survey of the Andean chain for the National Geographic Society in 1930. The mountain range, which shows clearly in the photograph, could not be seen by the photographer at the time he made this picture (see "Flying the 'Hump' of the Andes," by Captain Albert W. Stevens, in the NATIONAL GEOGRAPHIC MAGAZINE for May, 1931). Captain Stevens used a lens of 20-inch focus and an infra-red screen which admits to the sensitive photographic plate light that is invisible to the eye. The length of the exposure was $\frac{1}{50}$th of a second. Almost exactly in the center of the range Mount Tupungato is distinguished. In the foreground is Villa Mercedes, Argentina.



Photograph by Dr. Joseph F. Rock

THE CARAVAN OF DR. JOSEPH F. ROCK, ESCORTED BY NATIVE SOLDIERS, PAUSES ON THE PLAIN OF GABA ON HIS RETURN FROM THE KONKALING PEAKS OF WILD WESTERN CHINA

This explorer has led a series of expeditions of the National Geographic Society to little-known regions of China and Tibet. From Burma he brought back seeds of the chaulmoogra tree, whose fruit yields an oil which has proved of value in the treatment of leprosy. His splendid black-and-white photographs and natural-color pictures of, and articles on, the Yangtze Gorge, the Devil Dancers and Butter Gods of Choni, and the King Sungmas of Tibet have appeared in the NATIONAL GEOGRAPHIC MAGAZINE.

direction, and if any question arises regarding expense in getting out circulars, etc., remember you have Mr. Bell behind you. The point is to materially increase the corresponding membership."

I quote this message from Dr. Bell, offering financial assistance to The Society, because it was so characteristic of his generous nature. He was ready to donate thousands of dollars to help. But I begged him not to give a single dollar beyond the $100 donated monthly to The Society for my salary.

My theory was that if The Society's Magazine was to succeed, we must find out what kind of geographic magazine the public would buy, and that we could not ascertain this if we were to lean on a generous benefactor to pay deficits. Dr. Bell assented with a smile, and later told me that several years previously, he and Mr. Hubbard had expended $80,000 in a futile effort to establish a popular scientific weekly periodical. After two years of printing, they discontinued it and sold the name "Science," which they had bought for $5,000, to Dr. J. McKeen Cattell for $25.

I have the receipt for the $5,000 payment; Dr. Bell gave it to me as a souvenir.

That those early years were times of uphill struggle, hard work, and vexing problems is suggested by other letters.

For example, in October "the imperative necessity of providing the Secretary's office with further clerical assistance" was urged upon the board by the Editor-in-Chief, Mr. John Hyde, who added:

"While The Magazine itself has not suffered in the form in which it is presented to the members of The Society and to the public, its preparation has involved upon Mr. Grosvenor a strain that nothing but the most intelligent enthusiasm would have enabled him to bear. His untiring energy and single-minded devotion to the work of The Society in general and of The Magazine in particular are worthy of the highest praise.

"Perhaps I ought to add that I make these strong representations as the chairman of the Committees on Admissions and Publications, as a frequent visitor at The Society's rooms, and without Mr. Grosvenor's knowledge, that gentleman being ready to work himself to death, if need be, in the interests of The Society and in the carrying out of the orders of the Board and of its various Committees."

Every dollar was carefully husbanded and stretched like a stratosphere balloon. We had one inflexible rule; there must be no deficit at the end of the year, and no borrowing.

Now The Magazine pays handsome honorariums for all material used, but in those days articles were solicited gratis.

We had some amusing experiences. In the expectation of interesting the schools, we accepted with great enthusiasm the offer of the professor of geography in one of our oldest universities to write and donate to The Magazine a series of articles for teachers. The first paper soon arrived. I found it exceedingly hard to digest, and took it to Dr. Bell. He confessed that much of it was beyond him, too, but as it was sponsored by America's most widely acclaimed geography teacher, he recommended publication.

Soon letters of protest from educators deluged us, among them a letter from G. Stanley Hall, President of Clark University, one of the most ardent supporters of our project, who swore that if that article was to be the kind of geography we published, we had better discontinue our efforts. From that day, no sentence has found space in The Magazine that could not be readily understood.

MEMBERS OF A SOCIETY, NOT SUBSCRIBERS, SOUGHT

After Alexander Graham Bell had sailed for Europe in June, 1900, several members of the Board who had little confidence in Mr. Bell's plans began negotiations with a New York publisher with a view to turning The Magazine over to them. To explain Dr. Bell's plans and to discourage the negotiations, I wrote Miss Ida M. Tarbell, a good friend, the following letter on July 25, 1900, which I quote in part, as it answers the question frequently put to us, why members instead of subscribers are sought:

"DEAR MISS TARBELL:

"As you are aware during the past 16 months, Mr. Bell and others have been pushing The Magazine and planning to make it cover a field in which there is no competitor, to make it The Geographic Magazine of the country, reliable and *widely read*. But The Magazine is to be the means to another end which Mr. Bell has heretofore and does now, I believe, consider the most important. By it we

are to build up a great national society with thousands of members. What we want is not subscribers to a magazine but members of a society. . . .

"A combination of membership and magazine will be a stronger attraction than a mere subscription to a magazine. Where many persons would not subscribe for the magazine alone, they will become members because they get two things, the distinction of membership in a well-known society and also a good monthly journal. Vice versa, they would not become members except for the additional privilege of a magazine. . . . Neither The Magazine nor The Society can stand alone, for each helps the other.

"In the fall the Hubbard and Bell families are going to put up a memorial building to Mr. Hubbard. It is to be offered to The Society exclusively for its headquarters. It is another step in this same direction—to make The Society national and not a Washington scientific body. It has to become more popular, and hence The Magazine also must become less technical, and appeal to teachers, scholars, thinking men, and not to specialists alone. . . . The Magazine exists not for itself, like your *Popular Science Monthly*, but is the means, the tool by which we plan to build a society having thousands and thousands of members, and as few subscribers as possible, or, if we do get subscribers, to make them members as soon as possible. I hope my idea is clear: a great society and a great magazine is what we want and not a great magazine and a small society. . . .

"The more I think about it, the more convinced I am that if the plans offered you, as far as I can gather them from Mr. X, are pursued, the results will be a technical and local society and a good magazine, but not a great society and a great magazine. The barring from The Magazine of all reference to The Society, which is contemplated, is destructive. The Magazine is the journal of The Society and publishes its proceedings, not often, to be sure, but it allows 15 to 20 pages a year for the purpose. If The Magazine does not have any reference to The Society, members will drop off, and there you are again, getting subscribers and not members. This is just what Mr. Bell and the majority do not want; though certain members with whom you have been thus far corresponding want it, and are working for it. They are in the minority, however, or will be. It happens that they are in the field now. I write frankly, you see, for I want you to know the object of all. A great national society first and all the time. The Magazine is to bring this about and not thwart it. For the present, please consider this letter confidential."

DR. BELL HAILS "UNPRECEDENTED GROWTH"

It should be observed parenthetically that magazine men generally advised against any mention of the National Geographic Society in The Magazine, as they thought the public would not be interested in The Society, that mention of The Society would frighten away readers and subscribers. The original conception of The Society and The Magazine prevailed, however, and by 1912 Dr. Bell was able to address The Society in these words:*

"There has never been in the history of the world a scientific society that has increased in influence and power as the National Geographic Society.

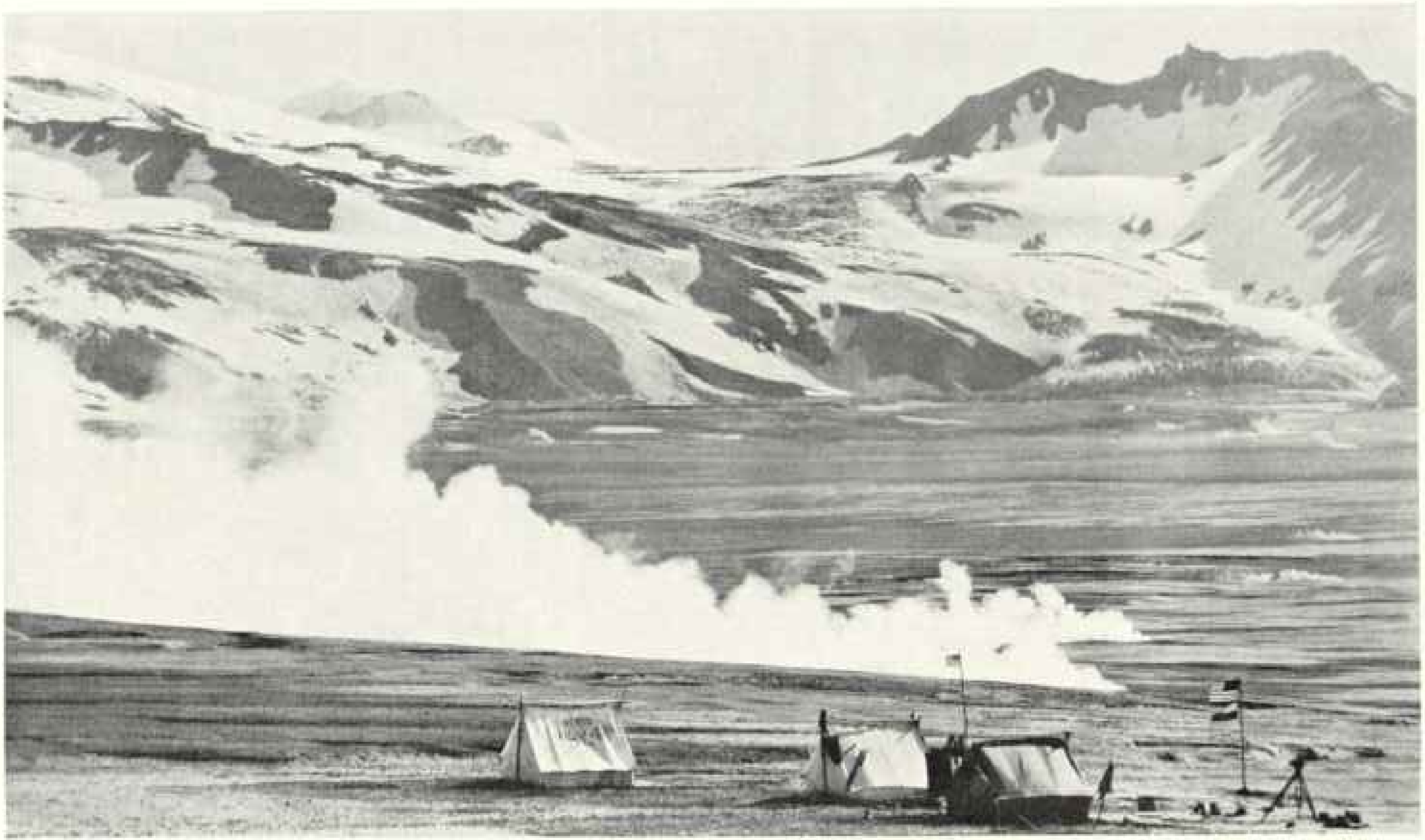
"In the year 1888," he continued, "The Society was organized under a national charter 'to promote the increase and diffusion of geographic knowledge.' Just think what that means! *To promote the study of the world upon which we live.* A truly great object for a little, feeble organization to undertake. At that time we had only about 200 members.

"The Society had no endowment, nothing coming to it but the membership fees. No millionaire has since come forward to help us out, and yet today The Society has a great endowment raised by its own efforts—a surplus to be devoted to the promotion of geographic science. We never had to take off our hats to any multimillionaire for having endowed The Society with a million dollars; we have done it ourselves.

"When I look back upon our early days, what a different condition of things prevailed! We had only about a thousand members, and The Society was living from hand to mouth. Like many other scientific societies, we constituted a strictly technical organization.

"We supported the NATIONAL GEOGRAPHIC MAGAZINE, at that time a valuable

* See NATIONAL GEOGRAPHIC MAGAZINE, March, 1912, pp. 272-276.



Photograph by Dr. Robert F. Griggs

HEADQUARTERS OF ONE OF THE SOCIETY'S SEVEN MOUNT KATMAI EXPEDITIONS, IN THE VALLEY OF TEN THOUSAND SMOKES

This is Baked Mountain Camp, with Mount Martin in the background. Before the eruption this was a green valley. Many travelers have camped beside a clump of bushes that formerly stood near the middle of this picture, but at an elevation much lower than the present surface, for the valley was here filled many feet deep by the flow of incandescent sand.

