VOLUME LXII NUMBER FIVE

# THE NATIONAL GEOGRAPHIC MAGAZINE

NOVEMBER, 1932

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THE NATIONAL GEOGRAPHIC MAGAZINE



# FROM THE MEDITERRANEAN TO THE YELLOW SEA BY MOTOR

## The Citroën-Haardt Expedition Successfully Completes Its Dramatic Journey

BY MAYNARD OWEN WILLIAMS, LITT. D.

SPECIAL STAFF REPRESENTATIVE OF THE NATIONAL GEOGRAPHIC SOCIETY

AFTER a week of Central Asian courtesies, we sat in a fascinating kiosk near New Kashgar, drinking the *chah-jan*, or farewell tea. The horses which had brought us across the Roof of the World stood ready to carry us to Aqsu (Aksu), where four of our seven tractors were to meet us.

A month before, the Taotai would have barred our way. Now, having wined and dined us, he was unquestionably cordial, but it would ease his mind when we were beyond his jurisdiction.

"We have not been able to satisfy you in everything, but our orders come from those who do not yet know you. Once in Urumchi, you will doubtless find the Governor as friendly as are we."

Before we proceed, it is necessary to go back a bit. The original plan, elaborated by M. Georges-Marie Haardt and M. André Citroën during two years of careful preparation, had been to cross Asia from Beyrouth to Peiping in one set of tractor motorcars, avoiding the mountain heart of Asia by cutting north of the Hindu Kush and driving east through Russian Turkistan.

In the flow and ebb of political currents, permission from the Soviets had been granted and refused. The final closing of Russian Turkistan against us necessitated two sets of cars, one going east from the Mediterranean, one west from the Yellow Sea toward a Central Asian rendezvous.*

Of the seven tractor-type cars we had used from Beyrouth, all were south of the mountain barrier over which we had just come on horseback. Five were in Srinagar, one remained in Gilgit, and one was on its way back to Paris after having set an altitude record of 13,775 feet over the Himalayas at Burzil Pass and blazed 207 miles of trail on which no wheels had ever rolled, from Bandipur Bridge to Nomal, north of Gilgit.

Of the seven similar but heavier cars which had toiled westward from Tientsin, four had been allowed to come to Aqsu from Urumchi, where the rest of the material was held, pending our arrival.

### CHINA VIEWS EXPLORERS WITH SUSPICION

Permission to cross China, canceled while we were in the mountains, had now been renewed; but our activities were limited until we had convinced the Governor of Sinkiang—an autocrat, quarantined from interference by almost impassable deserts—of our honesty of purpose.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "The Trans-Asiatic Expedition Starts," by Georges-Marie Haardt, for June, 1931; "The Citroën-Haardt Trans-Asiatic Expedition Reaches Kashmir," and "First Over the Roof of the World by Motor," by Maynard Owen Williams, Oct., 1931, and March, 1932, respectively.


Photograph by Maynard Owen Williams

MEN AND MATERIALS FROM 140 ANIMALS WERE TRANSFERRED TO CARS AT AQSU
A Turki is holding one of the riding ponies used in crossing the Pamirs, and Haardt, Jacovleff, Audouin-Dubreuil, and De Chardin stand beside the cars which had come from Tientsin.

Photograph by Citroën-Haardt Expedition

THE EXPEDITION LEADER PLAYING WITH THE MASCOT "PARIS" IN URUMCHI

Winter had settled down upon the Russo-Chinese capital of Sinkiang before the Expedition was able to set out across the wind-swept steppe toward the coast of the Yellow Sea, 2,900 miles away. Behind the windows at the left is the dining room and social hall used by the occidentals during their enforced stay. The yurts were occupied by them as sleeping quarters.

We had been suspected of everything: of seeking mineral or archeological treasure; of fostering a Pan-Turanian plot; of interfering in Chinese politics; of trying to unseat the Governor of Sinkiang. Later we were taken for Japanese advancing on Peiping in armored cars.

The Citroën-Haardt Trans-Asiatic Expedition successfully overcame psychological as well as physical difficulties and recorded many aspects of Asiatic life in many ways. Millions now know that in 1932, as in the days of the Mongols, 600 years ago, a group of relatively defenseless travelers can cross all Asia not only in safety, but with a growing sense of international fellowship.

No occidental device or invention could avail us in Sinkiang. We would advance or stay, as many other visitors have done, according to the desires or whims of the local officials; for this was the very heart of a continent into which occidentals have gone only through the cooperation or consent of those to whom it belongs.

In the Middle Ages, European missionaries and traders were welcomed in Central Asia. The Tatar or Mongol post then went far faster than did our motorcars from Aqsu to Peiping.

### RIDING FORWARD INTO MYSTERY

Central Asia is still far away! Far away those peaceful, dusty trails along which we tramped or rode in that witching hour before the autumn dawn; far away those quiet villages which burst into the flame of Turki dress when the rumor of our coming emptied the curious into the narrow streets.

Day after day we rode forward into mystery. Day after day we found welcome. When shall we forget that shady garden of Faizabad, east of Kashgar, with a pet gazelle staring wide-eyed through the shrubbery and Rahim's lovely daughter, with a fresh flower in her hair, arriving with a tray piled high with fruits, like a figure in an Egyptian mural?

Along the edge of the desert, tiny hamlets or walled towns. At the former we stopped only long enough to sample the luscious melons or wait for a local financial syndicate to make change for a "shinplaster" worth eight cents. At the latter we watched the life of these oasis communities, which teem with crowds on market days and become still when bright-garbed visitors have been lost to view down that "Great Route," which is so often a great rut.

The one long market street is lined with open-air kitchens and shops for breadstuffs, bright gewgaws, or sturdy products of the local smithy. Behind this relatively bright façade are caravansaries, where patient donkeys ponder great problems and camels act like haughty dowagers chewing gum.

In the autumn, once the summer glare and heat are tempered a bit, the desert itself is fascinating. Dust favors lone travel, and to one without distractions the silver and gold tassels of false sorghum, bunched with purple blossoms of the dwarf tamarisk, have a regal splendor. The flight of a solitary, black-winged stork against the hazy blue becomes a wordless poem. We almost tiptoed out of night-cool towns to keep lone rendezvous with the desert dawn.

### TWO GROUPS OF THE EXPEDITION MEET IN THE HEART OF ASIA

Eager as we were to see our friends, who had toiled toward us from Tientsin, we dimly dreaded losing this glad, free life in the routine marches of a motor convoy. As night settled down and the desert Angelus sounded from deep-voiced camel bells, the boundless sky seemed an intimate chapel into which the sound of striving motors must never intrude.

From the time when the Pamir and China groups of the Trans-Asiatic Expedition met in the dusty road at Aqsu, with Haardt bowing his tall body to salute his old friend "Maurice," chief mechanic and treasured companion during the "Black Journey" across Africa,* until the candles had burned low that night, October 8, 1931 was a day of days.

The shining tableware; the bright cloths; the Chinese lanterns in the soft darkness; the neat valises with clean clothing; the big, fine cars, so spic and span, after their adventurous crossing of the Gobi—these were but the material trappings for a long-awaited spiritual reunion between men who had planned a rendezvous half a world away and, after many adventures, had kept it.

Before we left, a Turki girl near death

* See "Through the Deserts and Jungles of Africa," by Georges-Marie Haardt, in the National Geographic Magazine for June, 1926.

Photograph by Citroën-Haardt Expedition

A WEAK LINK IN TRANS-ASIATIC TRAFFIC

Most of the 7,370-mile route from Beyrouth to Peiping needs only filling stations and repair shops to fit it for rough motor travel; but bridges are lacking and the trail is still broken by bad bits. Here even wheeled cars can advance, but a few miles farther (see opposite page) a serious barrier existed until the Expedition cars found their way through with the aid of native helpers.

was brought to Doctor Jourdan. While others assisted at the emergency operation, I sought to comfort the mother, whose confidence touched the heart. My notes were scribbled back there in a Central Asian garden:

"Here we are, misunderstood travelers in a far country. A bit of bazaar gossip and the sick arrive. And here is a Turki woman giving over her charming daughter to the rattling cutlery of a fair-haired boy of a surgeon. To-morrow we go our way. By then it would have been too late. The danger is still great, for no doctor can watch over her convalescence. Whether she lives or not, the time will come when all will forget this 'foreign devil' who juggled with Death under the dusty trees in a night-black courtyard. But the tradition of mutual friendship may live."

Three desert days, punctuated by irrigation canals and rivers, brought us to a plateau near the grottoes of Kizil.

Modern records have a short life, and in a few centuries our mode of living may become a greater mystery than is that of the Egyptians or Hittites. Why shouldn't fashion magazines, as well as lists of soon-to-be-forgotten names, be deposited in cornerstones? Such an archeological find, discovered A.D. 3132, would picture our costumes and customs much as the Kizil frescoes do the life of this Indo-European oasis in eighth-century Asia.

The main subjects in these monastic temples and cells are religious in theme; but

Photograph by Citroën Haardt Expedition

TRACK-TYPE CARS CONQUERING ONE OF ASIA'S WORST BARRIERS TO WHEELS

From the south rim of the Turfan Depression the trail drops nearly 6,000 feet in a few miles. Communication is through the narrow, rocky Tokosun Gorge, long used by high-wheeled carts, but never before used by motors. There is a hamlet in the gorge and the villagers are facilitating the return of the four cars which went to Aqsu over this rocky road.

the patron gets his place in the picture, and with the vast advantage that, while a deity may wear fanciful garb or be patterned through a stencil, the donor and his wife are dressed in individual clothes and their personal portraits painted.

We have no definite clue to the exact relation between these belted knights or ladies in tight bodices and flowing trains of the Kizil frescoes and Europeans in the age of chivalry and minstrelsy, but Albert von Le Coq, in his "Buried Treasures of Chinese Turkestan," has shown that the relation exists.

We followed Von Le Coq from one Central Asian site to another, studied the murals which remained after he had carted away forty tons of the best paintings to the splendid Ethnographic Museum in Berlin and studied the not-always-inferior frescoes which he left behind.

Thoroughly versed in Indian, Iranian, and Chinese art, M. Hackin, of our party, had traveled for months to see and study Central Asian art, yet any "scientific study" of the Kizil caves was forbidden. He might have been able, had he been allowed, to trace the influence of Alexander's artists, of Gandhara and Bamian, on this sixth- to eighth-century art, and to follow up its connection with Gothic art of centuries later and half a world away.

### A TALE OF TANTALUS AT KIZIL

Kizil could have provided him with weeks of original research. Other distinguished scientists had been barred from Sinkiang. He was there, working his way

Photograph by Maynard Owen Williams

A MONGOL PRINCESS WHO SPEAKS THE LANGUAGES AND THINKS THE THOUGHTS OF BOTH ORIENT AND OCCIDENT

Familiar with the life of the Rue de la Paix, Princess Palta (Nirgidma of Torhut) is here seen at the entrance of a yurt such as Asiatic nomads have used since the days of Herodotus (see Color Plate IX).

from grotto to grotto amid an intriguing maze of unspoiled beauty, which the next earthquake may toss into the valley of the Muz Art. But sketches or even notes were forbidden and winter was on its way down from Siberia. Hurriedly we examined a score of caves in which the frescoes are almost as colorful as ever.

Here Asoka offers earth to Buddha, here double-headed eagles abduct a figure like Ganymede. Corseted ladies with diaphanous blouses over round breasts, and others with diaphanous, hornpipe trousers, smile down from the wall.

Some of the primitive color relationships are like Athonite art. But most pleasing were impromptu sketches with which the old artists filled in empty spaces after their patrons' orders and stenciled hackwork were finished. One Tocharist painter, wearing a Sassanian costume, left a self-portrait. Two big-horned sheep or goats had a grace recalling Minoan figurines.

Greek key, swastika, and conventional flower and love-knot designs related this Greek art, adapted to Buddhist religion, with much that has, by devious routes, become familiar to us.

### RECEIVED AS PAYING GUESTS AT KUCHA

What Kizil is to the archeologist, Kucha is to the student of contemporary human types.

But Kucha, too, had its place in history. Once the metropolis of Central Asia, its musicians and dancers appeared before the court of the Tangs, and through Kuchnean translations Sanskrit literature reached the Far East. Out there in the Central Asian sands, one can still pick up stucco hands joined in Buddhist prayer side by side with heads resembling Zeus or Apollo, Silenus or satyr. The Indo-European Kucha known to Hsuang Tsang has been called "an Italo-Celtic oasis forgotten in the heart of the Gobi." There we dined beneath a string of paper flags, including the Tricolor and the Stars and Stripes.

We were welcomed to a charming garden, to which access for tractors and

IT IS SERIOUS TO GET INTO A RUT IN CENTRAL ASIA

This century-old rut, cutting across the ruins of Khocho, near modern Kara Khoja, is so deep that even a tall-wheeled cart must continue to a junction point (see text, page 538).

Photographs by Maynard Owen Williams

A MURTUK MOTHER AND HER COMBINATION CRIB, CRADLE, AND BABY CARRIAGE

Throughout Asia one finds various forms of cradles in which babies are carried into the fields and left in a near-by place of safety while the day's work is done.