Photograph by O. C. Havens

A PANORAMIC VIEW OF PUEBLO BONITO, EXCAVATED BY NATIONAL GEOGRAPHIC SOCIETY EXPEDITIONS

These ruins, set apart as the Chaco Canyon National Monument by President Theodore Roosevelt, are the oldest definitely dated major pueblo remains in the American Southwest. The colossal communal dwelling was under construction 919 A. D. and the settlement had reached its heyday in 1067. The Society's Pueblo Bonito expeditions and another series not only discovered the date of this prehistoric apartment-house metropolis of the aboriginal Southwest, but also developed a tree-ring calendar which dated more than 40 other major pueblo dwellings (see "Everyday Life in Pueblo Bonito," by Neil M. Judd, in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1925, and "The Secret of the Southwest Solved by Talkative Tree Rings," by Andrew Ellicott Douglass, December, 1929).

technical journal that every one put upon his library shelf and few people read. It was valuable, it was important, but it did not contribute anything to the financial support of The Society.

"In spite of the fact that the members of the Board of Managers and all the officers of The Society, including the Editor of The Magazine, served without pay, and in spite of the fact that our lecturers, as a rule, cost us nothing excepting an occasional honorarium to cover traveling expenses, our income, being derived exclusively from membership fees, was hardly sufficient to pay the printer's bill for The Magazine, the rent of our lecture hall, and the ordinary running expenses of The Society. Deficits were by no means unknown.

"We had no permanent home. Half an office room constituted our headquarters, and in shifting from one building to another, as happened more than once, a feeling of unpermanency ensued, and valuable material was in danger of loss.

"Then the use of the Hubbard Memorial Building was offered to us in memory of our first president—Gardiner Greene Hubbard—and for the first time we possessed a permanent habitation that in its beauty spoke of the position to which we aspired. But it threatened to be a white elephant, for we did not even have the means to provide for its lighting or to take proper care of it.

"It became a matter of vital necessity for The Society to increase its membership. Necessity spurred the Board of Managers into activity, and they adopted a new policy, unique, so far as I know, in the history of science. I do not know of any other scientific society that has ever adopted it, and I do not know of any other society that has succeeded as the National Geographic Society has done. Now, how was this accomplished?

"First of all, instead of limiting our membership to strict geographers, we threw open the doors of membership to all who desired to promote the increase and diffusion of geographic knowledge. We had a membership of one thousand in the District of Columbia; we had ninety millions of people outside the District of Columbia to whom we could appeal for an increase in our membership, but all we had to reach these outside members was our Magazine. Our Washington members enjoyed the course of lectures, but the outside members would have nothing but a magazine to hold them to The Society. The question was, How could we hope to interest thousands and thousands of people in a strictly technical geographic magazine?

"It was obviously necessary to change the character of The Magazine and to adapt it to interest a larger circle of non-technical members. We adopted this policy with an aim to making The Magazine support The Society. We did not mean to lower the scientific standard of The Magazine and make it simply popular, but we wanted to add certain features that would be of interest to everybody.

"But in starting out to make a magazine that would support The Society, instead of The Society being burdened with The Magazine, a man was of the first necessity; if we did not get the right man the whole plan would be a failure, and I can well remember how our Board of Managers discussed this proposed plan, and the difficulty of getting a man, and how the idea was laughed at that we should ever reach a membership of 10,000. Why, it was ridiculous. Geography, the driest subject of all in our schools, how could you expect a membership of 10,000 in the United States alone!

"As I said, in the beginning, we found it necessary to get the proper man, but fortunately we found him. A young man who had made a very brilliant record at Amherst College was engaged as Assistant Editor of The Magazine to stir up these new ideas, and to put new life into the scientific journal. But The Society did not have the money to pay his salary; that had to be raised by voluntary contributions from interested members. And so Mr. Gilbert H. Grosvenor commenced his work in 1899. He speedily captured The Society—and incidentally, he captured one of my daughters.

"Mr. Grosvenor in 1900 became Editor and in 1903 Director of the work of The Society. We have been very fortunate in securing his services, and with the intelligent action of an unusually fine Board of Managers, and the cordial support of the members of The Society, the success of The Society has been secured. We have increased to 107,000 members and we are still on the upgrade. There is no reason to suppose that we are going to stop growing.

"Our Magazine has become the greatest educational journal of the world. It goes to thousands of schools. . . . There is no reason why the circulation should not increase, and there is no reason why the Na-

tional Geographic Society should not be placed in possession of an endowment fund for geographic research, of its own making, many times that which it now possesses."

THE GUIDING PRINCIPLES

It might be well to repeat here some of the principles which were gradually evolved and followed in the development of The Magazine:

"1. The first principle is absolute accuracy. Nothing must be printed which is not strictly according to fact. The Magazine can point to many years in which not a single article has appeared which was not absolutely accurate.

"2. Abundance of beautiful, instructive, and artistic illustrations.

"3. Everything printed in The Magazine must have permanent value, and be so planned that each Magazine will be as valuable and pertinent one year or five or ten years after publication as it is on the day of publication. The result of this principle is that tens of thousands of back numbers of The Magazine are continually used in school rooms.

"4. All personalities and notes of a trivial character are avoided.

"5. Nothing of a partisan or controversial character is printed.

"6. Only what is of a kindly nature is printed about any country or people, everything unpleasant or unduly critical being avoided.

"7. The content of each number is planned with a view of being timely. Whenever any part of the world becomes prominent in public interest, by reason of war, earthquake, volcanic eruption, etc., the members of the National Geographic Society have come to know that in the next issue of their Magazine they will obtain the latest geographic, historical, and economic information about that region, presented in an interesting and absolutely non-partisan manner, and accompanied by photographs which in number and excellence can be equalled by no other publication." *

In the very first volume of THE GEOGRAPHIC, in 1889, appeared an article by a 33-year-old naval engineer, R. E. Peary, who was destined to carry the flag of his country to that desolate waste of shifting ice and water at the top of the world which men call the North Pole. But the scene of the exploration trip which Peary described in that early GEOGRAPHIC was almost as far away from the Poles as it is possible to get. Through tropic jungles he was making his way then. "Across Nicaragua with Transit and Machéte" was the title of his story.

PEARY THE INDOMITABLE

Again and again in these pages the dauntless Peary reappears. When many persons were shaking their heads and asserting that mortal man could never reach the Pole, Peary said in an address to the National Geographic Society on November 29, 1902:

"It may seem to indicate over-confidence to state boldly that the Pole can be reached, and yet it is a fact, even though the struggle has been going on unsuccessfully for years and years. Each time we have come a little nearer, each time we have learned a little more, and I say to you here tonight that it is not an impossibility, that it can be done, and that it is no more difficult than many of the great projects that we see being pushed to completion every day and which require money, persistence, hard work, and some ability to bring to full fruition."

Already the explorer had declared implacable war upon the pitiless forces of the Arctic and he planned his campaigns like a Napoleon. Lightly loaded sledges, swift dogs, hardy Eskimos, a far north base, living off the land—these were elements in his plans.

On December 15, 1906, at a meeting of the National Geographic Society, its Hubbard Medal was presented to Peary by the President of the United States, Theodore Roosevelt, in honor of his attainment of "Farthest North" at 87° 06'.

A year later, at another meeting of The Society, the Hubbard Medal was presented by the Vice President of the United States, Charles W. Fairbanks, to Captain Roald Amundsen of Norway for his achievement of the Northwest Passage in a vessel and the definite location of the magnetic North Pole.

It is significant that both of these awards came *before* these heroic explorers had achieved the goals of their lives—the North Pole for Peary, the South Pole for Amundsen. Later The Society awarded to both of them special gold medals for those crowning achievements, but who can say that the recognition of the earlier feats did not hearten and encourage them in the masterly campaigns that finally conquered the Poles?

* See NATIONAL GEOGRAPHIC MAGAZINE, March, 1915, pp. 318-320.

Years afterward, at a banquet of The Society in 1913, these two conquerors of the ends of the earth met for the first time face to face (see illustration, page 127).

Peary, to whose exploration The Society contributed a substantial sum, was one of the first to foresee the present era of aerial exploration in which Admiral Byrd, also with The Society's aid, has succeeded in flying over both Poles. In his last public appearance, as recorded in THE GEOGRAPHIC for April, 1920, Peary said at a meeting of The Society:

"Coming Polar explorers, both north and south, are quite likely to use modern means which have sprung into existence within the last few years; according to my own personal impressions, aerial flights."

DR. BELL'S PROPHECIES COME TRUE

In these early GEOGRAPHICS there stand out clearly, too, the genius and the vision of Alexander Graham Bell. In the June, 1903, issue, featuring numerous photographs of his experimental kites, he wrote:

"I have been continuously at work upon experiments relating to kites. Why, I do not know, excepting perhaps because of the intimate connection of the subject with the flying machine problem.

"We are all of us interested in aerial locomotion; and I am sure that no one who has observed with attention the flight of birds can doubt for one moment the possibility of aerial flight by bodies specifically heavier than the air. In the words of an old writer, 'We cannot consider as impossible that which has already been accomplished.'"

A few years later, in 1914, we find him not only predicting that man would fly from America to Europe, but asserting that by flying high and taking advantage of eastward winds it might be done between an early breakfast and a late dinner. In this the eyes of genius seem to have seen even beyond the stirring realities of our own present day.

"Calculation shows that our best machines should be able to cross the Atlantic in 13 hours," said Dr. Bell. "I hardly dare to say it aloud for publication. It is sufficiently startling to know that it is not only possible, but probable, that the passage may be made in a single day. But if, as I imagine, it can be done in 13 hours, you may take an early breakfast in Newfoundland and a late dinner in Ireland the same night."

Charles Augustus Lindbergh was a twelve-year-old schoolboy in Little Falls, Minnesota, when the bearded, kindly Dr. Bell, in this address, printed in full in THE GEOGRAPHIC, was telling the graduating class of the Friends School in Washington that a flight to Europe in a single day was "not only possible but probable" and was opening their eyes to other challenging developments of the future.

"Did you ever put your head under water and chuck two stones together to see what the sound is like?" he asked the boys.

"Three-quarters of the earth's surface is under water and has not yet been explored, at least to any great degree.

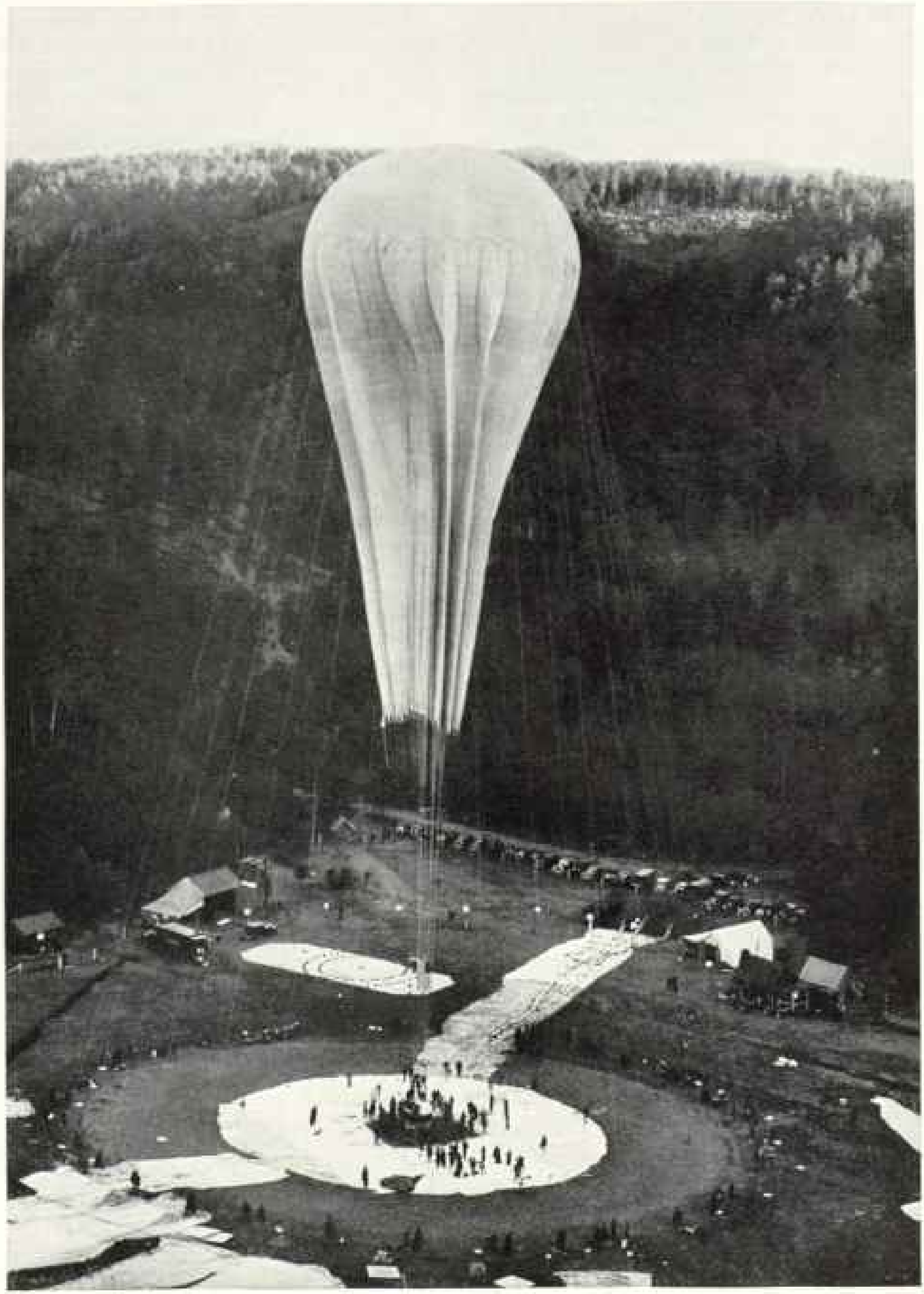
"Why should we not send down a sound instead (of a sounding line) and listen for an echo from the bottom? Knowing the velocity of sound in water and the time taken for the echo to reach the ear, we should be able to ascertain the depth of the deepest part of the ocean in less than four seconds instead of more than four hours. Here is something worth doing. It has never been tried. I have suggested it a number of times."