Photograph by Maynard Owen Williams

A THIN STRATUM OF MAN-MADE CAVES IN A CENTRAL ASIAN CLIFF

As at Bamian, in Afghanistan (see Color Plate IV), Buddhist monks used a cliff face for their temples and grottoes at Bäzäklik, ninth-century cultural center in Asia's vast deserts (see text, page 536, and Color Plate X).

trailers was had through a breach in the wall. Around the sumptuous table, to which offerings of sheep were led and servants brought feather boas of living chickens, we lunched splendidly and dined even better. On leaving, M. Haardt presented our hosts with an excellent watch. In Urumchi, weeks later, we were presented with a bill, including tips and the hole in the garden wall. The bill was paid with the price of the watch deducted.

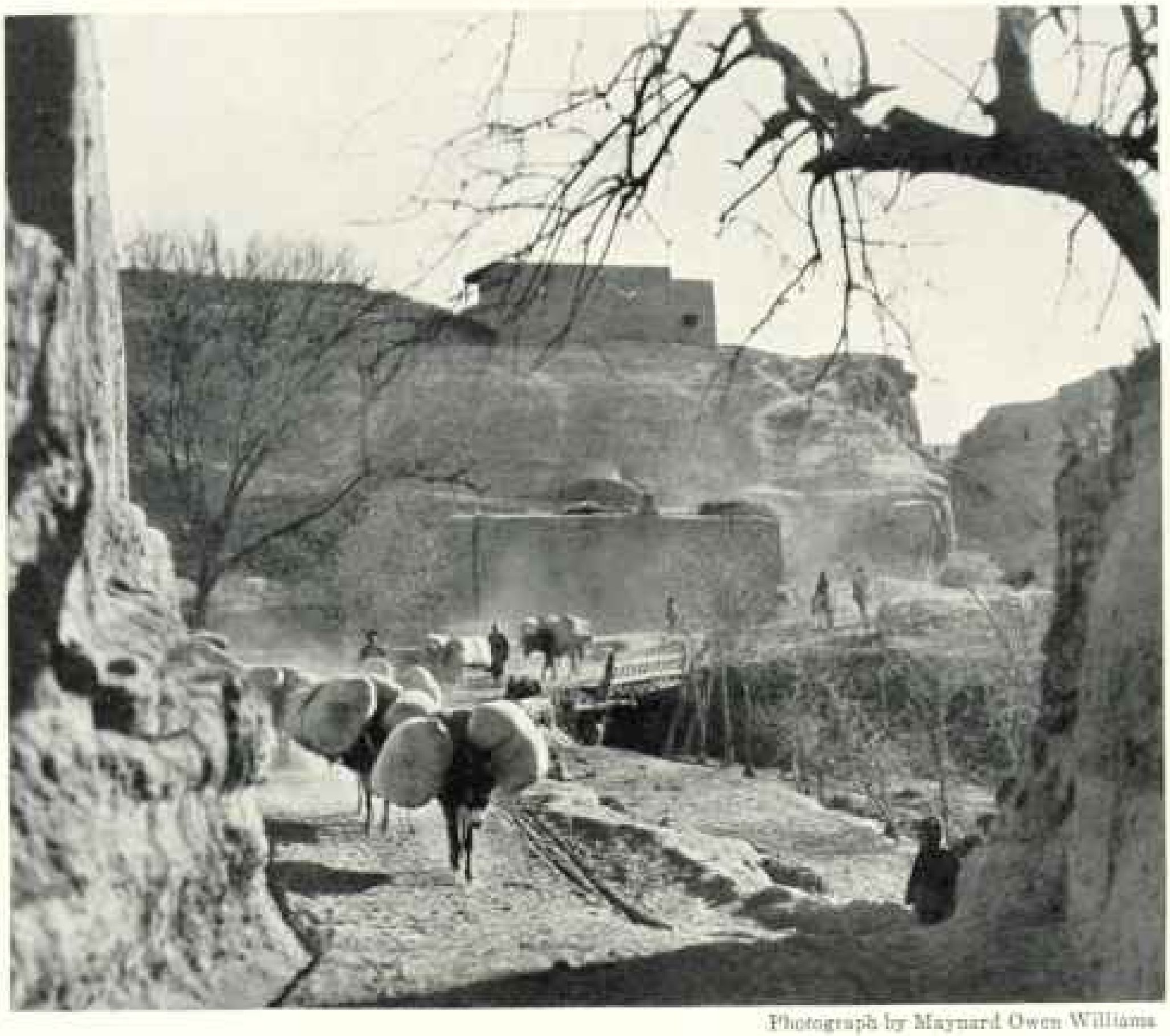
### TURKI MILLINERY IS ATTRACTIVE

As we slowly nudged our way through the teeming streets on market day, Kucha's bright crowds made us reluctant to leave, and hundreds of men and boys, trotting along in the dust of our four cars, seemed eager to prolong contact with this, the strangest sight of their lives.

Young Turki women, less free to follow, seemed irked because of their sex, but their perky little skullcaps, with bright pompons like imitation flowers touching jet hair, made *us* more tolerant.

To the right and left, almost brushing our sides, stretched seemingly endless bands of highly diversified Central Asian faces, not now, if ever, wearing a poker mask. As our second car nosed along, the surprise occasioned by the first had died away. But interest had not. Men squatted low to stare at our tractor bands—strange mechanisms in a region where the carts lurch along between what seem to be towering water wheels, diverted to emergency work in the arid desert.

Old grannies enjoyed us immensely. Apparently they had waited for us for decades and felt repaid. They didn't under-



Photograph by Maynard Owen Williams

A CORRIDOR THROUGH THE COUNTRYSIDE AT MURTUK: SINKIANG

One main stream and several tributaries have cut deep gorges through the loess, and roads mount or descend through narrow corridors in the earth. The village of Murtuk is divided into several hamlets, on different levels, between the plain and the stream bed.

stand what it was all about, nor did they even try. Smiling tolerantly at the solicitude of our drivers, they calmly dragged crawling infants away from the juggernaut cars.

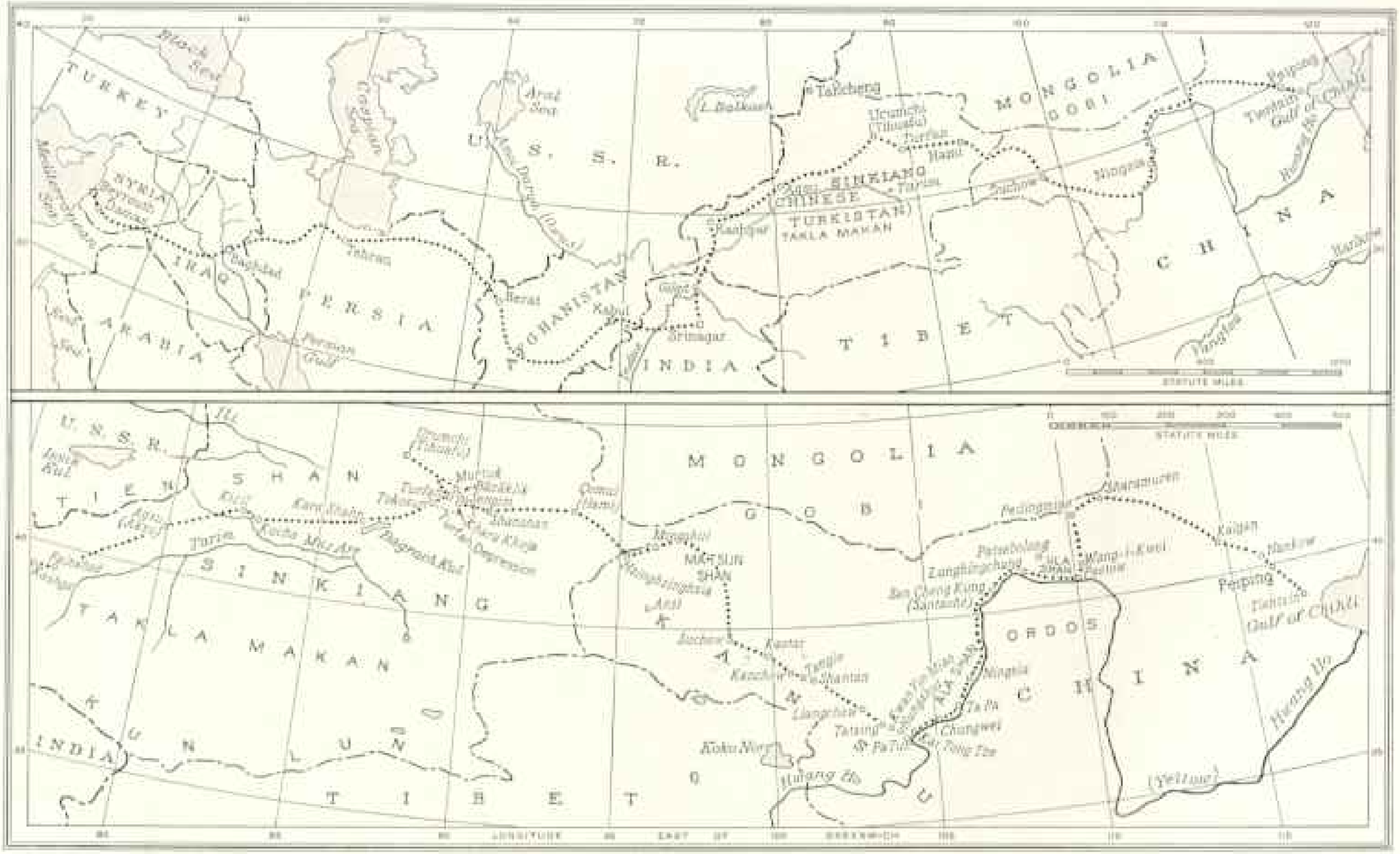
Young lads wearing fur-brimmed velvet caps, and nothing else, pushed in between their elders until some attractive mother, linked to a queue of little maids, herded the freer-running males out of our path.

At Kara Shahr we first touched China. West of there we had been in Chinese territory and had met Chinese officials, but the people were Turkis, sometimes called Chantos or Sarts.

Kara Shahr had Chinese temples with gray pigeons on curving roofs. Venders used the Chinese carrying-pole and the drumlike Chinese rattle. Mongol women wore long braids in brocade cases like gold-edged umbrella slips, but the women in bright jackets and trousers and the men in padded garments, broad at shoulder and narrow at ankles, were plainly Chinese.

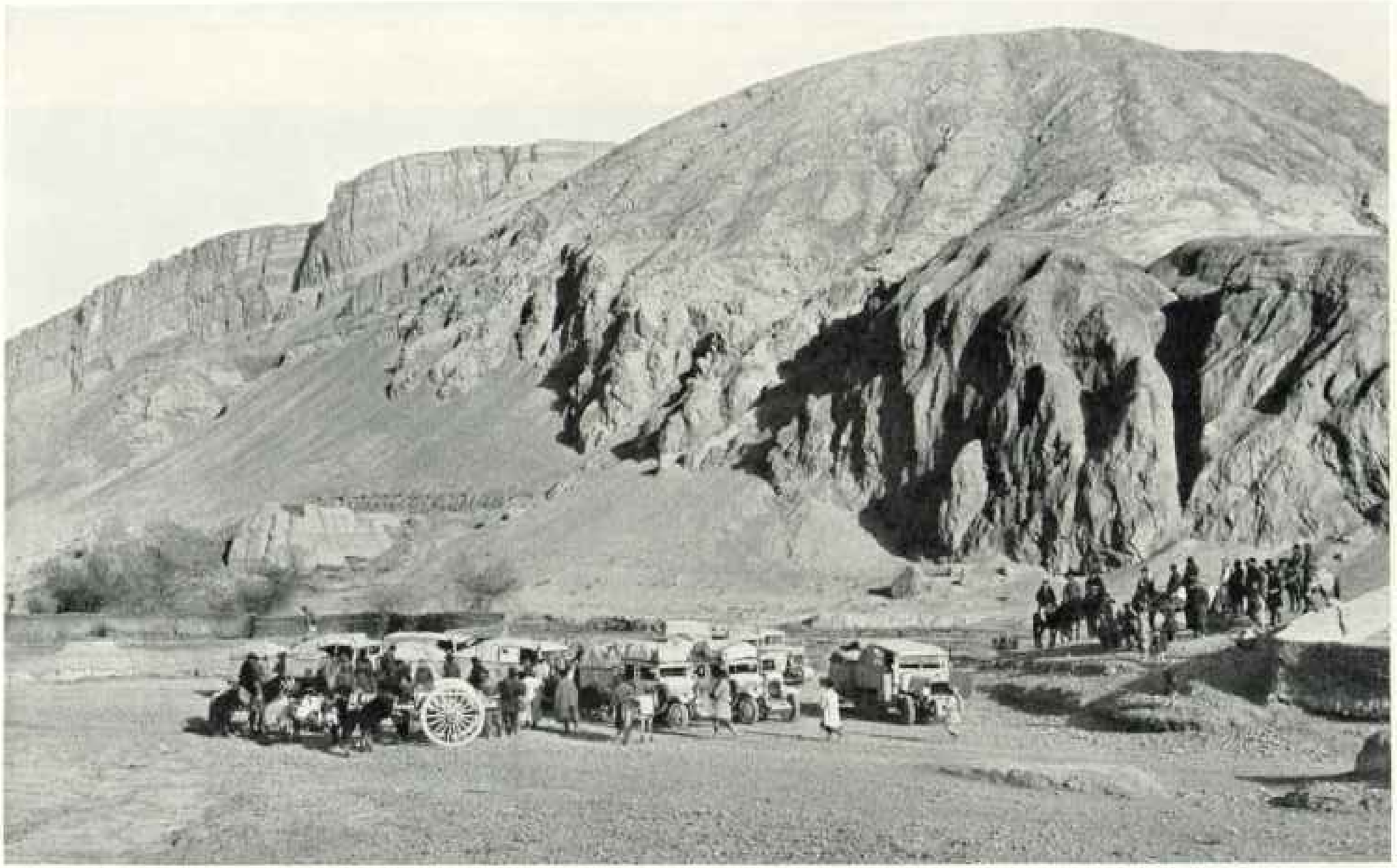
While we ferried our cars, men retarded the descent of their cottage-size Chinese wagons down the slippery banks by standing on a tangle of rope harness. An informal but numerous escort, prancing in and out of the dust-white beams of our headlights, accompanied us into town. Men and boys hopped onto our trailers, getting their first thrill of its kind, and our servants had to be restrained from spoiling the holiday spirit by repelling them with whips.