Today the floor of the ocean is being systematically mapped and drowned mountain peaks and valleys discovered by just such a sonic sounder. Huge liners from Europe, nearing North America, spot their position in heavy fog by feeling out familiar "landmarks"—hills and canyons on the floor of the sea—with the formless fingers of sound and echo.

In these old GEOGRAPHICS are reflected the expanding horizons and broadening interests, the new inventions and technical progress which marked the merging of the nineties into the twentieth century.

The modern arts of photography and photo-engraving were just beginning in 1899 and The Magazine began to employ them on a hitherto unheard-of scale.

In 1901 it noticeably increased in stature, with larger pages and two columns of type as at present instead of a single wide column. In 1902 appeared an article by Sir Henry M. Stanley on "A Great African Lake"—Victoria. One of the highlights of 1903 was Dr. Bell's paper on "The Tetrahedral Principle in Kite Structure," indicative of The Society's deep interest in aviation, which it has encouraged from the days of kites and crude "aerodromes" to the present era of aerial exploration and penetration of the stratosphere by giant balloons.



Photograph by Richard H. Stewart

BALLOON EXPEDITIONS SPONSORED BY THE SOCIETY AND U. S. ARMY AIR CORPS HAVE EXPLORED THE STRATOSPHERE TO RECORD HEIGHTS

Shortly after dawn on Armistice Day, November 11, 1935, the world's largest free balloon, the *Explorer II*, rose from this natural bowl in the Black Hills, near Rapid City, South Dakota, bearing Captains Albert W. Stevens and Orvil A. Anderson and a "flying laboratory" of scientific instruments. It reached the unprecedented height of 72,395 feet above sea level, collected invaluable data, and ended a remarkable flight of 8 hours 13 minutes with a perfect landing near White Lake, South Dakota. This photograph shows the smaller *Explorer I*, which attained an altitude of 60,613 feet on July 28, 1934.

In September, 1903, The Society moved from rented quarters into a handsome new structure, Hubbard Memorial Hall, presented to it by the Hubbard and Bell families (page 124). Deposited in the cornerstone was this document, written by Dr. Bell:

"This building is erected in memory of Gardiner Greene Hubbard by his children, Gertrude, Mabel, Roberta, and Grace. Gertrude, being no longer living, is represented by her only child, Gertrude, daughter of the late Maurice Neville Grossmann, and Roberta, being no longer living, is represented by her surviving children, Helen and Grace, daughters of Charles James Bell.

"The library is the gift of Mrs. Gardiner Greene Hubbard, who joins her children in establishing this memorial to her husband.

"The building is designed to be the home and headquarters of the National Geographic Society, of which Mr. Hubbard was President from the date of its organization, January 20, 1888, to the day of his death, December 11, 1897. . . .

"The box containing this document and other papers and coins will now be sealed and deposited in the cornerstone of the Hubbard Memorial Building in the presence of Mrs. Gardiner Greene Hubbard, and all the surviving descendants of Mr. Hubbard, together with a few personal friends.

"The cornerstone will be laid by Melville Bell Grosvenor, the infant great-grandson of Gardiner Greene Hubbard, in the arms of Mrs. Hubbard.

"Witness our signatures this 26th day of April, 1902:

GERTRUDE M. HUBBARD (MRS. GARDINER GREENE HUBBARD)

Children

MABEL GARDINER BELL AND HER HUSBAND, ALEXANDER GRAHAM BELL
GRACE HUBBARD BELL AND HER HUSBAND, CHARLES J. BELL

Grandchildren

GERTRUDE HUBBARD GROSSMANN
ELSIE MAY BELL GROSVENOR AND HER HUSBAND, GILBERT H. GROSVENOR
MARIAN H. GRAHAM BELL
HELEN A. BELL
GRACE HUBBARD BELL
GARDINER HUBBARD BELL
BOBBY BELL

Great-Grandchild

MELVILLE BELL GROSVENOR (X) His Mark"

Believing that The Society was now surely set on the path to success, Dr. Bell asked in October, 1903, to be relieved of the presidency. But he continued an active and most inspiring member of the Board of Trustees and a constant contributor of articles and suggestions to The Magazine until his death in August, 1922.

Charles James Bell, whose wife and daughters contributed one-half of the cost of Hubbard Hall, was the first cousin and brother-in-law of Alexander Graham Bell. He was the first Treasurer, 1888-1890, and Chairman of the Finance Committee of The Society from 1900 until his death in 1929. Ever ready with wise counsel, he was a staunch friend.

In 1905 two happy events took place. First, I was able to offer the following resolution to the Board, to which I had been elected in January:

"*Resolved*, That the National Geographic Society, through its Board of Managers, thank Dr. Bell for his generous subscription to the work of The Society from 1899 to 1904, and inform Dr. Bell that The Society is now on such a substantial basis that it can relieve him of his subscription for 1905."

Thus Dr. Bell was relieved of his generous donation of $100 per month which he had made for my salary from April 1, 1899. His total gift for this purpose was $6,900.

Second, in my search for an associate to help me carry forward the promising future, I was fortunate to discover John Oliver La Gorce, since 1920 the Vice President of The Society. I recommended his appointment to the Board as Assistant Secretary. On September 19, 1905, he was engaged at $60 per month, and he commenced work on September 22, which was his 25th birthday.

When Dr. La Gorce joined the staff of the National Geographic Society, it was a small organization of only 10,000. But his responsive nature and keen intellect recognized the possibilities ahead for The Society, and his generous heart was stirred to identify his life with a work that promised to promote effectively the welfare of mankind (see page 156).

In everything The Society has done since, he has been identified. Many of our useful and interesting projects he originated. He has labored with love and ceaseless energy to help develop the organization and bring it to the dignified position it now holds in the life of our country.

The National Geographic Society is the product of many minds and of much labor

of many men and women, but it is a conservative statement that without the powerful assistance of John Oliver La Gorce's personality, its gratifying progress would have been impossible.

The Magazine's development went forward apace. Peary on the North Pole, Taft on the Philippines, Gifford Pinchot on conserving our forests—these mark some of the issues of thirty years ago.

Taft was to write many more articles for The Magazine, to accept membership on The Society's Board of Trustees in 1918, and to continue an active and constant attendant at its meetings until his death in 1930.

Photograph by John Tee-Van

COLUMBUSES OF THE LOWER DEPTHS

Dr. William Beebe (right) and Otis Barton are back on deck after their world's record dive of 3,028 feet off Bermuda. The United States and the National Geographic Society flags, carried down on man's deepest plunge, are attached to the cable, as they were during the descent (see "A Half Mile Down," by Dr. William Beebe, in the National Geographic Magazine for December, 1934).

"PERDICARIS ALIVE OR RAISULI DEAD"

When a Moroccan chieftain kidnaped an American engineer and the United States Government dispatched its famous ultimatum, "Perdicaris alive or Raisuli dead," The Geographic was on the job, and in 1906 published the complete story by the kidnaped man, Ion Perdicaris. Members who perhaps had pictured Raisuli as a crude, bloodthirsty ruffian learned that he was "gracious and dignified, a man of fine presence," and as humorous and quick at repartee "as though he had been born in County Galway."

"He could not bear to hear a child cry," wrote Perdicaris, "while on several occasions I noticed his care to avoid allowing the bees collected on his cup to drown, as I saw him lift them out with his spoon or finally empty the cup itself on the grass."

In this same year, 1906, appeared the first of Mr. Shiras' remarkable flashlight photographs of wild game (page 129), and in 1907 The Geographic published, among other articles, Dr. Bell's famous paper on "Aerial Locomotion," "An Awakened Continent to the South of Us," by Elihu Root, the Secretary of State, and "Our Heralds of Storm and Flood." The pictures were improving and the articles, too.

Some of the diverse elements that the American melting pot has fused into one people were shown in a series of photographs of immigrants landing at New York. Still wearing their picturesque native costumes,

the dress of field or fen or forest, they look surprised and mystified at the wonder that was New York even then. There are Russian Cossacks with knives in their belts, Romanian shepherds in white peasant garb, a German family of one daughter and seven sons, a Scottish family of seven daughters and four sons. Here is America in the making, and out through the country today are hundreds of their descendants.

In December, 1907, another young man, George W. Hutchison, age 21, joined the staff. Indefatigable, unselfish, and intelligent, he gained promotion to Associate Secretary, Acting Secretary, Secretary, and member of the Board of Trustees.

Every large organization must have one officer who delights in detail and has an extraordinary capacity for it, and whose duties require him to say to his associates "No" 99 times and "Yes" once. Sometimes this official becomes austere, harsh, and crabbed. From him his associates are apt to shy.

But twenty-five years of serving as buffer against aggressive contractors and making business decisions have only increased the warmth of George W. Hutchison's distinctive and attractive personality.

Ever vigilant and alert for any mechanical or human improvement that will advance The Society's membership interests, always watchful for any trespass on The Society's rights, tenacious, straightforward, prudent, George W. Hutchison continues always cheerful, genial, and cordial, sympathetic and wise friend, whose counsel every one of his fellow workers seeks when perplexed (see page 157).

One of the highlights of 1909 was the publication of "The Panama Canal," by Lieut. Col. George W. Goethals, builder of the mighty ditch which altered geography, "dividing the land and uniting the world."

Because of The Society's "extraordinary growth," it was announced in The Magazine for May, 1909, that "the unimproved property on Sixteenth Street adjoining Hubbard Memorial Hall" had been purchased for $11,000 to make room for expansion.

Publishing side by side the first reports by Commander Robert E. Peary and Dr. Frederick A. Cook, both claiming discovery of the North Pole, The Society stated: "Before the National Geographic Society can, however, accept the conclusions of either Commander Peary or Dr. Cook that the North Pole has been attained, it will be necessary that the scientific records and data of each explorer be carefully examined by its Committee on Research or by some body or commission acceptable to the Board." Peary submitted his records. They were examined by a Committee of the Board, comprising Henry Gannett, Chief Geographer of the United States Geological Survey, O. H. Tittmann, Superintendent of the United States Coast and Geodetic Survey, and Rear Admiral Colby M. Chester, former Superintendent of the United States Naval Observatory.

On their recommendation, a special gold medal was awarded to Commander Peary for discovering the Pole on April 6, 1909. The National Geographic Society's championship of this noble American naval officer will always be a glorious chapter in the history of our Society (see illustrations, pages 126, 127, 129, 132).

FIRST COLOR SERIES IN 1910

Important indeed in the history of the NATIONAL GEOGRAPHIC was November, 1910, for in that number appeared The Magazine's first series of illustrations in color, incidentally the largest collection of photographs in color which had ever been published in a single issue of any magazine.

"Scenes in Korea and China," the 24-page series was called. Reproducing them cost several times as much as an ordinary issue, but had been made possible by expanding membership and advertising receipts.

Varied and highly interesting had become the contents of THE GEOGRAPHIC now. The house fly and charging rhinos, fishes that carry lanterns, Labrador and Liberia, Mexican volcanoes and Holland cheese—all these and many more subjects found a place between its yellow covers in this eventful year.

"Taming the Wild Blueberry" and "The Wild Blueberry Tamed," by Frederick V. Coville, gave the first popular accounts of life-long researches by the author that have created a new industry.

Leafing through these volumes toward the present, it grows harder and harder to turn the pages rapidly, the pictures and articles are too arresting: "Wild Man and Wild Beast in Africa," by Theodore Roosevelt, Honorary Member of the National Geographic Society; "Reptiles of All Lands," by Raymond L. Ditmars; "Notes About Ants and Their Resemblance to Man," by Dr. William Morton Wheeler;

"The Grandest and Most Mighty Terrestrial Phenomenon: The Gulf Stream," by John Elliott Pillsbury, U. S. Navy. Carl Akeley writes on elephant hunting with rifle and camera. James Bryce joins the list of GEOGRAPHIC authors.