We were housed in a residence just prepared for a new Taotai and had dinner with the Amban, whose title may be ancestor of our word "ambassador." His welcome had an unofficial cordiality about it,




THE 3,257-MILE ROUTE OF THE CITROËN-HAARDT TRANS-ASIATIC EXPEDITION FROM KASHGAR TO PEIPING (LOWER) AND THE 7,370-MILE ROUTE FROM BEYROUTH TO PEIPING (ABOVE)

All but two of the Pamir Group cars halted at Srinagar. The "Silver Crescent" continued to Gilgit and the "Golden Scarab" to Nomal. From there to Aqsu, where they were met by four of the seven track-type cars of the China Group, the explorers advanced about 700 miles without motor aid. Eleven men made the entire trip from the Mediterranean to the Yellow Sea. As far as can be learned, the only American who has ever made this overland trip is the representative of the National Geographic Society.



THE EXPEDITION AT AN ANCIENT CROSSROADS OF SILK ROUTES

On December 2, 1931, the main party, coming from Urumchi, here joined the archeological group, which had been studying in the vicinity of this age-old center for silk roads between East and West (see, also, text, page 538). This point, near Kara Khoja, at the south end of the Sungim Gorge, a noted archeological region, is below sea level.

Photograph by Maynard Owen Williams

TINY CARS IN AN IMMENSITY OF SPACE, BETWEEN SHANSHAN AND QOMUL (HAMI)

At a distance the Expedition tractors so resembled the color of the soil that they were distinguishable chiefly through the dust clouds they raised. Not a house, not a human being, no fixed base of supplies, a scarcity of water. Yet fifty tons of motors and men completed the trip.


Photographs by Maynard Owen Williams

THE LEADER DISPLAYS THE "GOLDEN SCARAB" PENNANT

The initial triumph of the "Scarab" was the first motor crossing of the Sahara. The second was the first motor crossing of Africa from Morocco to Madagascar and Capetown. On February 12, 1932, M. Haardt reached Peiping, first overland leader from the Mediterranean to the Yellow Sea since the Middle Ages.

A SEAL CUTTER IN QOMUL

The vanity case of the older Chinese is a snakeskin receptacle containing his official seal and the rouge paste which is used as ink. Business men, artists, and others, instead of signing their name, stamp it with a seal made of wood, soapstone, gold, or jade. The Chinese seal may be the ancestor of movable type and printing.

Photograph by Citroën-Haardt Expedition

A WATER HOLE IN THE GOBI NEAR THE SINKIANG FRONTIER

Infrequent wells, used by camel caravans, were the only landmarks in this area. Thick ice had to be broken before water could be obtained. Since camel caravans always stop near such wells, the Expedition found ample supplies of camel dung for melting ice or heating water.

Photograph by Maynard Owen Williams

CENTRAL ASIAN CAMELS TAKING A SUNSET DRINK NEAR QOMUL

The Bactrian or Mongolian camel is a reliable burden-bearer in winter. Hundreds of camels were used to lay down Expedition supplies. In summer they weaken and die unless they are turned to pasture.

Photograph by Maynard Owen Williams

A THEATRICAL PRESENTATION WITHIN SIGHT OF THE GODS

In Suchow, except in the case of this mid-city shrine, the stage is across the street from the temple of which it is a part. The temple courtyard is a gathering place for soup kitchens, barbers, and petty tradesmen. Shortly before a theatrical performance the entrance is narrowed and each visitor pays an admission, sometimes as low as a thirtieth of a cent.

In the rough Tokosun Gorge, one of many barriers which have long hindered through traffic, but which we overcame, we were met by Point, Petro, and Chauvet.

To each of our two groups it seemed that the other had had the wilder adventures and greater difficulties. In his brief and modest account, Lieut. Comdr. Victor Point, leader of the "China Group," tells how he kept his Central Asian rendezvous. His task was complicated by the fact that he must return, with his chief, over the same route.

COMMANDER POINT'S ADVENTURES

"On April 6, 1931, I left Tientsin with the 'China Group,' composed of Brull, technical director; Dr. Delastre; the naturalist, Reymond; Carl, assistant archeologist; Specht, cinema operator; Kervizic, radio expert; and Maurice Penaud, chief of nine chosen mechanics, to whom were entrusted our seven tractor-type motorcars, each with its trailer, and two trucks.

"With me, also, was Petro, the engineer to whom we had previously confided the organization of the service of supplies in China. The Rev. Father Teilhard de Chardin, eminent geologist, was to join us in Kalgan a few days later.

"My task was to reach Kashgar in time to meet our leader, Georges-Marie Haardt, who, with the 'Pamir Group,' had left Beyrouth on April 4.

"To obtain the necessary permissions, the Citroën-Haardt Trans-Asiatic Expedition was required to accept the collaboration of eight Chinese associates.

"We left Kalgan May 16, and the nine cars soon climbed to the Mongolian plateau. In two stages we crossed the prairies stretching to Peilingmiao, where our eight Chinese companions joined us.

"This Chinese Scientific Delegation was made up of Dr. Tsu Ming Yi, influential member of the Kuomintang; two military officers, General Yao and Lieutenant Colonel Tiao; Mr. Liou, botanist; Mr. Young, geologist; a journalist, a student, and a secretary.

### THE HORNS OF A CRITICAL DILEMMA

"May 24 we invaded the sands of the Gobi—a long journey into the unknown, which I faced with some apprehension. The cars were overloaded. To cross the desert they must carry gas enough for 1,250 miles instead of 300. To add to our anxiety, there came a radio message from the French Legation at Peiping with word that two of our supply caravans had been pillaged near the Sinkiang frontier.

"Our advance proceeded normally in spite of difficult passages through rocky defiles and two violent sand storms, first testings which only united my men more closely.

"Each evening, as on the watery sea, sextant observations of the stars enabled me to fix our position. After nineteen days in the desert, we reached Suchow, our first supply depot, on June 11.

"On our arrival, a radio message from the Legation of France informed me, first, that the Governor of Sinkiang would allow our party to enter his province only on condition that no Chinese were included, and, second, that a Moslem revolt had just broken out in Sinkiang.

"Forced by Nanking to accept a Chinese delegation, I was now ordered by Sinkiang to leave it behind. If I did this, the return of our leader through China would be impossible. The protection of the Central Government, yesterday indispensable, to-day stopped our advance and to-morrow might compromise us in the eyes of the Governor of Sinkiang.

### REBELLION CLOSES THE "GREAT ROUTE"

"At 8 o'clock on the evening of the 15th the commanding general forbade me to leave Suchow. An hour later, forbidden the use of our radio or the Government telegraph, we were cut off from the world.

"The next day the prohibition to leave was ascribed to the state of insecurity of the 'Great Route' by way of Ansi, where we had supplies.

"'In that case I'll enter Sinkiang from the desert.'

"All the Chantos of the Hami, or Qomul, region were in revolt and Tungans (Chinese Moslems of Kansu), led by General Ma Chung Ying, were trying to invade Sinkiang. Amid the disorder, I hoped to cross the frontier without being perceived, and follow my route with the Chinese members in spite of the Governor's orders. Better that I suffer delays than that I make it impossible for our leader to complete his journey.

"For five days we followed an old, abandoned trail across the chain of the Ma Tsun Shan. On June 26 we reached the threshold of Sinkiang. On the edge of a well was a warning left by the last caravan, advising travelers, if they would avoid trouble, to flee to the mountains.

"Why should we? We were in Sinkiang, with Hami only 125 miles away. Forward, march!

### THE CHANTOS PROMISE SAFE CONDUCT

"Through a deserted region, for I took care to avoid the infrequent villages in which troops might be stationed, our cars advanced without being seen. On the morning of the 28th we passed through the first Chanto village. It had just been abandoned. An old woman in tears told us that a battle at the gates of Hami might break out at any moment.

"Suddenly we came upon the wreckage of war: horses killed, carts overturned, corpses lining the road and in the ditches: soldiers, women, and children huddled together in utter disorder.

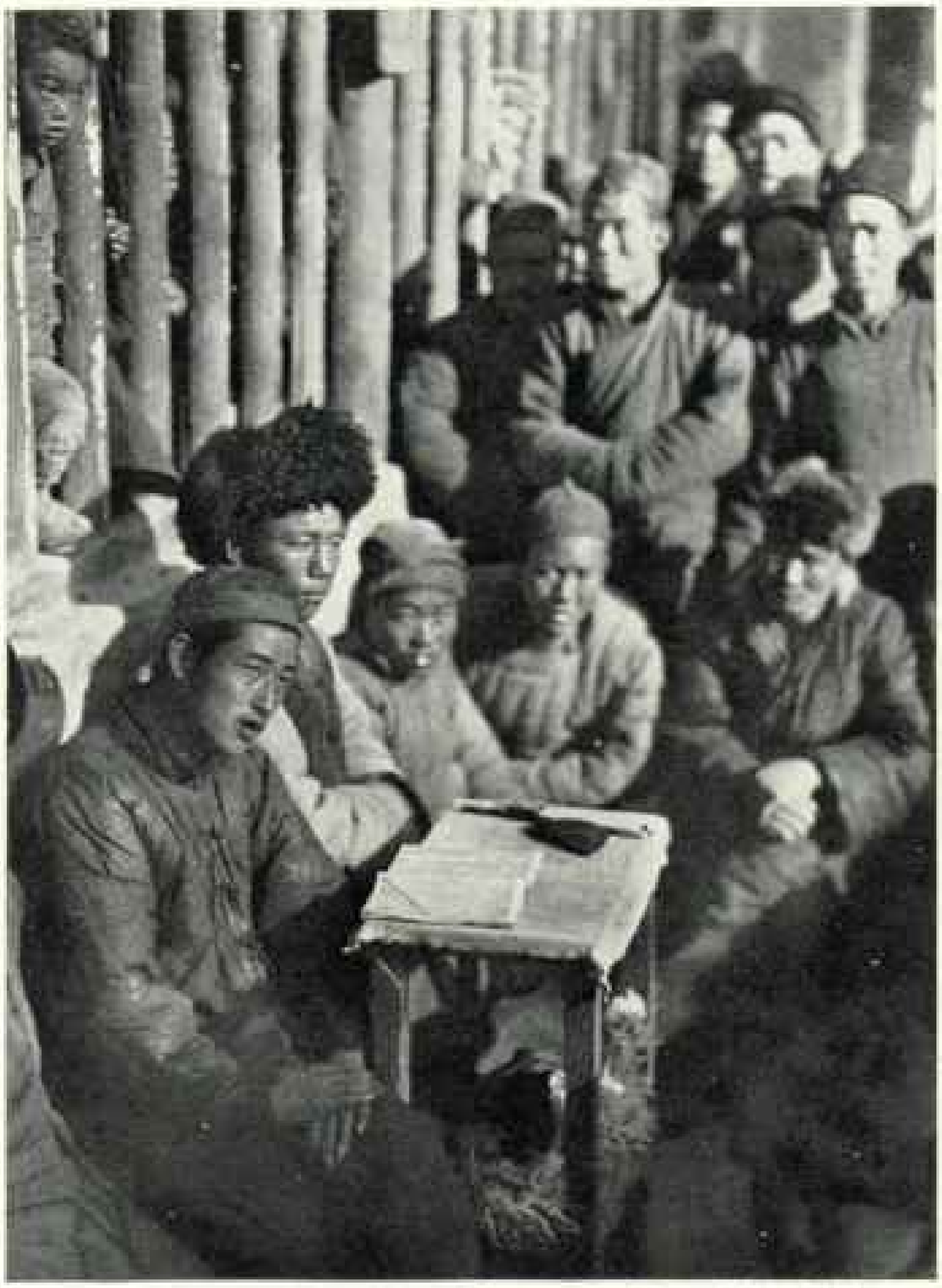
"Since the Chanto mountaineers are fine shots, the Chinese troops, having suffered heavy losses, were in a critical condition. Unexpectedly appearing from a crossroad, the nine expedition cars saved them from massacre. The assailants first hesitated and then retired behind the dunes. The Chinese regained confidence. Amid the disorder, Doctor Delastre calmly ministered to the wounded.

"Before night, reinforcements from Hami announced that the route was clear, and we continued our way amid burning homes.

Photograph by Maynard Owen Williams

THE "HELL" OF A TAOIST TEMPLE IN SUCHOW, KANSU PROVINCE

For more than 2,000 years Taoism, now a "conglomeration of animism, polytheism, and magic," has been the popular religion of the Chinese. Its philosophy is responsible for Chinese passivity in the face of suffering and emphasis on culture rather than possession. In the "hells" connected with their temples many forms of torture are represented, tortures in the face of which the virtuous, overlooking the hell from a bridge of safety, take only a detached interest.



Photograph by Maynard Owen Williams

THIS CHINESE STORY-TELLER HAS HIS PROMPT-BOOK BEFORE HIM

In earlier days story-tellers, being illiterate, spun their endless yarns from memory. This young man, whose audience crowds a corner of a Suchow temple courtyard, frequently consulted a printed version of his thrilling tale. Listening to the oriental story-teller is as much a habit as "tuning in" is in the West. The Chinese still retain a high respect for the printed or written word, and small bits of paper containing Chinese characters are saved (see, also, "New China and the Printed Page," in the NATIONAL GEOGRAPHIC MAGAZINE for June, 1927).

"Hami, one of three holy cities of Chinese Turkistan, is divided into two citadels. One is Chinese. In the other, called Qomul, there lived, up until a year before our visit, a Moslem king whose authority extended far and wide. After his death the Governor of Sinkiang, refusing to recognize the crown prince, had replaced him by a Chinese official. Hence the revolt, in the midst of which we now found ourselves.

"This young prince, who was still at Qomul, assured us that we had nothing to fear from the Chantos, and that he would announce our passing by personal messenger. Under such conditions it seemed feasible to go to Turfan; but, to my great regret, I would be forced to leave behind our engineer, Petro, to safeguard from pillage two of our supply caravans which were halted several stages from the city.

"We left Hami on July 1, with 275 miles separating us from Turfan and 900 miles from Kashgar. The country was desert, the villages in ruins. That very evening Chanto horsemen surrounded our camp, to the vast fright of the Chinese savants, hidden inside the cars. But the young prince had kept his promise. At daybreak the horsemen were nowhere in sight.

## A SUMMONS TO THE SINKIANG CAPITAL

"We reached Turfan without incident and found a cordial reception. A radio message informed us that our leader, Georges-Marie Haardt, had reached Srinagar with all his men and cars.

"The hoped-for rendezvous now seemed certain! Bent over the maps, we counted the stages. The mechanics, at the end of a mighty effort, now proposed to roll on by day and night through the summer heat, accentuated by the depression below sea level.

"Just as we were leaving Turfan, I was handed a telegram from the Governor of

A CHINESE GRAVE BETWEEN SUCHOW AND KAOTAI

This saw-tooth wall and central shrine, serving a family plot, whose actual graves are behind the camera, is peculiar to Kansu.

Photographs by Maynard Owen Williams

YOUNG CHINA OFTEN SMILES

The traditional "poker face" of the oriental is used to hide feelings; but the Chinese are remarkably quick to show emotion by facial expression. A group of children in Suchow.

Photograph by Maynard Owen Williams

THE CHRISTMAS DINNER ARRIVES FROM INSIDE THE WALLED CITY OF KANCHOW

Not only did the explorers pick up foreign supplies at Kanchow, but native cooks brought local delicacies for the Christmas dinner. Roast suckling pigs, protected by sheets of paper, arrived on iron spits. Rich soup was brought suspended from carrying poles, and disks of native bread supplemented the Swedish crisp bread, which was eaten all the way across the continent.

Sinkiang, asking me to come without delay, with all my men and cars, to Urumchi, the provincial capital. But to make a detour via Urumchi would cost us an extra 250 miles! I decided to go myself, together with the Chinese delegation, in a single car. Having passed over the command to Brull, I set out without anxiety.

"Nothing in the magnificent welcome we received two days later at the Governor's yamen gave a hint of trouble. Cannons were fired and full military honors accorded us. July 8 a gala luncheon was given us, and the minute it was over I planned to leave to rejoin my companions.

"At the moment of farewell, Governor King wished me a happy trip toward Kashgar. When I asked for my car, two guards barred the way.

"'Am I a prisoner?'

"No explanation. I could neither leave nor communicate with the Governor, my luncheon host of a few moments before!

"After three days, Mr. Chen, in charge of foreign affairs for Sinkiang, kindly explained that I must await the arrival of my men and cars from Turfan. Since I told him that they would not leave without my order, he asked me to give it.

"I refused.

"'Think it over.'

"After a week of confinement and not a few thoughts, I had to give in.

"Mr. Chen showed me a telegram from Nanking ordering the provincial authorities to stop all activities of the Expedition. The Pamir Group could not enter. The China Group must return to Peiping without delay.

"What now of our Central Asian rendezvous? At any price, I must warn Mr. Haardt and seek the aid of the Legation of France.

"The use of our radio was naturally forbidden. In order to use the set without drawing attention, my first care was to choose a camp outside the city, near a little temple set among trees.

"Soldiers, who watched our every move, surrounded the camp. Some days later, in

Photograph by Maynard Owen Williams

NOT RICE, BUT A FRIED CRULLER, IS KANCHOW'S BREAKFAST

Because of the high cost of animal transport, the Chinese diet is usually confined to locally grown foods. In the interior, fruits and sea foods canned in Canton are luxuries too expensive except for the rich. These crullers of coarse flour, fried in vegetable oils, are not unpalatable, for in China "the stomach, not the palate, decides what shall be food."

spite of every precaution and thanks to the remarkable sang-froid of our radio expert, Kervizic, and the ingenuity of the mechanic, Conté, by masking the sound of our motors and hiding our antenna in a tree, we were able on July 26, after a month of silence, to renew contact with the Legation of France and the Pamir Group.

"It took five weeks to convince the Governor that in no case would I allow him to requisition our nine cars. Only on September 6 did he consent to let me send four cars toward Kashgar to meet Mr. Haardt, and even that on condition that I go into the war zone to install a radio for his staff headquarters.

### POINT KEEPS HIS RENDEZVOUS

"October 8, soon after my return from the Chinese lines, I learned that the Pamir Group caravan of 60 camels and 80 horses had joined the four cars at Aqsu.

"October 21 Petro, the comrade so devoted to our cause and so dear to our hearts, from whom we had heard nothing in three months, arrived in Urumchi. He had escaped from Hami during the siege and, after a thousand adventures in the trackless desert, completed our group.

"The next day we learned that the Haardt party had left Kara Shahr, only 185 miles away. This time nothing should prevent me from hastening to meet him.

"It was in the Tokosun Gorge, amid the chaos of high-piled rocks, last obstacles that still separated us, that I saw the black and orange pennant of the 'Golden Scarab.' It was 11 o'clock, on October 24. That was the car of him toward whom, during seven months, we had not ceased to strive. And there he stood before me, opening wide his arms. My mission was over."

Three days later, on October 27, 1931, came the final reunion at Urumchi. No one house could hold us. Executives and cinema men lived in the "Rue de Rivoli," the main center, with yurts and cars crowding the courtyard. "Intellectuals" slept in the "Avenue Victor Hugo," mechanics in the "Rue Jean Juarez." In this Russo-Chinese city, where our fellows

Photograph by Maynard Owen Williams

A CHINESE CHRISTIAN CALENDAR ON THE DOOR OF A MISSION CHURCH

To this mission church, shaped and decorated like a Chinese temple, the poor and half naked are ever welcome. It is situated near Liangchow, opium center, but the entire Christian community refrains from planting or using the drug. Nestorian Christianity reached China more than twelve centuries ago.

had lived for months, home terms had been adopted, as in the trenches. Many of the songs we sang after supper had a barracklike virility. It was a red-letter day.

### GOVERNOR PROVIDES PLEASANT SURPRISES

To me our delicious lunch with the Governor of Sinkiang was a pleasant surprise, after the unpromising picture given by my friends. "There he sat, surrounded by soldiers with their hands on the Mausers, and we didn't dare reach for a handkerchief." As a matter of fact, I reached for my handkerchief several times without thinking about it.

### A MONGOL PRINCESS DISCUSSES ORIENTAL ATTITUDE TOWARD THE WEST

Occidentals have the impression that all Chinese look alike, but in our expedition uniforms we seemed to have less individuality than did the square-faced Governor of Tacheng, the scholarly High Commissioner of Qomul, and the thin-faced Governor, our host. Their racial unity was undeniable, their variety of personality striking. Their politeness fitted them like an old coat; ours was neatly creased, like a "Sunday suit." When we joined in the game of passing a lighted match, the one in whose hands it goes out being forced to drink for all, these solemn Chinese showed more excitement than did we.

Georges Le Fèvre, Expedition historian, regarded our delay in Urumchi as a heaven-sent blessing. An ardent seeker for facts, he kept busy day and night and his voluminous notes increased by many pages a day. During our stay he and I had a delightful discussion with a Mongol princess (see Color Plate IX). She wore riding boots, a tight blue skirt, and a simple white blouse, lightly touched with coral embroidery. Her hair was slightly disheveled by her dashing ride on a tough-mouthed pony. Attractive, intelligent, objective, this oriental woman spoke French without accent and Anglo-American Eng-

lish seasoned with slang. Dancing with her had seemed strange. Talking with her seemed utterly natural.

"Why do occidentals and orientals dislike one another?" we asked, our actual relationship belying our thesis. Hitherto we had looked at Asiatic peoples through occidental eyes. We now looked at ourselves through theirs. Here, in Sinkiang, the Governor held all the tricks. Our world was far away, robbed of influence by censorship and desert.

"Why call conservatism dislike?" she replied. "Do you always welcome strangers to your clubs and homes? The oriental has his psychological Great Wall, whose protection is beginning to seem less sure. The man behind it doesn't want to be loved or even appreciated. He wants to be undisturbed.

"People seek to protect not only property, but modes of life. Perhaps your way of life is right for you, but it threatens ours.

"You are in a hurry, and hence barbaric. You are entranced by mechanical toys, which you haven't mastered. You like frankness; but, until real understanding exists, even formal politeness helps. You dominate world ideals, which differ from ours.

"You are men of auto, railway, radio. You find this a backward land, without roads, speed, a free press, a balanced budget, sanitation, or familiar forms of justice. Hence you pity the Chinese. But *they* live in the Celestial Kingdom, the center of all the world that counts. Your progress is chaotic, at least in its impact on orientals, because its spiritual values are not realized. We Mongols are emancipated. 'A good horse and a wide plain under God's heaven,' that's our desire. And we realize it.

"My uncle is Shaliva Gegen, third Buddhist dignitary. One simply can't shock him; he's too deeply rooted in righteousness. He doesn't know any great Westerners, even by name; but he said to me,

Photograph by Maynard Owen Williams

A HEADLESS DEITY IN A KANCHOW TEMPLE

Earthquake and military occupation have ruined this modern temple. Camp kitchens have been set up almost in the laps of the gods, and their brightly colored costumes have been soiled by smoke and peeled off by steam from cooking food. Marco Polo lived for a year in Kanchow, and there saw reclining Buddhas symbolizing the entry of Sabry Buddha into Nirvana. One such figure is still famous, but soldiers are quartered in the temple and the author was unable to photograph the giant figure.

"The spark of creative life now exists in the Occident. The Westerners will find the light. But it is still hidden under the husk of materialism. In a future incarnation, the Pantshen Lama will be a Nordic."

### ON TO PEIPING, A GRUELING JOURNEY OF 2,300 MILES

On November 15, Bruil, Jourdan, Kegresse, and Carl left for Paris via Siberia, carrying to the French relatives of our "lost battalion" photographs showing how well and happy we were, despite all. But for us the trip was far from finished.

From Urumchi to Peiping is 2,300 miles. Two of our caravans had been pillaged. The rebel Ma Chung Ying stood astride the Great Road waiting for us, with tons of our supplies already in his hands. Sand dune and river, desert and rocky defile lay across our path. The cold of the Mongolian plateau was often in our thoughts.

Fur coats and boots were made. Our wind-proof "Shackleton" trousers were lined with sheepskins or fur. Blankets were made for our motors and felt inner curtains added to protect ourselves. Urumchi is accustomed to cold and the necessary materials were at hand and cheap.

Penaud invented a heater, shaped like a speaking trumpet, which was bolted to our exhaust manifold. Its funnel collected air from the fan and conducted it into the car. With an excess of faith and scant ideas of a Mongolian winter, he added a metal stopper to "keep us from roasting in our furs." That proved unconscious irony.

On November 18, with winter piling its snow along our route, an archeological group, led by Audouin-Dubreuil, left Urumchi with full permission for Hackin, Jacovleff, and the cinema and photographic crew to study various sites, notably Bäzäklik (see Color Plate X). Iconoclasts had scratched out eyes. Archeologists, removing tons of wall or ceiling, had made no adequate record of that they left behind.

### JACOVLEFF HAS HIS PALETTE HEATED

There we spent eight happy days, while Jacovleff, with a gasoline heater keeping his palette from freezing, copied frescoes, and the rest of us shivered in dark caves beside our cameras.

M. Hackin's verbal comments livened the scene and his writings may give the only account of the relations between what remains and what has been removed, what the frescoes represented in themselves and what they reveal of international cultural relationships during Manichean and Buddhist days at Bäzäklik.