FIFTY COMMON BIRDS IN COLOR

June, 1913, was a notable number. In it were published in full color the portraits of fifty common birds from paintings by Louis Agassiz Fuertes. The series, forerunner of many bird paintings to be published in THE GEOGRAPHIC, was made possible by a marked increase in The Magazine's circulation. In 1913 The Society was able to erect a new building to house its expanding activities.

Events now were moving toward the fateful year of 1914, and in the August Magazine, the very month in which the conflagration began, THE GEOGRAPHIC issued as a supplement a large Map of Europe in colors, including the new Balkan States. In explanation I should state that the previous summer, 1913, I was caught in a war scare in Europe and for several days was unable to get money from the French bank. Every one on the Continent was so certain of an impending war that on my return to Washington I arranged to have a European map prepared, engraved, printed, and stored in The Society's cellar until the outbreak of hostilities. For eight months we held 300,000 copies of this map, awaiting the inevitable conflict.

"The eyes of the civilized world are now focused upon Europe and the stupendous war there beginning," said a brief article announcing issuance of the map. "The map will prove of much value to the members of The Society who wish to follow the series of military campaigns that it is feared will be without parallel in history." Accompanying tables gave the size of the armies and navies of Europe. This was followed in succeeding months with articles on each of the embattled powers.

When The Society's membership passed the half-million mark, the Board of Trustees presented to the Editor the following certificate, which was written by Gen. John M. Wilson, previously Chief of Engineers of the U. S. Army:

"*Resolved*, That the thanks of the Board of Managers of the National Geographic Society are hereby tendered to Gilbert H. Grosvenor, Director and Editor of The Society, for the superb work he has accomplished within the past eighteen years in bringing our Magazine to the present prominent position it holds among the publications of the Nation and in raising the number of our members from about one thousand to nearly six hundred thousand.

"Honorable in every sense, highly accomplished, true in every relation of life, Mr. Grosvenor is admired by us, not only for his literary ability, industry and skill as an editor, but for all his attributes of a true gentleman and scholar.

"We wish for him long life, health, happiness and prosperity, and that Heaven's choicest blessings may be showered upon him and the loved ones of his family.

"*Resolved*, That the foregoing resolutions be handsomely engrossed and framed, signed by the members of the Board of Managers of the National Geographic Society and presented to Mr. Grosvenor with the sincere regards of the members of our Board.

John M. Wilson, Brigadier General, U. S. A.; J. E. Pillsbury, Rear Admiral, U. S. N.; C. M. Chester, Rear Admiral, U. S. N.; T. L. Macdonald; A. W. Greely, Major General, U. S. A.; Henry F. Blount, Alexander Graham Bell, Jno. Joy Edson, Frederick V. Coville, Geo. Otis Smith, George R. Putnam, Charles J. Bell, James H. Gore, George Shiras, 3d, Franklin K. Lane, Henry White, S. N. D. North, Rudolph Kauffmann, C. Hart Merriam, David Fairchild, Grant Squires, O. P. Austin, Secretary; O. H. Tittmann, President.
Washington, January 17, 1917."

I was instructed to print this resolution in The Society's Magazine, but begged an editor's privilege of postponement.

WAR UNROLLED MAP OF WORLD

"The Civil War," wrote Emerson, "unrolled the map of our Union and hung it in every man's house."

So it was again in the World War, on a bigger scale. To show its members where in Europe mighty armies were locked in conflict, The Society in 1918 issued its famous map of the Western Front, which came instantly into demand all over the world.

No hasty summary can do justice to the activity of THE GEOGRAPHIC in those war years. One must glance through the issues themselves to appreciate it. In them stirs the tenseness, excitement, and patriotism of history's most awful war, a war in which millions of Americans found a new and very personal interest in the lands across the seas and in such prosaic but vital things as how the world is fed and where it gets its steel and coal.

Photograph by Clifton Adams

IN THIS ROOM JOHN OLIVER LA GORCE "HAS LABORED WITH LOVE AND CEASELESS ENERGY"

On the office walls of the Vice President of the National Geographic Society and Associate Editor of The Magazine are hung many strange weapons and trophies collected on travels about the world (see page 152). Old ships' running lights suspended above his desk lend a tang of the sea, the elephant's foot at the right brings to mind African treks, and many primitive knives, arrowheads, spears, and shields always interest visitors.

Photographs by Willard R. Culver and N. V. Blakeslee

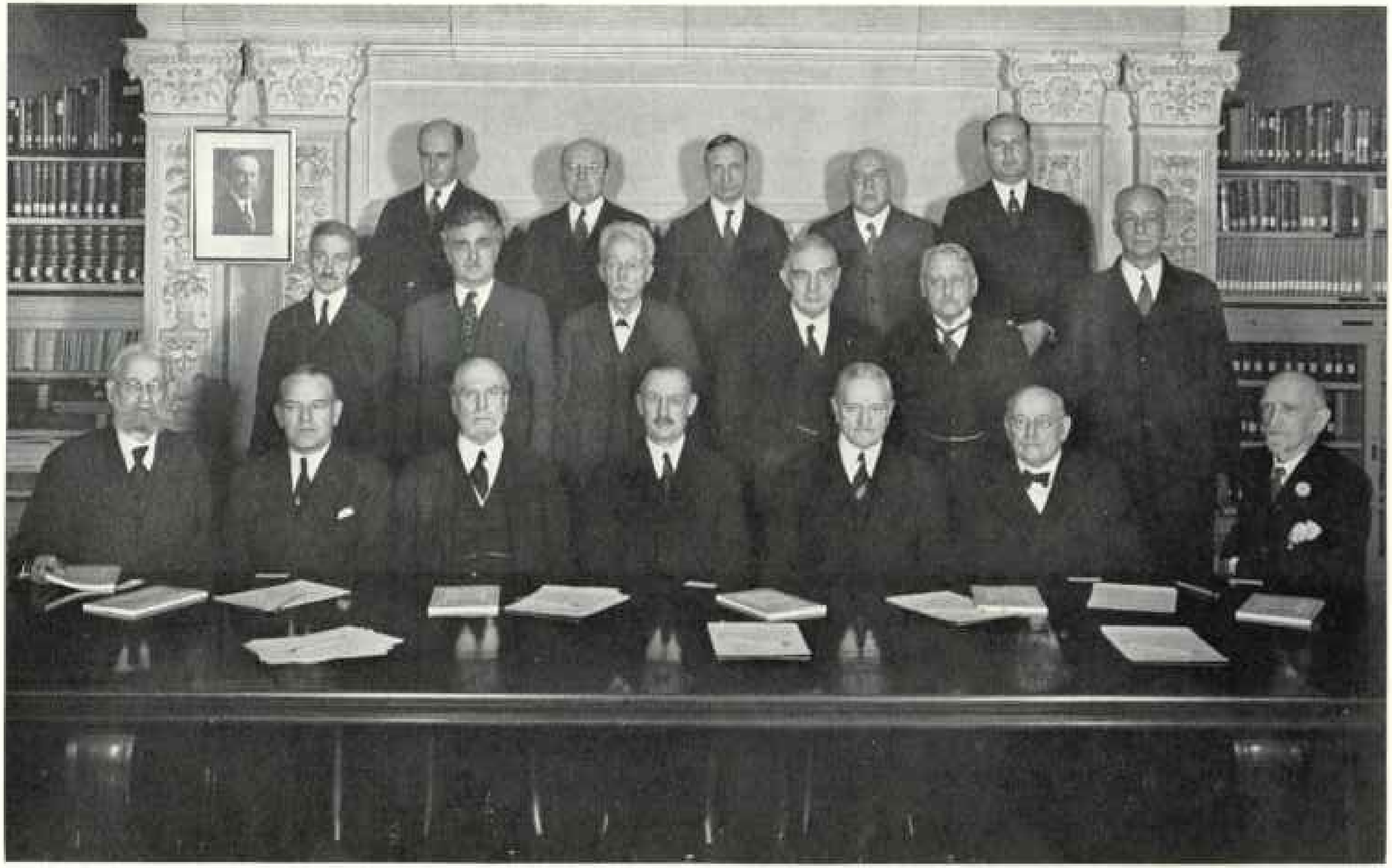
HERE ARE WELCOMED MEMBERS OF THE NATIONAL GEOGRAPHIC SOCIETY WHEN THEY CALL AT THEIR SOCIETY'S HEADQUARTERS

Mr. George W. Hutchison, Secretary, points out to visitors the bronze seal of The Society inlaid in the marble floor of the foyer. The medallions on the elevator doors at the right symbolize world transportation of yesterday and tomorrow. On the walls of the rooms beyond are hung hundreds of enlargements, many of them hand colored, representing the finest photographs taken by The Society's staff photographers on their expeditions to the far places of the globe.

Photograph by Maynard Owen Williams

TRACTOR TREADS IN THE FOOTPRINTS OF MARCO POLO

With the Haardt Trans-Asiatic Expedition, first to cross Asia by motorcar, went Dr. Maynard Owen Williams, chief of The Society's Foreign Editorial Staff. Overcoming mountain barriers two and a half miles high, ice fields, vast deserts, and plains inhabited by bandit tribes, eleven members of the expedition made the 7,370-mile journey from Syria to China in ten months—April, 1931, to February, 1932. A wealth of photographs, the first in natural color of Central Asia, and much valuable scientific data were obtained concerning little-known tribes, villages, and historic sites. Above, the expedition passes beneath the dusty walls of Farah, Afghanistan.



Photograph by Charles Martin

TRUSTEES AND OFFICERS OF THE NATIONAL GEOGRAPHIC SOCIETY IN 1930

Left to Right (seated): Maj. Gen. A. W. Greely, Dr. John Oliver La Gorce (Vice President), Mr. Chief Justice Charles Evans Hughes, Dr. Gilbert Grosvenor (President), Gen. John J. Pershing, John Joy Edson (Treasurer), Dr. O. H. Tittmann. *Second row:* Dr. George R. Putnam, Dr. George Otis Smith, Dr. C. Hart Merriam, Judge John Barton Payne, Theodore W. Noyes, Dr. Frederick V. Coville, Chairman of the Research Committee. *Top:* George W. Hutchison (Secretary), Dr. John A. Foote, Captain Raymond S. Patton, Dr. George K. Burgess, and Robert V. Fleming, who was elected Treasurer of The Society after the death of Mr. Edson in 1955.

THE GEOGRAPHIC'S first Flag Number, in October, 1917, received the praise of President Woodrow Wilson, and the second Flag Number, in September, 1934, with its reproduction of 808 of the world's flags and emblems, was an even greater publication achievement, forming the most comprehensive picture gallery of flags ever published in full color.

An article on "Our State Flowers," with paintings by Mary E. Eaton, was printed in 1917, with the result that nearly a score of States have since adopted State flowers by legislative action.

Immediately after the war, in May, 1919, THE GEOGRAPHIC'S important series of articles on the States of the Union was launched with Dr. La Gorce's story on "The Industrial Titan of America"—Pennsylvania.

One of the most popular of all the GEOGRAPHICS was the March, 1919, number, devoted entirely to the dog, "mankind's best friend," and splendidly illustrated from paintings by Louis Agassiz Fuertes. Through the months and years that followed, similar triumphs were achieved by numbers dealing with horses, cattle, deep-sea fishes, birds, wild animals, and other interesting creatures. From living models the intricacies of fin, feather, and fur, of leaf and petal were portrayed by the able brushes of Edward Herbert Miner, Hashime Murayama, William Crowder, Allan Brooks, Mary Eaton, Else Bostelmann, and Mr. Fuertes. To preserve and make more widely available these color plates and text material The Society publishes its Nature Library, which now comprises ten volumes.

The spirit of romance and adventure behind the story of geography was admirably caught by N. C. Wyeth in his series of mural paintings on Discovery for The Society's headquarters, and reproductions of these were distributed to members as supplements. At the same time, J. R. Hildebrand, in a series of articles, set forth the personalities and the achievements of those courageous men who filled in huge gaps on the map of the world in the Age of Discovery—Columbus, Vasco da Gama, Magellan, Marco Polo, Capt. James Cook, etc.

"AGE OF AVIATION" IN THE GEOGRAPHIC

But if one theme more than another has dominated the pages of geographic history since the war, that subject is flying, for the present decades are truly an Age of Aviation in which man has learned to use his wings and with them to widen his horizons in every direction. To this remarkable advance the titles of articles in post-war GEOGRAPHICS form an interesting key:

Aerial Conquest of Mount Everest; Air Adventures in Peru; America from the Air (a unique series of photographs by Captain Albert W. Stevens); The Arctic as an Air Route of the Future, by Vilhjalmur Stefansson; Ballooning in the Stratosphere, by Auguste Piccard; By Seaplane to Six Continents, by Commander Francesco de Pinedo; Canada from the Air; First Flight to the North Pole; Conquest of Antarctica by Air, and Our Transatlantic Flight, by Rear Admiral Richard Evelyn Byrd; Exploring the Earth's Stratosphere, and The Non-Stop Flight Across America, by Lieut. John A. Macready.