It is toward Central Asia that we must look for future light on the religion of Manes (or Mani), for both Zoroastrians and Christians persecuted the Manicheans and destroyed their writings. Manes had a wide influence on his times, and Saint Augustine was a Manichean "auditor" for nine years before changing his views. Before Manes was crucified and flayed by men of his own race, the King of the Uigurs became an adherent of his ascetic religion, in which light and goodness fought against darkness and evil in the souls of men.

### GROTTOES WITHIN GROTTOES

In Bäzäklik, Buddhist grottoes were roofed in with mud bricks inside excavated grottoes bearing Uigur inscriptions, and one fresco is evidently Manichean. As reconstructed by Jacovleff, it has something of the delicacy and charm of a back drop for some graceful scene of oriental life, but the original is dark and badly damaged and the inscription indistinct.

A famous chirographer and miniature artist, Manes himself painted frescoes in Manichean temples and traveled in Chinese Turkistan. Is it impossible that the obscure mural at Bäzäklik, which Von Le Coq seems to have overlooked, is a copy of Manes's own work? How long a time elapsed between the Manichean and Buddhist frescoes is still a mystery, as is much of Central Asia's story, but there is enough Buddhist art remaining to indicate relationships reaching far to the west and south. Chinese art seems not to have influenced the Bäzäklik frescoes.

A celestial jazz band, a Mona Lisa smile, a bull-riding Siva, and a red-bearded "barbarian," whom I dubbed "Barbar-barbarossa," were clear enough to have a popular interest. These blue-eyed barbarians held up their soft boots by suspenders fastened to their belts. So did the Scythians and others whose graves mark a route from the Crimea to Mongolia. Here history may not hang by a

Photograph by Maynard Owen Williams

AN ISOLATED GOD OUTSIDE LIANGCHOW

Near the vast expanse of graveyards outside the west wall, there were formerly several Chinese temples. These were razed by earthquake, but some of the gods still loom above the ruins. With the temperature below freezing, the smiling lad at the left is naked from waist to ankles.

Photograph by Maynard Owen Williams

A COBBLER OF LIANGCHOW (SEE TEXT, PAGE 560)

thread, but these boot-suspenders form a clue to since-forgotten Indo-European relations with Cathay.

### AN OBSCURE CLERK COMPILED A HANDBOOK OF ASIATIC TRAVEL

The people of Murtuk soon became friendly enough to permit photographs including themselves. After weeks of restrictions, it was great to be at work again. The inspector provided by the Governor proved highly literate and sympathetic. His attainments having been recognized, and rewarded, he carried his writing brush everywhere. He had found "face." We found happiness, for at Bäzäklik we plunged back through history into fascinating days.

Chinese chroniclers, Marinus of Tyre, and Ptolemy, father of scientific geography, all referred to the "Silk Route" across Asia; but it was a clerk in a Florentine commercial house, Francesco Balducci Pegolotti, who gave us a detailed record of the one of many silk routes which was most in use in the Middle Ages.

Pegolotti had traveled enough to know the problems of foreign trade, and he set himself the task of writing a business man's Baedeker, glossary, table of weights and measures, and foreign exchange list. Market quotations and commerce reports outspeed geographies, and business men, like missionaries and pilgrims, have ever been incorrigible travelers; therefore Pegolotti's dry-as-dust handbook to medieval trade ranks in value with the marvelous travel narratives of William of Rubrouck, Marco Polo, or Friar Odoric.

The merchants of Venice then thought in terms of argosies, and the hopping-off place for the overland journey was not Syria, but Tana, near the mouth of the Don. From there the route led to Sarai, capital of the "Golden Horde." In Pegolotti's day the entire route to Peiping was safe, even for priceless silks.

Down the Volga to Astrakhan, across Transcaspia to Khiva, skirting the Hunger Steppe and mounting the valley of the Ili, the route of the silk-seekers escaped the great mountain barriers, one route keeping north of the Celestial Mountains as far as Kara Khoja, where it crossed other routes that converged from south of the Tien Shan and north of the Kunlun.

Not only commerce, but art and religion, politics and the rudiments of printing, moved along these routes.

At Kara Khoja we were overtaken by the main party, and the drive to Peiping was on. At dinner all agreed to M. Haardt's program of forced marches, and our de luxe equipment, from this point on, became mostly impedimenta.

### MILD WEATHER AND MISSIONARIES PREVENT HARDSHIPS

The tents were seldom pitched. Valises and even washbasins were ignored for days at a time. Not only actual cold, but the threat of greater always hung over us. Seldom were we free from fatigue. We might resign ourselves to subordinating scientific and artistic work to the onward march of the motors and have great admiration for the mechanics, toiling with bare hands in the dead of the winter night; but the cars, lacking light oil and anti-freeze because political delays had not been foreseen, demanded unceasing care. Men and cars were both tired out and mutually dependent.

The fact that we arrived in Peiping without exceptional hardship is due to two factors—the relative mildness of the winter of 1931-2 and the help of the Christian missionaries. The latter not only guarded our supplies during a period of rebellion and requisition, but also enabled us to divide one long journey into several shorter ones, at the end of each of which we found physical and spiritual warmth and recreation.

At Suchow, Ningsia, Paotow, Peilingmiao, Kalgan, and Nankow we found shelter, often with missionary help. Christmas Day in Kanchow, New Year's at Liangchow, a much-needed rest in the Christian city of refuge at San Cheng Kung, and generous hospitality at Wang-i-Kwei were not only memorable; they were essential to the health and success of all the men in our group.

Photograph by Maynard Owen Williams

EARTHQUAKE AND NEGLECT HAVE RUINED THIS GATEWAY SHRINE

Formerly the western gateway, topped by a neat temple in which the gods beamed with inanimate benevolence, was the chief entrance to the large and wealthy city of Liangchow. To-day the murals are defaced, the doors have been broken up, and seekers for fuel wander in and out, looking for bits of paper, wood, dung, or even roots of herbs.

Photograph by Maynard Owen Williams

EXPEDITION CARS ALMOST ASTRIDE THE GREAT WALL AT HUNGSHUI

After dangerous night driving, the travelers reached this obscure town along the line of the Great Wall. The cars are beyond the city walls, ready to push on toward the Yellow River and its region of sand dunes.

Photograph by Maynard Owen Williams

A TRACTOR HELPS A TRUCK OVER A SOFT DUNE

Where wheels wallowed, strips of matting were spread on the sand; but when the dunes were too steep or soft, a trailer was detached and a tractor dragged the sand-bogged wheeled car to firmer ground. In upper center Father Teilhard de Chardin watches the towing problem.

Photograph by Maynard Owen Williams

A TALE OF TRAVEL, WRIT IN SAND

Behind, the Yellow River; ahead, sand dunes hundreds of feet high; between the two, not even a cart track (see, also, page 563).

Once started on one section of our journey, there was no real rest until it was completed. Night after night we felt our way ahead over atrocious trails, with a theoretical rest for men and motors from 2 to 5 in the morning. The driver slumped forward over his wheel. His seat-mate, who could doze during the day, watched the temperature dials for water and oil. Whenever a radiator got cold or a bearing stiff, a motor woke with a roar. A hundred fantastic landscapes tossed up by our ranging headlights are now mingled in what some of us feel was reality and others a bad dream.

The supply column had worked well, but two caravans had been completely pillaged. Worn tractor bands had to be dismantled and some of the 120 teeth, 60 talons, 60 metal plates, or 60 rubber treads needed to complete each of fourteen bands used where most needed. In spite of oversize air filters, our motors breathed destructive quantities of dust. Running in low gear with a seven-ton load made the work performed far greater than the mileage indicates (see, also, page 578).

FOOD IS COOKED WHILE THE MOTOR CARAVAN MOVES AHEAD

Until we left Urumchi our kitchen car, which had never functioned *en route*, suggested a bathtub in which slovenly tenants store coal. But on the return it was real comfort, those cold winter nights, to line up beside this car and get a "hand-out" of steaming soup and hot stew.

In its normal state, sparsely settled Sinkiang is not unattractive. After hours in which autumn-golden toghrak trees or a rosy-fingered dawn have been the only diversion, the teeming towns, livened by

people in a high pitch of excitement and curiosity, have rare vivacity.

We saw life through the eye of a calliope-player, and in each tiny town our passing set an impromptu feast day. We provided the show which brought crowds running, but to no occidental eye could we compare with them in interest.

Near Qomul the spirit changed. War had altered the very dust. Mud villages upon which life, in escaping, has strewn its débris are sad affairs. Those who had made the westward trip tried to identify spots where they had seen fighting; but we from beyond the Pamirs had no such thrill. A deserted desert is desert indeed.

What drama there was we carried with us. With a side wind and deep dust, our long line of lumbering machines suggested a dust-colored destroyer fleet laying a dust-colored smoke screen over a dusty countryside. At night topographic features became headline material and display advertising under the sweep of our headlights.

At Qomul, late at night, we entered a rich Turki's compound and slept in a room decorated with Moslem chirography, Russian cream separators, rococo lamps, copper teakettles, shelves overflowing with Moslem books, and tables cluttered with bric-a-brac. We had to vacate this scene of unwonted luxury and very little air to leave room for the Governor's seven wives, who exemplified feminine tolerance by arriving in a single motorcar.

We camped outside town, only a few yards from where the motors had stopped on their way west during those dangerous days when Specht, perched on the roof of his car, calmly filmed the war.

### THE FROST-BITTEN CHINA GROUP REGAINS ITS MID-SUMMER TRAIL

At Hsinghsinghsia, a hundred miles or so from Qomul, a supply of gasoline had been buried months before. But with two-score military motors operating in Sinkiang, at a time of war and requisition, it seemed better, before leaving the main route, to keep our actual gas reserve high. Native carts had carried ahead 300 gallons, together with two cases of food, a spare motor-block, and Whymper tent, and left it in a village called "Ever Flowing Water" because of its never-failing source.

My notes covering this period were recorded by a pen which had to be thawed out after every few words by placing it in my mouth. But the memory would have lasted in any case. Some one waked me from my doze beside Gauthier, driver of the "Silver Crescent."

"Eh bien, it seems that there are two or three dirty rooms, one occupied by fifteen frozen corpses, and an open shed."

"Better sleep with fifteen to-night than be one of sixteen to-morrow," I thought, for during several nights my breath had been freezing to the edge of my sleeping sack. So when I discovered a room with a raised platform in it, I made my bed. Behind was another room, which I thought better not to investigate.

Dawn, robbing us of the wholly mythical corpses, revealed the fact that each of us might have had a room to himself, or a house. Aside from one old man who had stayed here to inter the dead, and so "win credit," we had a whole village to ourselves. Moslem rebels had disemboweled the Chinese gods in the hill-top temple, but "Ever Flowing Water" needed only the return of its population to enable it to resume normal life.

### MINING FOR GAS AND OIL IN NO MAN'S LAND

Ansi was in the hands of Ma Chung Ying. To reach Suchow, we must turn aside from the "Great Road" and blaze a trail through the desert; but our buried supply of gas was on the main route. Audouin-Dubreuil offered to go to Hsinghsinghsia on a gas-and-oil mining adventure, ambush or no ambush, and returned so heavily loaded that he broke a spring.

We left Sinkiang at Mingshui Pass, with a cold early-morning wind at 6,600 feet, higher than Mount Washington; but lighter snowfall in this arid region gave a different aspect to the inconsiderable heights above the general plateau.

After a thirty-hour run without sleep, we passed through a flood of refugees fleeing from Ma Chung Ying and arrived at the gates of Suchow. A sumptuous tea made things look brighter. Our home was a new but drafty building constructed as a semisocial, semireligious club of Shensi and Chihli merchants.

The Commandant, who had just acquired a new 14-year-old wife, sent word

that if we'd send over a case of motor oil, negotiations for our departure would proceed more smoothly. Delay was no tragedy for me, for the city is unusually interesting, and among the hundreds of youngsters who followed me about there were many whose smiles were worthy of record.

### A CAMERA ATTRACTS A PIED PIPER FOLLOWING

Behind my camera curious children trailed along as behind the piper of Hamelin. With a stand camera, you are at the mercy of the mob. Offend them and you might as well go home. Inspire their good will and they'll warm your heart.

There is a mid-city temple in whose courtyard open-air restaurants, barbers, and medicine men ply their trade. Back against the main shrine, a story-teller, younger than most, was spinning such an endless tale as the Chinese love, with—first time I ever saw this—his prompt-book before him (see page 530). On the stage, so placed that the temple gods can see, a theater was in action, with gongs and rattles agallop (see page 527).

Meanwhile the rebels under General Ma Chung Ying were near—and coming nearer.

A night attempt to use our wireless brought a colonel down on us. But Li and Gao, our interpreters and confidential agents, were instructed to lose $29 to him at mah jongg, and the flurry passed.

The following morning permission to leave came—unexpectedly.

After a delay of several hours, the city gates at last slowly swung open and our cars filed out. Twenty-four hours later Ma Chung Ying's troops entered Suchow.

By then we were at Kaotai, with a bandit's head—one sample from 27 fresh ones—dangling by a cord beside the city gate. We picked up 60 tins of gas, which a German missionary had kindly stored in the Sunday-school room, and pushed on.

Kanchow marked a great change from Suchow, where the temple gods still stare in undisturbed serenity. Soldiers were quartered in the big temple of the Sleeping Buddha.

Both earthquake and military occupation had brought destruction on another temple, whose tall pagoda had been left uncompleted by orders of the Kuomintang. Vandals had criss-crossed classic scenes with scratches. Idols remained amid heaps of rubbish composed of their own broken members (see page 535).

### A CHRISTMAS-DAY FEAST

Friends in France and America were wishing us a happy home on Christmas Day. They had their wish. We halted in a city where the Polos spent a year.

Grishkoff, Petro's assistant, who had been guarding our supplies, arrived with a Ford truck piled high with Christmas presents for men and motors. Petro, opening his private stock of cigarettes, tossed the flat tin boxes right and left until only one remained.

Roast suckling pigs, arriving on crude iron spits (see page 532), lacked nothing but an apple in their mouths. In the absence of a Yule log, "N-O-E-L," spelled out in candles, gladdened our eyes. At every place an individual menu card with the owner pictured in one of Jacovleff's spirited sketches. Our German missionary host sat beside our leader, and gathered about a common table were more than a score of tried, true friends united in a common but hitherto-unaccomplished task. What well-wisher could have wished us more?

The trip from Kanchow to Liangchow was one of those unexpected experiences which pounce upon the explorer and test his mettle and metal. Perhaps the mechanics trusted the latter a bit too far. But if they did they paid the price.

With Ma Chung Ying just behind and the promise of plenty of spare parts in Liangchow, at the end of only 200 miles of supposedly decent road, we set out after lunch on December 26.

Just at dark we passed the twilight-magnified walls of Tanglo and at 2 a. m. stopped beyond Shantan. A broken distributer disk kept some of the mechanics busy all the cold night, and one mechanical difficulty after another hounded their second day.

### GOLDEN BANGLES SUGGEST BANDIT HAUNT

Sunset brought us to a miserable village, wrecked by earthquakes and said to be bandit headquarters. In the steep, rocky passage beyond, perfect for ambush, a tractor band gave way. By to the motor caravan again moved on.

 Finlay Direct Color Photograph by Maynard Owen Williams

THE MODERN SUCCESSOR OF THE PEACOCK THRONE

In 1665, Tavernier, French jeweler to Indian princes, described the Peacock Throne at Delhi. In 1739, Nadir Shah carried it to Persia. Behind this modern throne in the Gulistan Palace in Tehran is another, said to contain parts of the famous Mogul throne, across which two peacocks spread wide their jeweled tails, inlaid with $30,000,000 worth of rubies, emeralds and pearls. The fate of the original throne is one of the mysteries of the East.

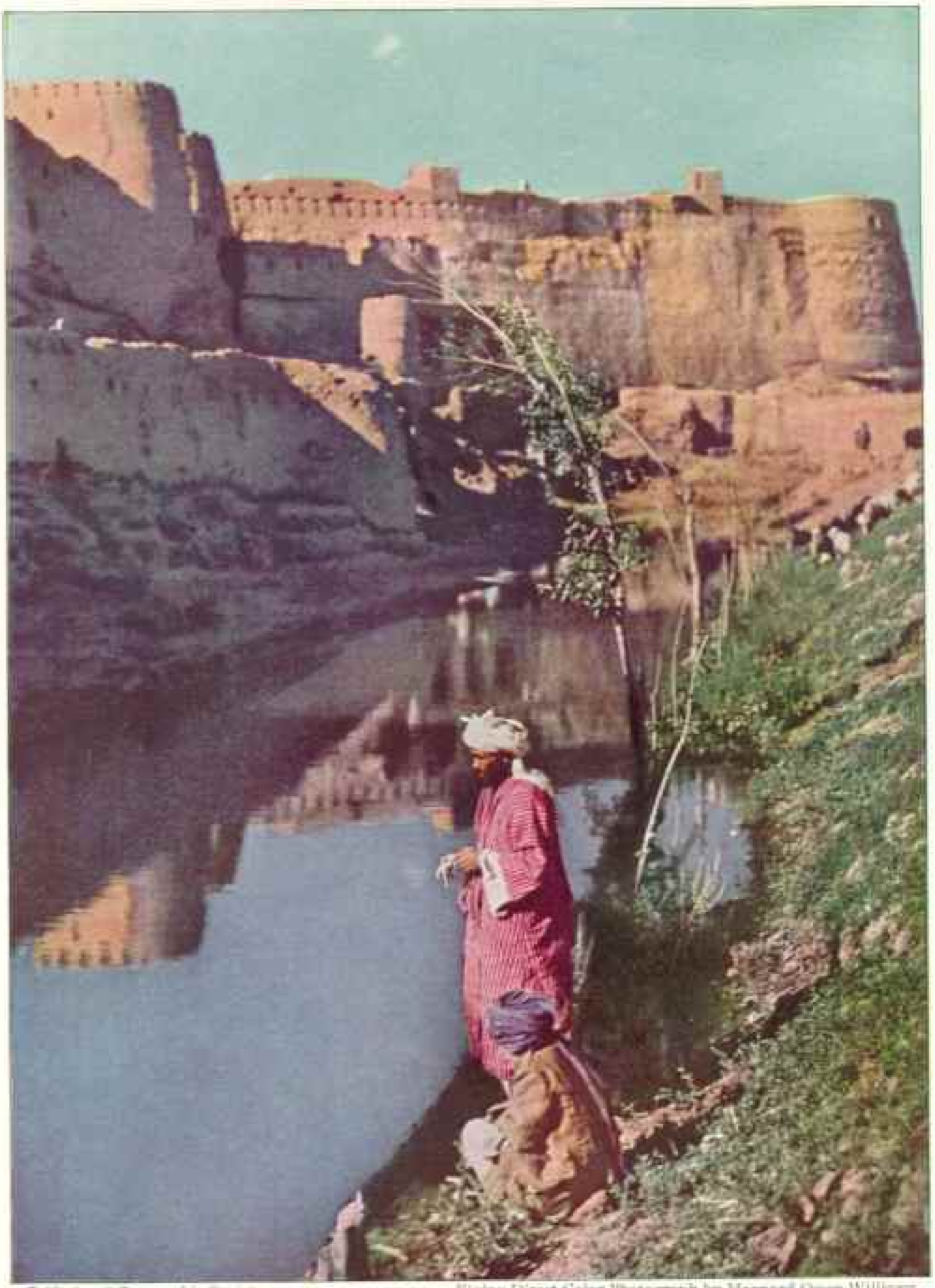
THE GRECO-ROMAN PORTICO TO ZENOBIA'S DESERT CAPITAL

Palmyra reached its zenith under the famous Queen Zenobia. One-time halting place on the Silk Route from Cathay, it is now a caravan station in the Syrian sands northeast of Damascus, with motors displacing camels.

 Finlay Direct Color Photographs by Maynard Owen Williams

A BEDOUIN ARAB IN HIS MODERN SHIP OF THE DESERT

A camel took ages to adapt itself to the desert. The automobile, in a decade, has made the Syrian Desert an international motor highway. For airplanes, twentieth-century argosies between East and West, this former barrier is already one vast landing field, crossed by three air lines.



 Finlay Direct Color Photograph by Maynard Owen Williams

THE WALLS OF GHAZNI: MAHMOUD'S CAPITAL

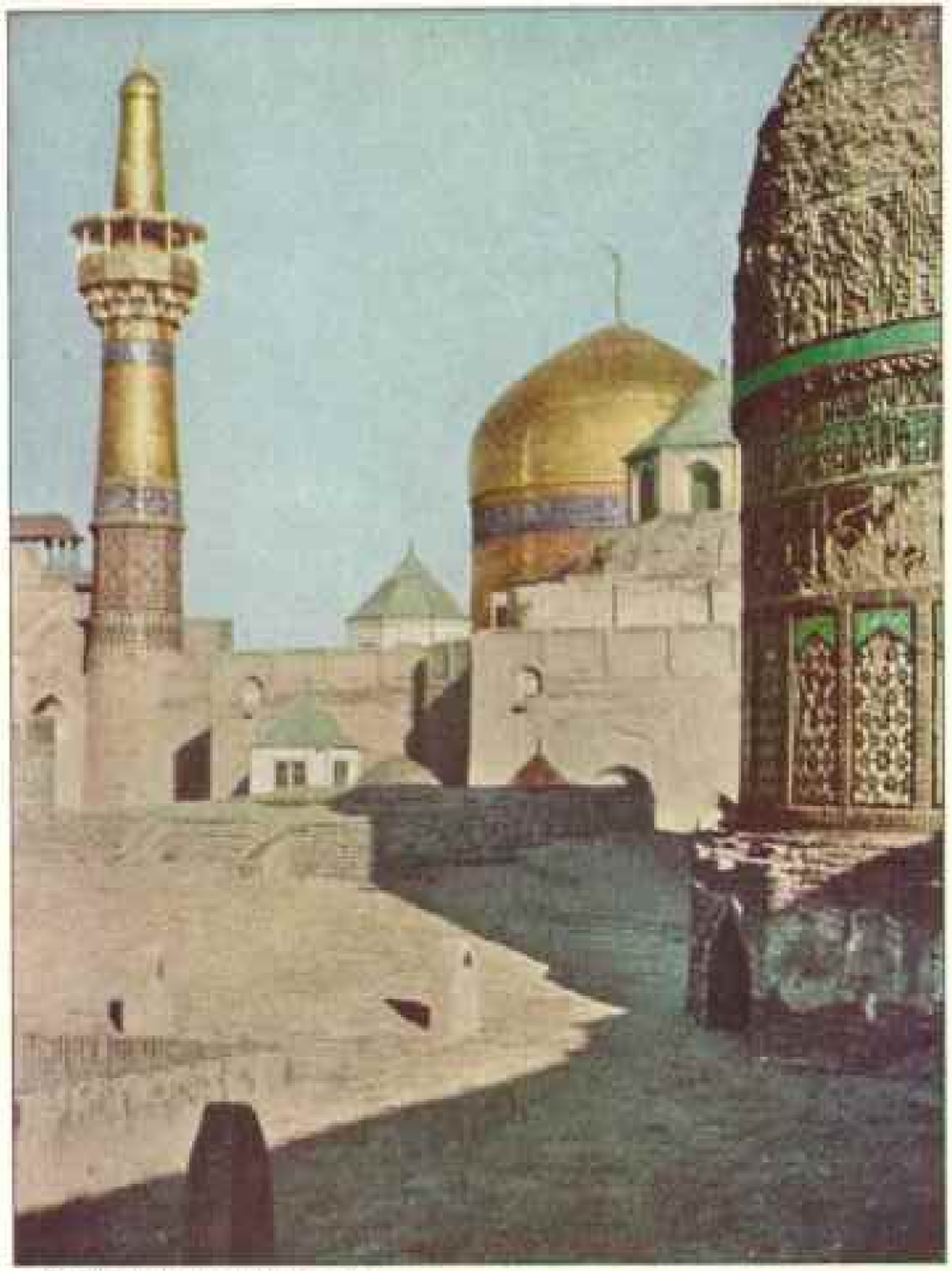
From nearly a score of invasions of India, more than 900 years ago, the Afghan Mahmoud of Ghazni brought back enormous wealth to his home city. Invaders from Ghazni founded the dynasty of the Grand Moguls at Delhi. The present mud-walled city, which lies to the south of the Afghanistan capital, Kabul, was probably only the citadel or "ark" of Mahmoud's great capital.



Finlay Direct Color Photograph by Maynard Owen Williams

A BUDDHA, EIGHT FEET HIGHER THAN NIAGARA FALLS, DOMINATES BAMIAN VALLEY

The giant statue, cut in the conglomerate cliff-face, was once so gilded that Hsuang Tsang thought it bronze. The plaster covering was held in place by pegs in a way resembling modern cement work. Clearly Greek in its type, it was the principal monument of a colony of thousands of Hinayana Buddhist monks. Bamian, meeting place of Iranian, Indian and Chinese influences, is of utmost importance in the study of Central Asian art and cultural relationships.





RADIANT BEACONS TO THE TOMB OF THE EIGHTH IMAM AT MESHED, PERSIA

Above the famous shrine of Hazrat Imam Reza, Eighth Apostle of the Prophet, two minarets and a dome, all sheathed in gold, may be seen from afar. This view is from the roof of one of several theological seminaries, grouped about the sacred precincts which no Christian may enter.

Finlay Direct Color Photographs by Maynard Owen Williams

ITINERANT CLOSE-HARMONY SINGERS OF MAZANDERAN PROVINCE

Small troupes of actors and singers tour through Persia, keeping alive old native harmonies. These two young women made for the Citroën-Haardt Trans-Asiatic Expedition a sound-cinema record of Iranian music and rhythm at Babol (Barfrush), center of a fertile section not far from the shores of the Caspian Sea.