Exploring the Stratosphere, Flying the "Hump" of the Andes, Exploring the Valley of the Amazon in a Hydroplane, Photographing the Eclipse of 1932 from the Air, by Captain A. W. Stevens; Fighting Insects with Airplanes; First Airship Flight Around the World (Dr. Hugo Eckener tells The Society about it); Flights from Arctic to Equator, by Walter Mittelholzer; Flying Around the North Atlantic, by Charles A. Lindbergh and Anne Morrow Lindbergh; Flying Over Egypt, Sinai, and Palestine; Flying the World's Longest Air-Mail Route; From London to Australia by Aeroplane, by Sir Ross Smith; How Latin America Looks from the Air, by Major Herbert A. Dargue; Into Primeval Papua by Seaplane; On the Trail of the Air Mail, and Looking Down on Europe, by Lieut. J. Parker Van Zandt; Man's Amazing Progress in Conquering the Air, by J. R. Hildebrand; Navigating the *Norge* from Rome to the North Pole and Beyond, by Gen. Umberto Nobile; On the Wings of the Wind (in motorless planes), by Howard Siepen; Our Conquest of the Pacific, by Kingsford-Smith and Ulm; Seeing America from the *Shenandoah*.

President Coolidge Bestows Lindbergh Award; Seeing America with Lindbergh; To Bogotá and Back by Air, by Charles A. Lindbergh; Seeing the World from the Air, by Sir Alan J. Cobham; Seeing 3,000 Years of History in Four Hours, by Maynard Owen Williams; Skypaths Through Latin America, by Frederick Simpich; Unexplored Philippines from the Air.

This is only a partial list, but what a thrilling story it tells of achievement in the

air, and what an aviation library of first-hand stories by the famous flyers themselves these volumes form!

During the last few years, too, flyers have gained the lion's share of The Society's coveted medals awarded for outstanding geographic accomplishments. Seven of the last eight medals have gone to aviators and the last two have been won by women flyers.

The complete list of medals, presented by the National Geographic Society at memorable special meetings honored by the presence of Presidents Theodore Roosevelt, Taft, Wilson, Coolidge, and Hoover, and recorded in The Society's Magazine, will be found in the Cumulative Index.

Glancing back through these 36 years of GEOGRAPHICS, one sees how the growth of The Society has coincided with the growth of a national and international viewpoint. The eyes of the average man were turned with new interest toward the Poles when explorers strove to conquer them; toward the acquisitions of the United States in the Spanish-American War; toward Central and South America with the construction of the Panama Canal; toward the expansion in the West; toward Europe with the World War, and latterly toward the whole world, now that man has wings and the globe has greatly shrunk as measured in the time it takes to travel over it.

Throughout this entire period The Society has sought to present articles and pictures of a type to interest and inform the average intelligent man and woman. The growth in circulation from a paltry 165 to more than a million families is due in large part to this program.

INCREASE IN MEMBERSHIP DUE TO COOPERATION OF MEMBERS

We promised original members, if they would help to increase the number of members and thereby increase the funds available for obtaining material, that we would give them a better GEOGRAPHIC MAGAZINE.

Our promise was: "Increase our circulation by getting us new members and thus increasing the funds available for investment in The Magazine and we will give you a better Magazine."

The members responded generously, and that we kept our promise is shown by comparing the successive volumes of The Magazine and by the duration of membership.

In size as well as quality The Magazine has grown year by year. The 12 issues for 1935, with 1,598 pages, and two map supplements, form the fattest volume of all.

All over the world go these beautifully printed, yellow-covered GEOGRAPHICS. One member's copy travels first by train, then by mighty ocean liner, by upriver sampan, by coolie courier, and finally by camel caravan to interior China.

Other prosaic stencil record cards are magic keys to a monarch's gold-bedecked palace in India, a South African ostrich farm, a tea plantation in Malaya, a jungle settlement among wild rubber trees of tropical Amazonia.

The tables on pages 163 and 164 show the geographical distribution of The Society's million members.

READ BY FATHER, MOTHER, CHILDREN

From this vast host of members everywhere come hundreds of letters bearing witness to the influence of The Society, which soon will observe its 50th birthday.

"Whenever things get in a rut, life seems dull, walled in by monotonous repetitions or filled with perplexities, I pick up a NATIONAL GEOGRAPHIC, sit down and go traveling," writes a housewife. "I come back refreshed, enlightened, and more conscious of the fullness of life—and we are very likely to have something different for dinner that night."

"Father reaches for THE GEOGRAPHIC first; he says it gives him adventure and business perspective," writes another member. "Mother uses it for preparation for her woman's club—if the children have not grabbed it for a school assignment."

"I need my GEOGRAPHICS to interpret world news, to make these happenings seem real," writes a third.

"The most valuable bequest we have received this year," says a letter from a school principal, "was a set of bound volumes of the NATIONAL GEOGRAPHIC MAGAZINE, extending back 15 years.

"Though some were worn from much use, the member apparently having loaned them frequently, we were glad to receive them because we had tried in vain to obtain some issues, and prices quoted on others by rare-book dealers were so costly they were prohibitive."

"Schools require no introduction to the NATIONAL GEOGRAPHIC," observes the *Minnesota Journal of Education*. "The

Magazine is as much a part of school libraries, on the reading tables and reference shelves, as is true of literary classics, books on history, science, and fiction."

From a member in Ireland comes this: "Need I say that I would sooner starve than go without my NATIONAL GEOGRAPHIC? We have nothing on this side of the Atlantic that can touch it."

A WORLD OF "INFINITE VARIETY"

I am often asked, "What will THE GEOGRAPHIC do when subjects of geographic interest have been exhausted?" My invariable reply is, "Our world contains an infinite variety and an inexhaustible reservoir of geographic material of ever-surprising interest, if we have but the wit to see and interpret it."

For "armchair traveling" there is no substitute for THE GEOGRAPHIC. Then, too, quick communications link all nations now, so that every man's interest in other parts of the world steadily increases. The day when history was formed by events that could be localized is gone. News and thoughts are now exchanged among nations almost instantaneously, so that the whole world is sensitive to important events in any of its parts. The epic story of these parts —and their ever-changing human and economic geography—is told in the GEOGRAPHIC MAGAZINE.

"Of all sciences," wrote Joseph Conrad in THE GEOGRAPHIC, "geography finds its origin in action, and, what is more, in adventurous action."

The volumes to which the new Cumulative Index is the key tell, subject by subject, the story of geographic action for the last 36 years.

The gratifying progress of the National Geographic Society has been possible because of the happy and harmonious unity of action which has ever animated the Board of Trustees and executive staff in carrying out the altruistic purpose and ideals of The Society. Of course, no member of the Board of Trustees or of the staff can ever acquire a financial interest in the National Geographic Society or its Magazine, nor when he severs his connection with The Society can he carry with him, or bequeath, a tangible asset to represent his years of service with the organization.

The National Geographic Society staff of men and women, by operating The Society on sound business principles, and combining sagacity and energy with literary skill and patient research work, are enjoying hugely the rich experience of creating, and endowing in their own lifetime, a unique educational institution.

I have already paid tributes of respect and admiration to Vice President John Oliver La Gorce and Secretary George W. Hutchison (see pages 152, 154, 156, 157).

It is 34 years since a notable company of explorers, scientists, and educators, gathered in the home of Alexander Graham Bell, were sorely perplexed. They believed they had a plan for developing an organization that, if realized, would render immense service to mankind by making people acquainted with each other, and thus overcoming that ancient and unfortunate human prejudice which calls all unknown people barbarians.

We needed for a balance wheel a Treasurer who possessed vision as well as business acumen. How well I remember our pleasure when our President, Dr. Bell, suggested the name of John Joy Edson and he accepted. The Society was rather small in those days (April 1, 1901), twenty-five hundred members in all, and the paid staff consisted of three persons!

As we had expected when we persuaded him to accept the post as a labor of love, Mr. Edson initiated policies that have been important in The Society's growth and success, and, largely as a result of his wisdom and unswerving cooperation for 34 years, there has been created in the Nation's Capital an altruistic educational institution whose beneficent influence extends throughout the entire globe.

Many others have served The Society ably and long. There is space to mention only those of 10 years' service on the editorial staff of The Magazine:

Ralph A. Graves, ingenious and capable Assistant Editor from April 1, 1916, until his lamented death, September, 1932.

J. R. Hildebrand, Assistant Editor, since February, 1919, gifted writer and discerning critic.

Franklin L. Fisher, resourceful Chief of Division of Illustrations, since December 1, 1915, who has gathered an efficient corps of illustrators and photographers for The Magazine.

William Joseph Showalter, Chief of Research Division, from April 1, 1914, until his death, October 13, 1935, author of many outstanding studies.

Maynard Owen Williams, explorer and erudite Chief of Foreign Editorial Staff, since June 1, 1919.

Frederick Simpich, Assistant Editor, who while a Foreign Service Officer in Turkey, Mexico, and Germany, contributed many cogent articles to THE GEOGRAPHIC.

Albert H. Bumstead, Chief Cartographer since 1915 (see page 130).

Charles Martin, Chief of Photographic Laboratory, since 1915, specialist in color photography.

McFall Kerbey, competent Chief of School Service, since September 10, 1920.

Melville Bell Grosvenor, Assistant Editor, alert and industrious, the fourth generation of his family privileged to serve The Society, since September, 1924.

GEOGRAPHICAL DISTRIBUTION OF MEMBERS OF THE NATIONAL GEOGRAPHIC SOCIETY, MAY, 1935

United States	
Alabama	4,550
Arizona	3,364
Arkansas	2,404
California	92,906
Colorado	9,032
Connecticut	18,300
Delaware	2,249
Florida	10,197
Georgia	6,268
Idaho	3,730
Illinois	49,678
Indiana	16,548
Iowa	13,272
Kansas	10,369
Kentucky	6,277
Louisiana	5,259
Maine	9,729
Maryland	13,013
Massachusetts	46,568
Michigan	30,483
Minnesota	16,625
Mississippi	2,405
Missouri	16,313
Montana	5,063
Nebraska	8,516
Nevada	1,278
New Hampshire	5,286
New Jersey	47,225
New Mexico	2,000
New York	120,763
North Carolina	7,580
North Dakota	2,750
Ohio	50,419
Oklahoma	8,437
Oregon	13,993
Pennsylvania	71,741
Rhode Island	6,751
South Carolina	3,121
South Dakota	4,061
Tennessee	6,046
Texas	23,895
Utah	3,357
Vermont	3,604
Virginia	11,530
Washington	19,920
West Virginia	6,308
Wisconsin	18,860
Wyoming	2,557
District of Columbia	9,998
United States Territories, etc.	6,758
Canada	37,127
Foreign	107,253
Miscellaneous	3,023
Total	1,008,713

U. S. Territories and Possessions	
Alaska	1,191
Canal Zone	757
Guam	14
Hawaii	2,640
Philippine Islands	1,319
Puerto Rico	769
Samoa (American)	12
Virgin Islands	56
Total	6,758

Canada	
Alberta	3,070
British Columbia	5,379
Manitoba	1,976
New Brunswick	860
Northwest Territory	35
Nova Scotia	1,418
Ontario	15,136
Prince Edward Island	138
Quebec	7,078
Saskatchewan	1,944
Yukon Territory	93
Total	37,127

Central America	
Costa Rica	208
Guatemala	382
Honduras	223
Nicaragua	75
Panama	119
Salvador	136
Total	1,143

Mexico	
Mexico	2,928

South America	
Argentina	2,454
Bolivia	138
Brazil	2,183
British, French, and Dutch Guiana	111
Chile	776
Colombia	512
Ecuador	137
Paraguay	32
Peru	542
Uruguay	229
Venezuela	585
Total	7,699
West Indies, Bermuda, etc.	3,107
Netherlands (East) Indies	965

Asia	
Afghanistan	14
Arabia	22
China	1,898
French Indo-China	54
Hong Kong	280
India	2,153
Iran (Persia)	198
Iraq	69
Japan	916
Levant States (Syria)	108
Palestine	186
Siam	170
Siberia	4
Straits Settlements	466
Turkey	218
Total	6,756
Europe	
Albania	17
Austria	332
Belgium	1,223
Bulgaria	50
Czechoslovakia	851
Danzig	13
Denmark	888
Estonia	66
Finland	236
France	2,507
Germany	1,997
Gibraltar	31
Great Britain and Ireland	40,506
Greece	236
Hungary	310
Italy	2,067
Latvia	111
Lithuania	48
Luxembourg	31
Monaco	29
Netherlands	2,363
Norway	1,300
Poland	398
Portugal	561
Romania	243
Spain	1,560
Sweden	1,777
Switzerland	2,213
Union of Soviet Socialist Republics	96
Yugoslavia	235
Total	62,297
Australia	
Federal Capital Territory	33
New South Wales	3,239
Northern Territory	27
Queensland	1,640
South Australia	960
Victoria	3,092
Western Australia	897
Tasmania	464
Total	10,372
New Zealand	
New Zealand	4,049