Finlay Direct Color Photographs by Maynard Owen Williams

AFGHAN TRIBESMEN ASSEMBLED AT MUKUR TO GREET THE CITROËN-HAARDT TRANS-ASIATIC EXPEDITION

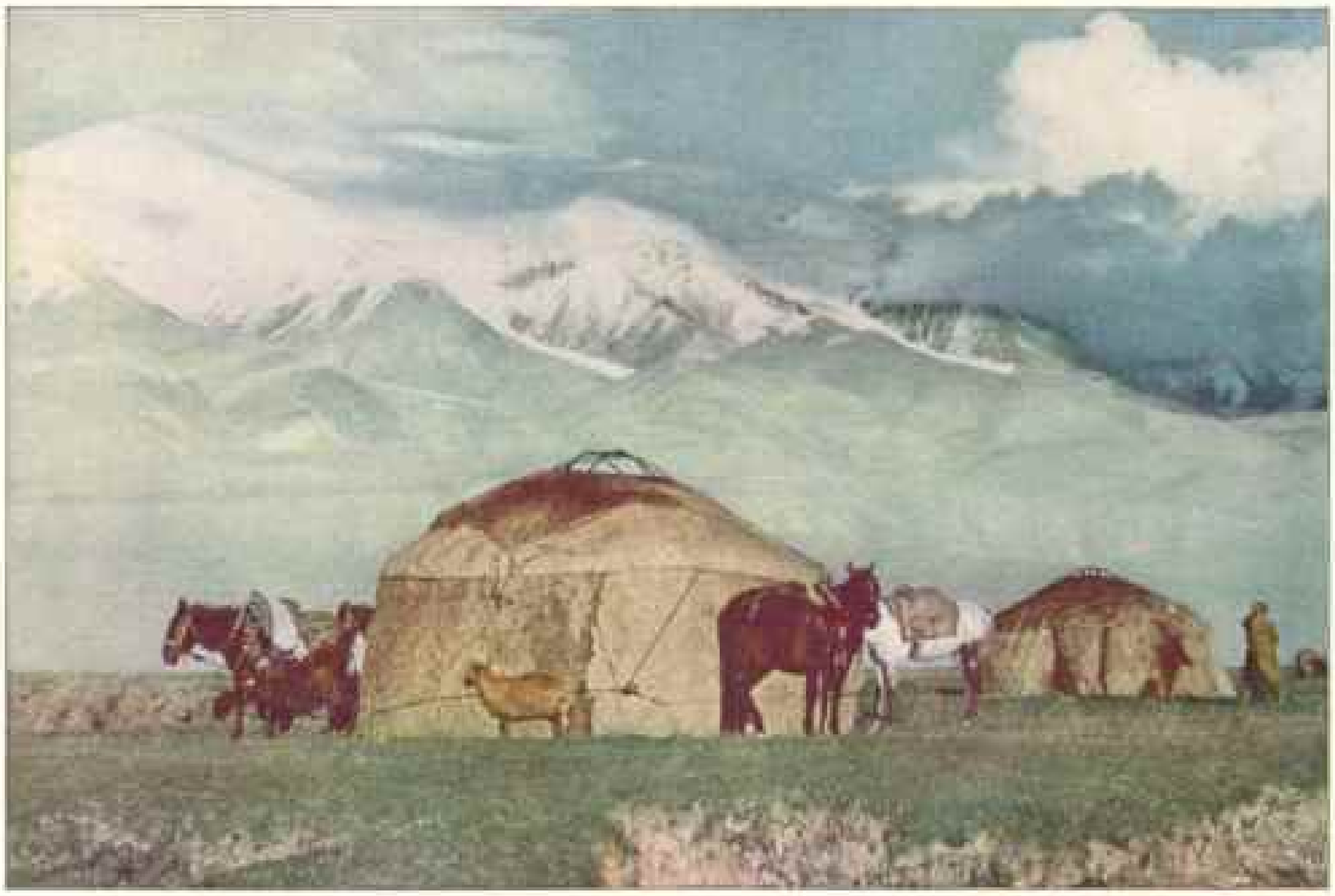
The two at the left, with bits of mirrors worked into their elaborately embroidered costumes, are members of the Allchul tribe. Those at the right are Kharotis.



Finlay Direct Color Photograph by Maynard Owen Williams

THE RED GATES TO THE TARIM BASIN, A FEW MILES ABOVE TASHMALIK

These ruddy cliffs, shutting in the narrow and barren valley of the Gez, mark the transition from the snow-topped Pamirs to the hot, dusty plains leading to the dread Takla Makan Desert of Sinkiang (Chinese Turkistan).



KUNGUR, 25,146-FOOT KING OF THE KASHGAR RANGE, AS SEEN FROM A KIRGHIZ CAMP AT BULUNKUL

Cloth tents were carried by the explorers, but native yurts, heated by central fires, proved preferable.

 Finlay Direct Color Photographs by Maynard Owen Williams

A KIRGHIZ DAIRY MAID AND HER YAK CALF

When the yak is young, its coat more nearly resembles wool than hair.

By 3 in the morning we entered another "bandit village," with a score or so armed men still abroad in the silent streets. A dazzingly pretty Chinese girl, with bright dress, gold bracelet and earrings, picked out by our lights against this drab, ruined region, did more than the armed men in sheepskins to give an illusion of evil to this sordid street of tumble-down shacks.

Commandant Pecqueur and Hackin, quiet, courageous men, patrolled along on foot, keeping contact between the closely aligned cars and looking for ambush or trouble. In the middle of each Chinese gate is a high center stone above which the double doors are fastened. Over this we slowly climbed and took the road through a countryside shaken open in deep cracks by an earthquake years before.

Soon afterward, something else went wrong. In the bright moonlight the leading truck was not to be seen. Petro would stop when our headlights were extinguished, but I went forward on foot to warm up and give him the news. His cold motor needed cranking—welcome exercise to one cold and stiff from inactivity. Then, thinking the column would overtake me, I kept on down the chalky ribbon of trail flanked by ghostly earth-rents full of shadows.

Thus should one experience the desolation of the desert—afoot, alone, in the silence, with a pale moon lighting the earthquake-ravaged earth just enough to reveal its ugly wounds. My "brief walk" ended five hours later. And during those five wonderful hours Nature ran the gamut of beauty and desolation amid vestiges of a mighty past. From the edge of a plateau I could see the thin light-bands from our headlights, far behind.

One of the thrills of our motor crossing was to see a night caravan sweeping its luminous shafts to right and left—now turning a dull, dusty companion car to buffed silver, now making a shadowy mesa leap toward heaven's dark void, now adding a fairy brightness to coarse desert plants, now turning mysterious black walls to chalky whiteness.

As I looked down upon them a couple of miles away, I thought I had never seen the lights so dramatic. Then one by one they went out, a sign to the car ahead that something was wrong. Each driver is responsible for the car behind. When he loses contact he stops and extinguishes his headlights.

The score of parallel ruts beside the line of the Great Wall, here merely a succession of bulky towers, gave little evidence of recent use. Ages of traffic had worn them so deep that even a high-wheeled cart must continue in the track in which it starts. But there was dust at the bottom of all. A massive memorial stone, its top writhing with carved dragons, cut the sky, and I turned aside long enough to let one of the old watchtowers of the Great Wall impress itself upon me.

### ONCE MORE ON THE MARCO POLO TRAIL

To one passing through a shadowy hole in the curtain wall, this truncated pyramid loomed majestic in the moonlight. Crumbling protector of trade routes and racial integrity, who knows but my trail to-night was followed by Marco Polo* on his way to Cambaluc and far Kinsai?

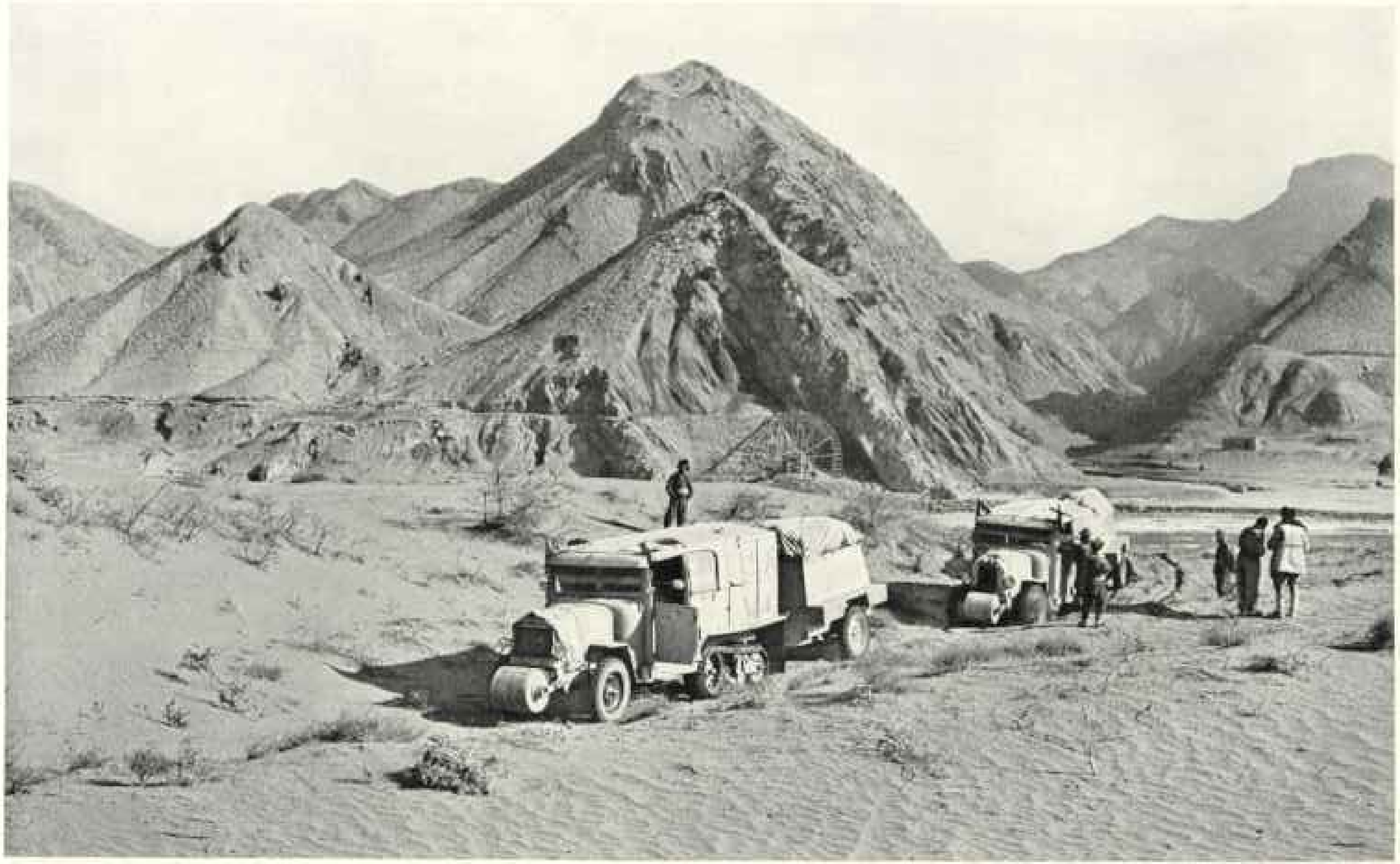
Off to the right a shepherd, or bandits, had a brush fire. I thought of what a George Borrow would have made of such a chance! But I was one of many and my companions were somewhere down below, circling the plateau across which I tramped.

Red sky preceded the dawn and around a group of three minor towers there was a glow like that from a forest fire. From the far edge of the plateau one saw a wide plain much cut by silvery watercourses and with isolated farmhouses, fortified by tall mud towers, scattered far and wide.

Shortly afterward Petro picked me up. Fugitive from Qomul after weeks inside the besieged city, wanderer in the Takla Makan, drinking the water from his radiator, hero of a hundred adventures among the Chinese, whose language he speaks with fluency, the one man who provided the mechanics with story-book romance at the journey's end by marrying Barbara Schurman in the home where she had lived as daughter of the American Minister to China, Petropavlovsky expressed relief that my own trifling adventure, almost entirely of the spirit, had ended safely.

"What did you gain by it?" he asked. How could I say? One can't put a price on dreams.

* See "The World's Greatest Overland Explorer," by J. R. Hildebrand, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1928.