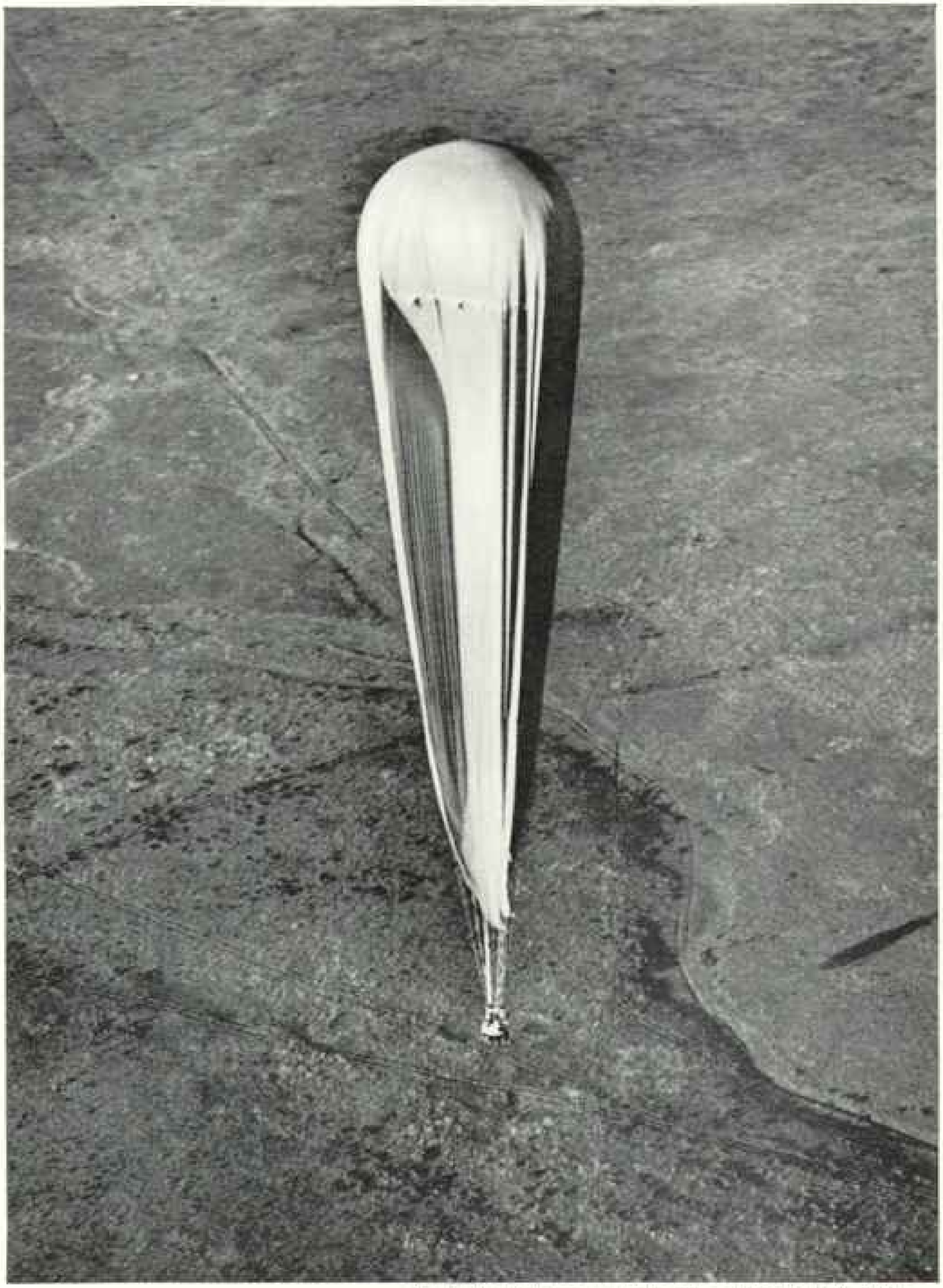
Africa	
Independent Countries	
Egypt	485
Ethiopia (Abyssinia)	20
Liberia	15
Belgian Africa	
Belgian Congo	164
British Africa	
Anglo-Egyptian Sudan	46
Basutoland	23
Bechuanaland	4
Cape of Good Hope	1,587
Gambia	12
Gold Coast	83
Kenya	244
Mauritius (island)	49
Natal	925
Nigeria	108
Nyasaland	54
Orange Free State	338
Rhodesia (Northern)	114
Rhodesia (Southern)	324
Sierra Leone	24
Somaliland (British)	5
South-West Africa	45
Swaziland	10
Tanganyika	104
Transvaal	1,765
Uganda	55
Zanzibar (island)	2
French Africa	164
Italian Africa	9
Portuguese Africa	253
Spanish Africa	15
Total	7,048
Islands, Miscellaneous	
Ascension	2
Azores	80
Canary	61
Cook	9
Cyprus	28
Falkland	10
Fiji	90
Iceland	22
Madeira	42
Malta	53
New Caledonia	5
Newfoundland	316
New Hebrides	9
Norfolk	2
Samoa	33
Society	16
Solomon	18
Tonga or Friendly	8
Miscellaneous	65
Total	889

ACTION PHOTOGRAPHS OF THE BALLOON'S PERFECT LANDING

© Major H. Lee Wells, Jr.

ON THE MARK AND ALMOST READY FOR A WORLD-RECORD DASH INTO THE STRATOSPHERE

Here *Explorer II* poises on the floor of the bowl near Rapid City, South Dakota, five minutes before the ascent. Beyond, low-lying haze floats over the expedition's "tent city." Three appendices hang from the balloon just above the gondola. These are "inverted chimneys" of cloth. When the balloon later rose to "pressure height"—an altitude so high that the low air pressure permitted the gas to expand and fill the bag—the appendices allowed the surplus helium to escape.

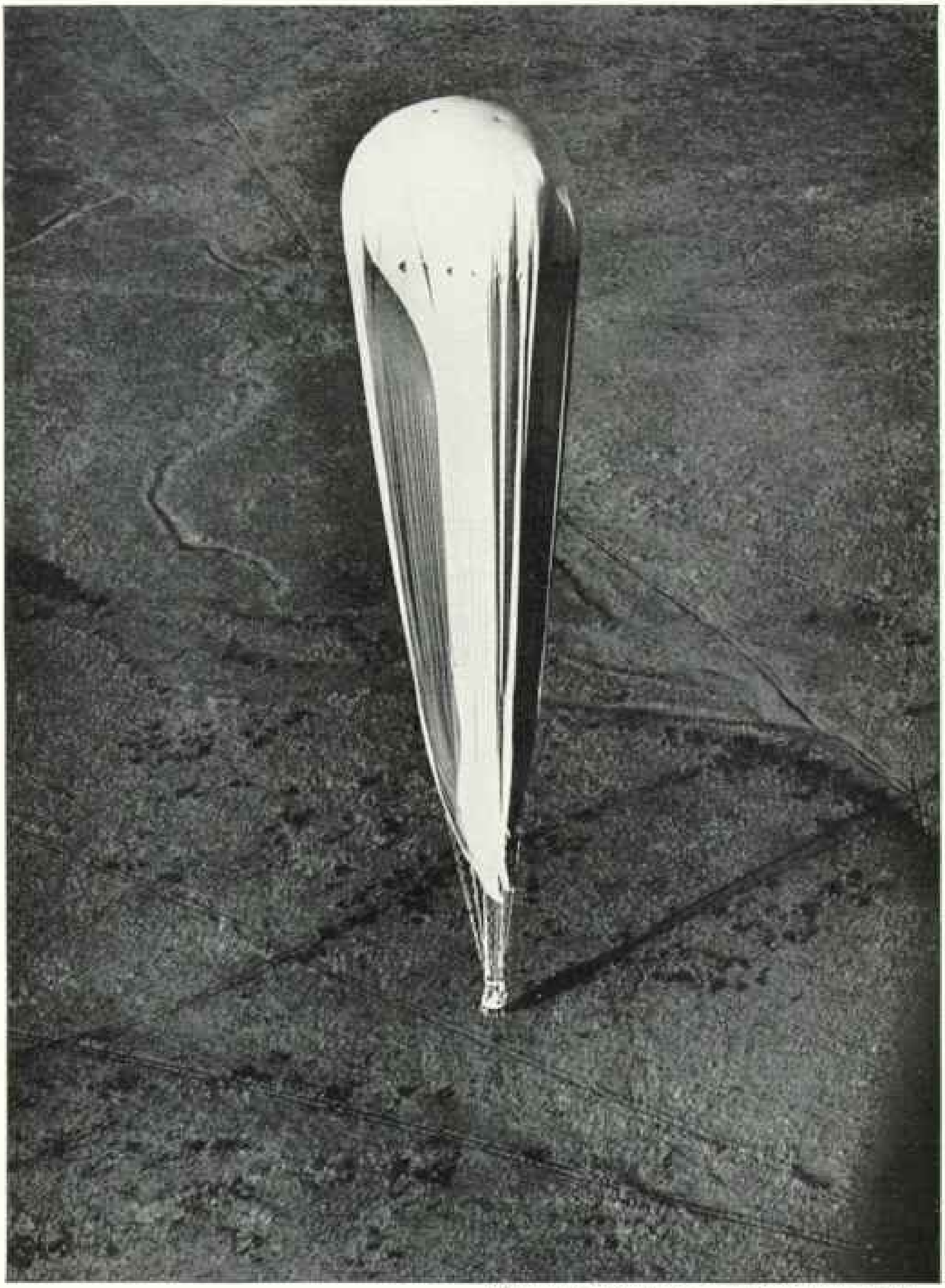


Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Baisley

COMING DOWN SLOWLY, WITH 30 FEET TO GO

The huge balloon, its gas once more a mere "bubble" in the top, drifts to earth, about 12 miles south of White Lake, South Dakota, after its journey 13.71 miles above sea level. The gondola's elongated shadow (right) affords a scale to measure the bag's approximate height above the ground. Beneath the gondola grass and weeds are magnified by late-afternoon shadows.

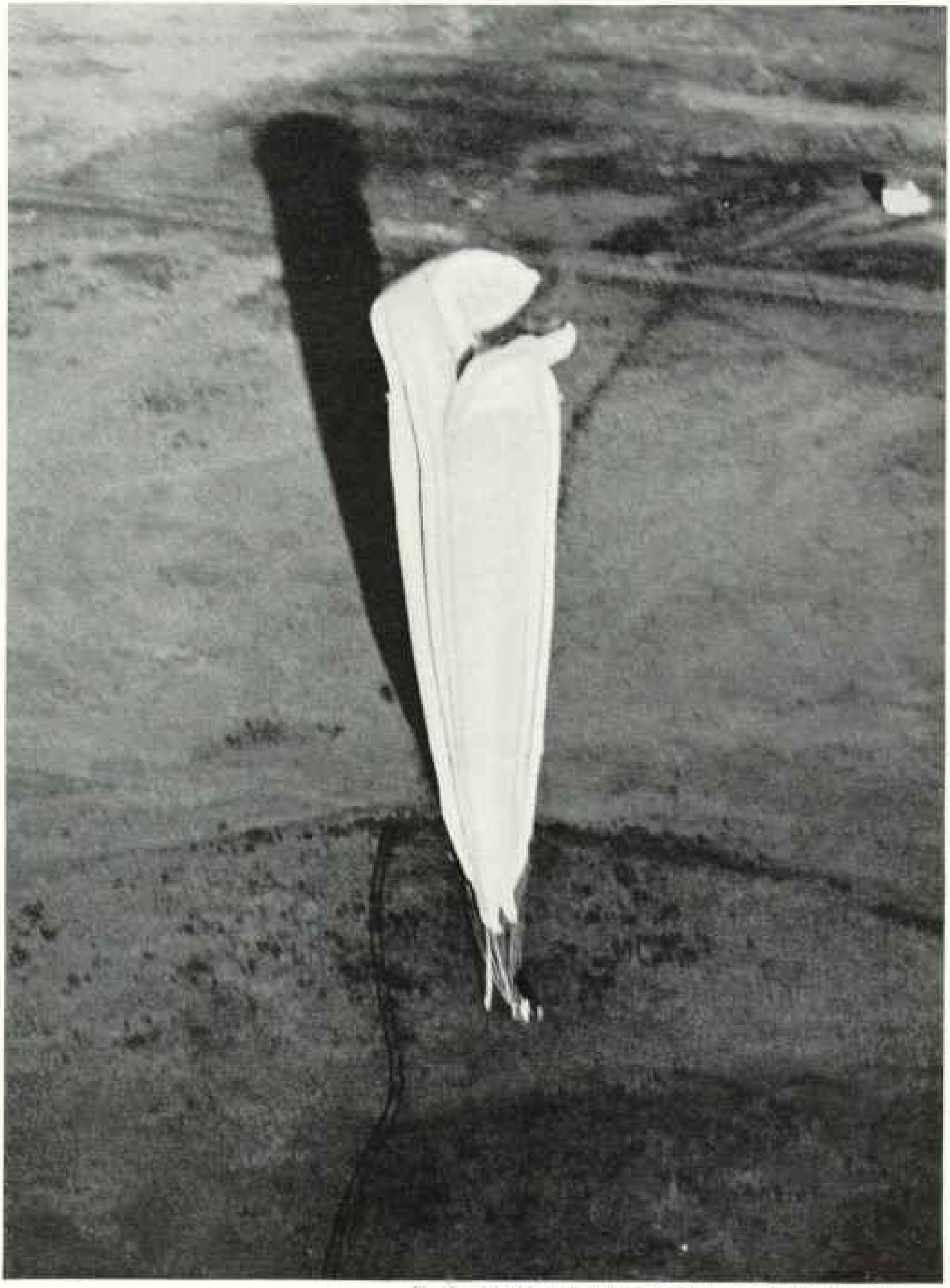
ACTION PHOTOGRAPHS OF THE BALLOON'S PERFECT LANDING



Photograph by Richard H. Stewart and Captain James Hinelip

CONTACT! THE GONDOLA MEETS ITS SHADOW AND THE GROUND

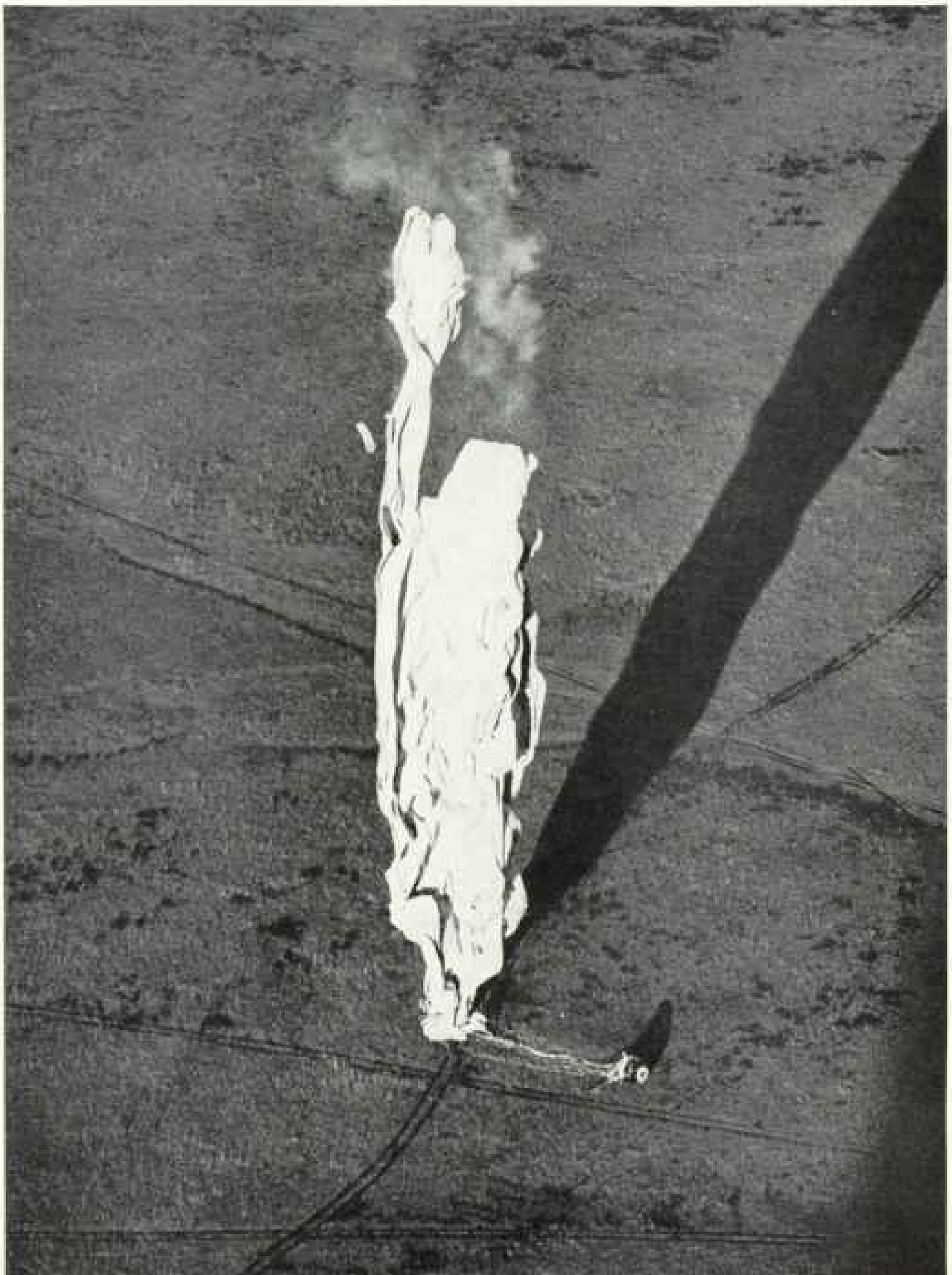
At this instant Captain Stevens and Captain Anderson, working together, pulled the rip cord to release the gas and deflate the bag. The tiny dimple in the top of the balloon near the right edge indicates the pull is taking effect. The black dot to the left is one of the two balloon valves. This remarkable series of pictures, taken from escorting airplanes, shows the successive stages in the safe landing of the *Explorer II*.



Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Bailey

THE BALLOON TOP SPLITS ASUNDER AND "EXPLORER II" GIVES UP THE GHOST

A fraction of a second after the rip cord was pulled (see Plate III), the upward-surging gas tore the top out of the balloon, putting a stop to its drift. At the moment this photograph was taken, the nearly decapitated bag had just begun to drop to the earth. There was practically no noise when the bag opened and fell. A close study of this and the succeeding illustrations will show that the gondola was not dragged along the ground after it had gently rolled over on its side.



Photograph by Richard H. Stewart and Captain James Halslip

GAS ESCAPES, AND, LIKE AN EMPTY SACK, THE BAG FALLS TO EARTH

The smokelike cloud rising from the opened bag is soapstone dust shaken from the fabric and carried upward by the escaping helium. The rubberized cloth of the bag was treated with this powder to prevent its folds from sticking. Helium gas is nonexplosive and invisible. So gently did the gondola come down on the ground that the doughnut-shaped, inflated bumper (clearly visible as a white circle on the car) did not burst.

Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Baisley

FROZEN BY PHOTOGRAPHY, THE FAST-FALLING FABRIC SEEMS A GIGANTIC FLAME

How well the sudden ripping of the balloon accomplished its purpose—to prevent the unwieldy bag from acting as a sail and dragging the gondola—is shown by the slack ropes and webbing lying between the top of the car and the cloth. In the middle distance is a farm on one of the State's convenient section-line roads—a dirt lane that a few minutes later became choked with traffic (see Plate VIII). Every detail of the collapsing bag, even to the cloud of escaping soapstone dust, is strikingly delineated in the black shadow cast by the setting sun.

ACTION PHOTOGRAPHS OF THE BALLOON'S PERFECT LANDING

Photograph by Master Sergeant G. B. Gilbert and Captain H. K. Baisley

A SINGLE FINGER OF CLOTH STILL POINTS TO THE STRATOSPHERE

Less than a second separates the last bit of the falling *Explorer II* from the earth. The successive stages in the rapid deflation of the big bag, shown in this and the three preceding pictures, took place in five or six seconds. The automobile appearing to the right of the gondola was the first to arrive on the scene. As the balloon descended, the trailing 500-foot rope closely paralleled the road in the distance, and when it finally snaked across the highway it temporarily halted automobile traffic. The balloonists shouted requests to the drivers to get out and hold the rope, but they seemed to fear the trailing hawser.

Photograph by Master Sergeant G. R. Gilbert and Captain H. K. Bailey

FROM FAR AND NEAR, MOTOR CARAVANS RAISE THE DUST AS THEY STREAK TO THE LANDING

Explorer II drifted for miles only a few thousand feet above the South Dakota countryside when it was coming down, with the result that hundreds of automobiles took up the chase. Some motorists even kept it in sight all the way from Rapid City to White Lake, an airline distance of 225 miles. This picture was taken five minutes after the gondola had touched the ground and shows automobiles parked and the passengers clustered about the globe. Two airplanes, from which motion pictures and the accompanying still photographs were made, have landed in an adjoining pasture in the foreground.

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At an expense of *over* $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

The Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole, and contributed $75,000 to Admiral Byrd's Antarctic Expeditions.

The Society granted $25,000, and in addition $75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees 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, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to an officially recognized altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, which obtained results of extraordinary value.

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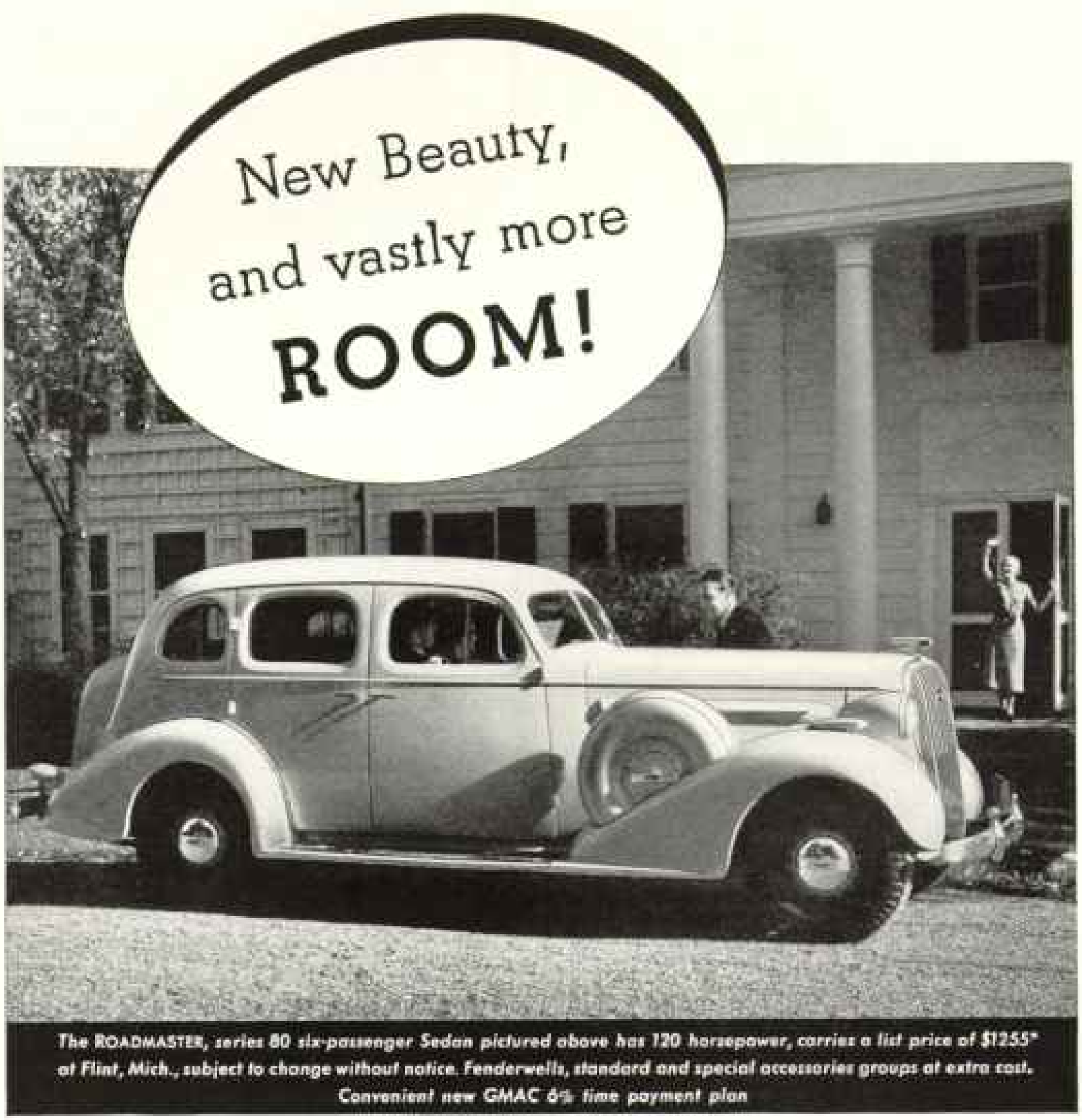

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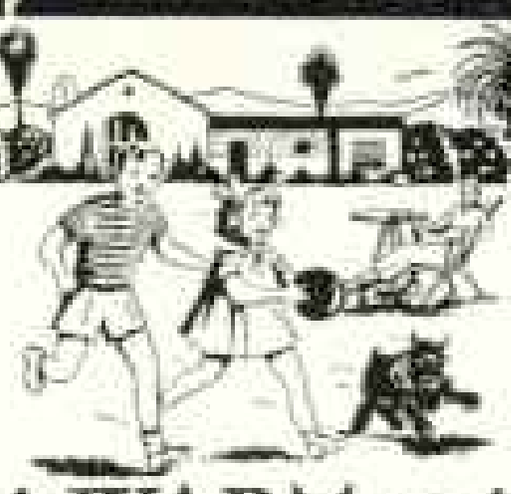

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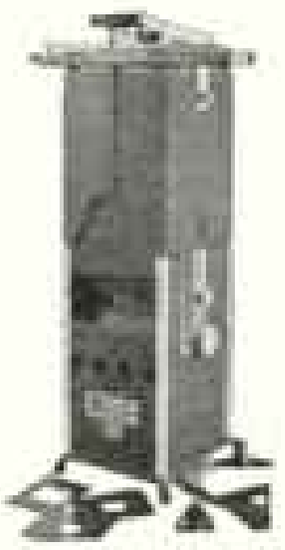

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The National Geographic Directory of Colleges, Schools and Camps

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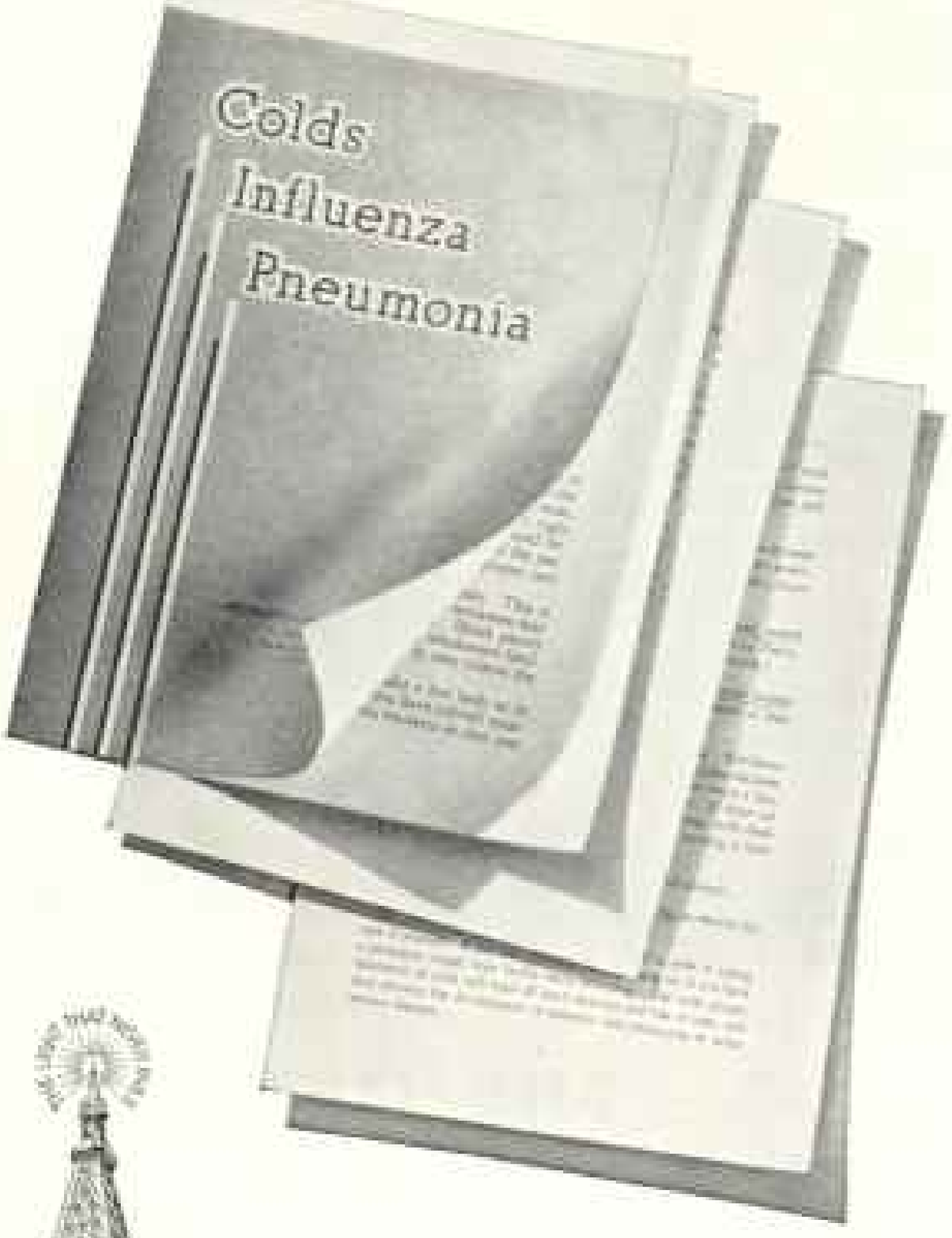

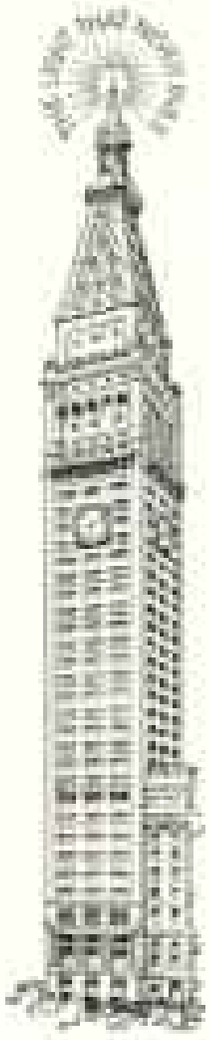

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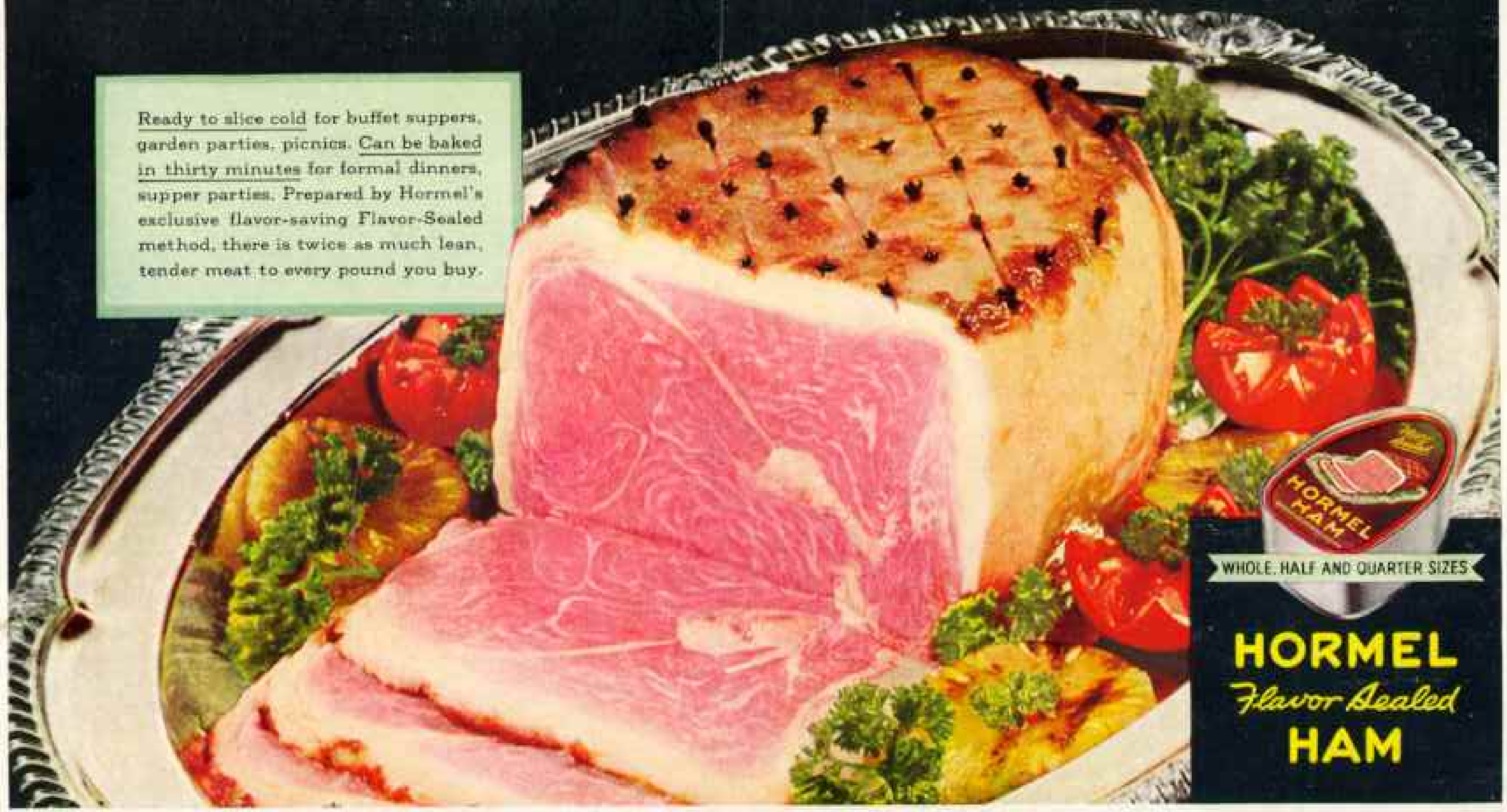

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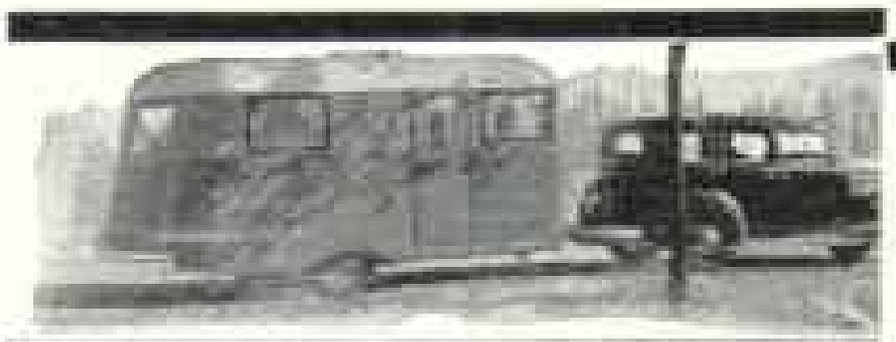

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Washington, D. C.

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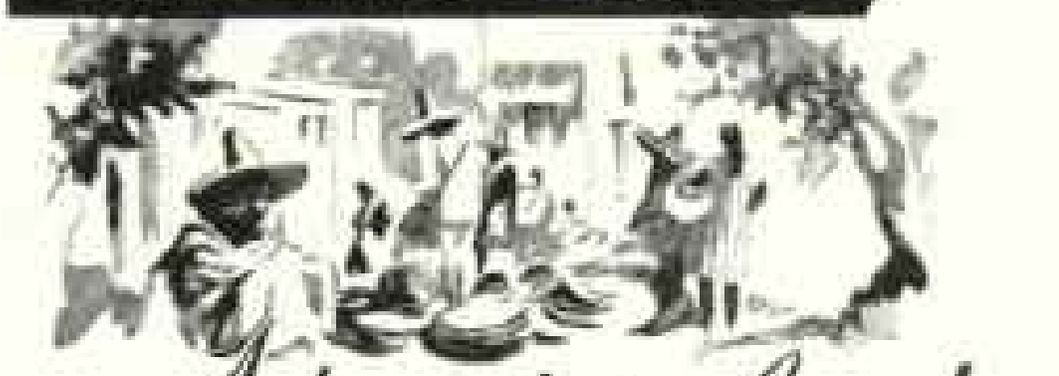

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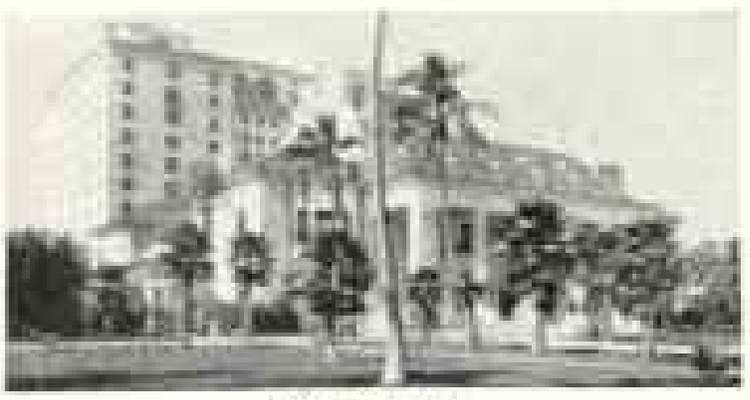
Palm Beach



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GEORGIA

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