Photograph by Maynard Owen Williams

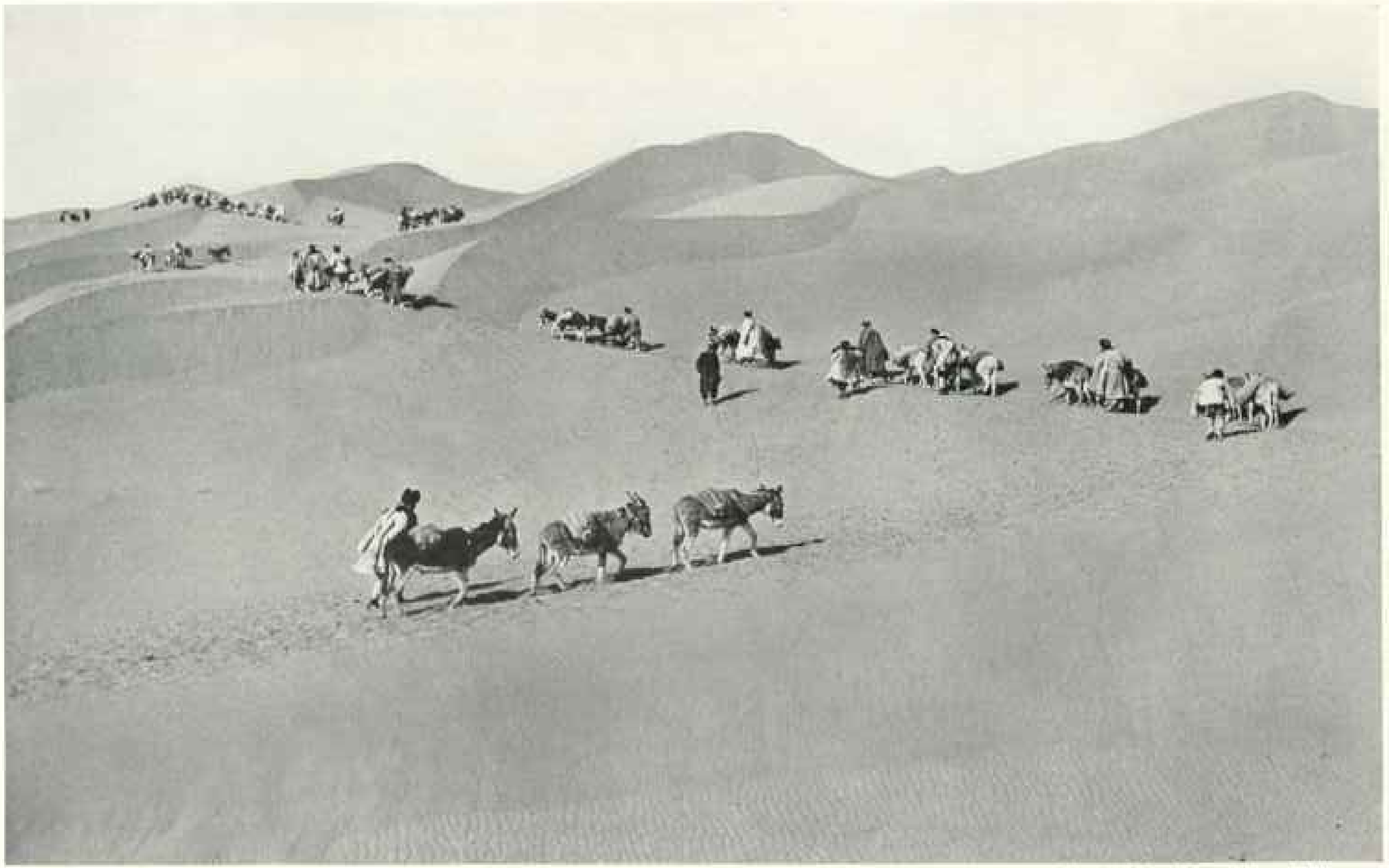
PATH-FINDING CARS IN HEAVY SAND BETWEEN DUNE AND RIVER

Along the Yellow River there was an ice sheet where 5-ton cars could be loaded onto a ferry, three miles below this spot. With each car requiring one barge trip and ten cars in all, it was essential that the water journey be reduced to the minimum. Across the river is a water wheel for irrigation. There are coal mines in the hills to the right, and small coracles of coal were being paddled downstream amid the floe ice.

Photograph by Maynard Owen Williams

THE DRIVER CHANGED HIS MIND

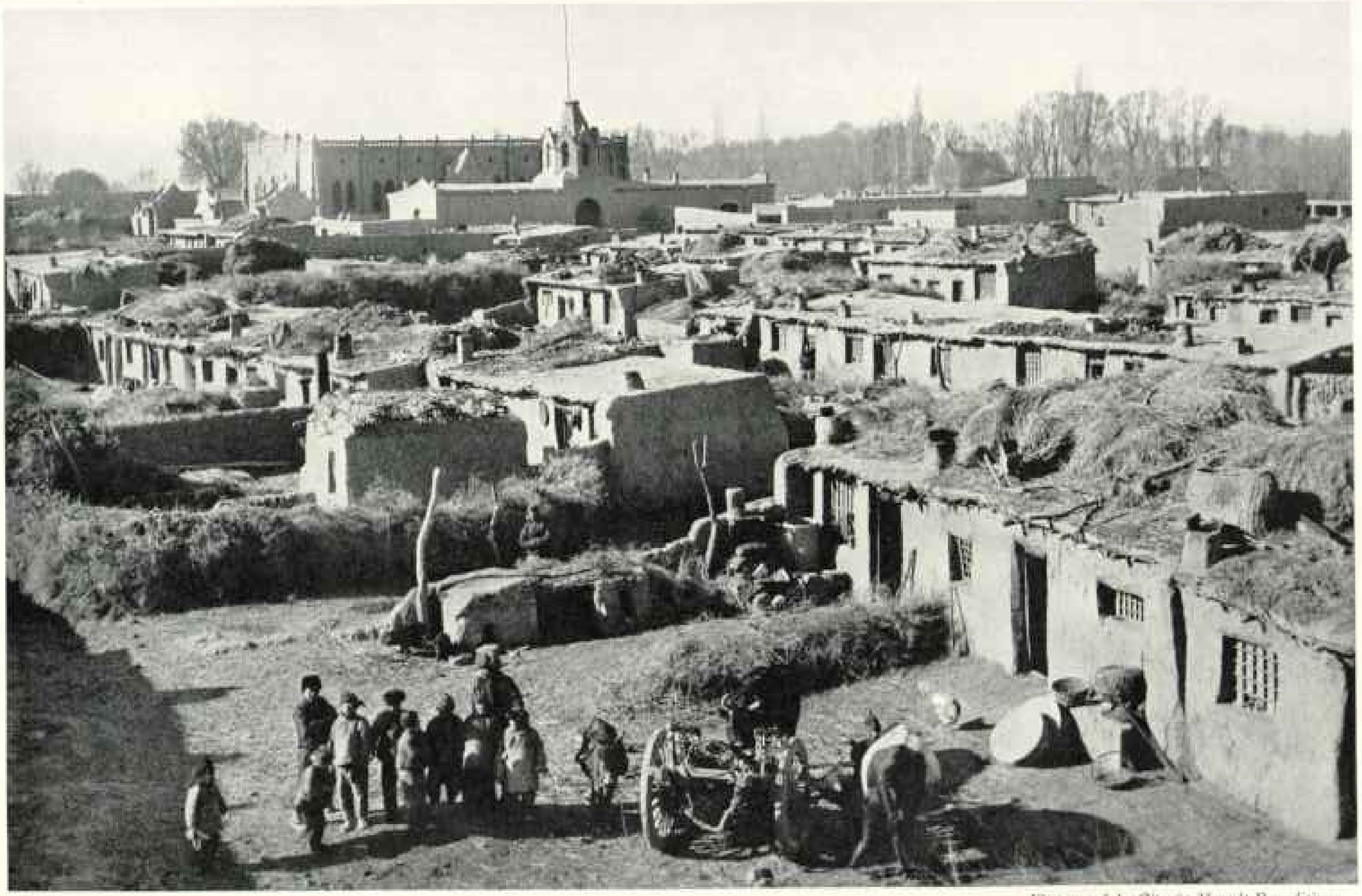
The ice edge had dropped below the earlier sand-covered level and what seemed relatively smooth going hid an 18-inch drop. When part way onto the ferry, the 5-ton tractor tended to push the boat away from the bank, and sand is being sprinkled on the ice to reduce skidding. The Yellow River south of Chungwei.



Photograph by Maynard Owen Williams

ANIMAL CARAVANS SET PRECEDENTS NO MOTOR CAN FOLLOW

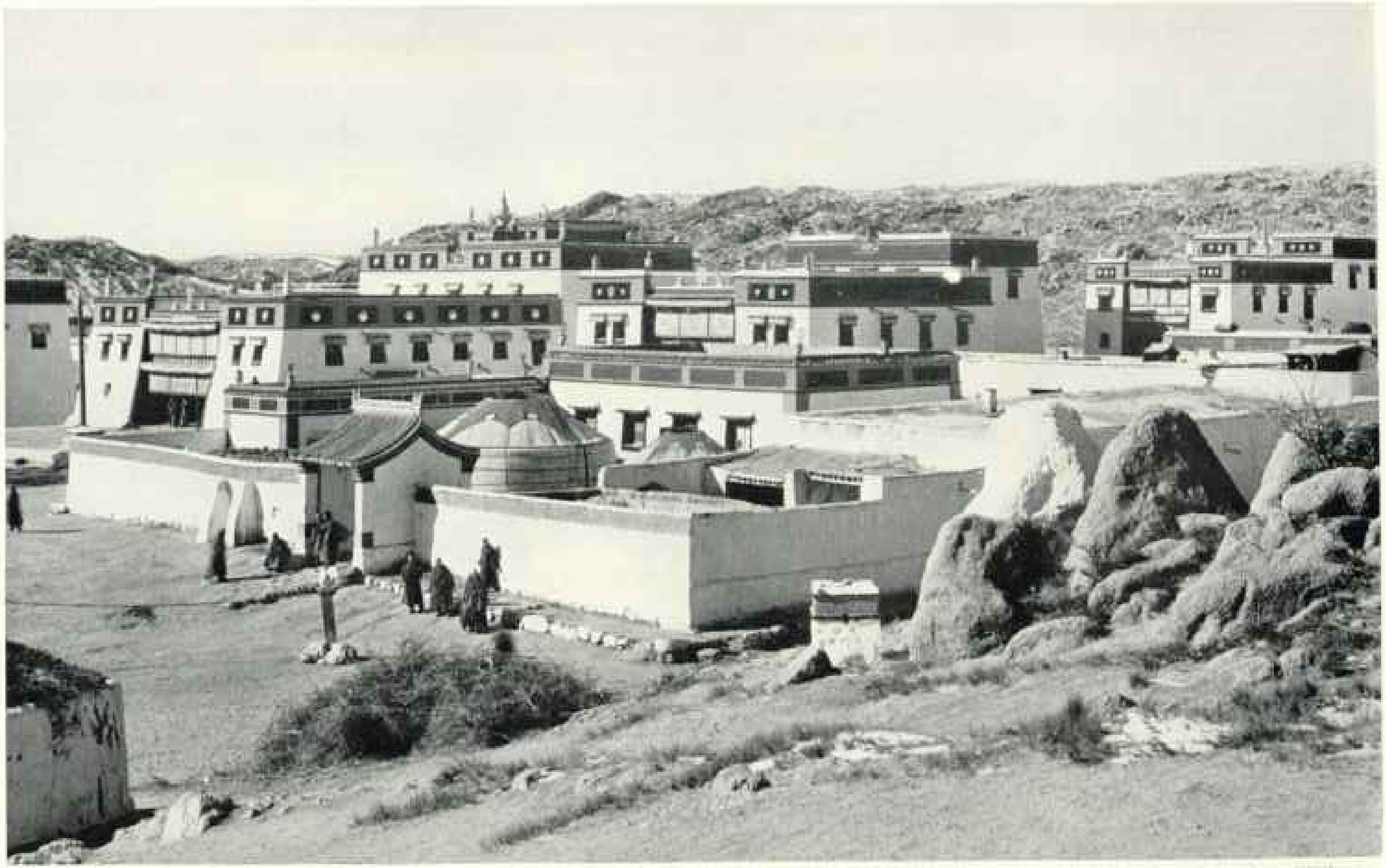
To avoid the one-mile barge trip necessary to the tractors, donkey trains climb an ever-changing trail to the top of the 600-foot sand dunes, which slope steeply toward the Yellow River. Note the sheepskin clothing of the drivers even on a sunny day (see text, page 564).



Photograph by Citroën-Haardt Expedition

PEASANT HOMES INSIDE THE CHRISTIAN CITY OF REFUGE AT SAN CHENG KUNG

The large building at the upper left is the church. Farther left is a bit of the wall, along which armed guards keep watch. The Expedition was welcomed here, as to other Christian mission stations, where the men could rest and the motors be prepared for further adventures (see, also, text, page 566).



Photograph by Maynard Owen Williams

SHARAMUREN, LAMA COLONY, IS ASIA'S "SPOTLESS TOWN"

This view shows three of the temples, attractive structures in white, red, gold, and black. Many whitewashed homes surround the temples, but most of the people live in felt yurts, of which each private courtyard has at least one.

Photographs by Maynard Owen Williams

A MONGOL PRINCESS LEAVES THE CEREMONIAL YURT OF PRINCE HSI SSU NYING

Although it would be immodest to pose for a photograph with hundreds of her retainers looking on, she halted long enough for this informal picture to be snapped (see, also, page 577).

A MONGOL VISITOR TO THE LAMASERY AT PEILINGMIAO, WEST OF KALGAN

Behind him is a highly colored Buddhist guardian god, one of the four deities which protect man against evils coming from the four points of the compass.

A circle of miserable folk silently watched us breakfast, while a woman with bound feet hobbled over with hot water for tea. The generous Petro immediately gave a butt of bologna to one man, who divided it with studied fairness. The dispenser of jam solved *his* problem of justice by sticking his finger into the tin, withdrawing as much preserve as would stick to it, and letting one half-naked youngster after another lick it clean.

That flooded plain delayed us. The ice would not bear our weight, yet when we stopped our wheels froze solid.

We slept with the Catholic fathers near Liangchow, after they had brought peasants through the night to smooth our way across irrigation ditches too narrow and deep to cross without shovel work.

Even we were tired. Fifty-two hours at a stretch was enough. But for the last car it was sixty-four. It had broken a tractor hand only 600 yards from the Mission, and a driver had dropped beside his car from sheer fatigue. As usual, Haardt stuck by his admiring mechanics till the finish.

The next morning, rising so late that I was ashamed of myself, I found only servants about. Hackin's Afghan complained, "There is bread for the Chinese 'boys' when there is none for the masters"; and Amira, Haardt's Kashmiri, said that if he had known how cold it would be, he would never have left Kashmir.

"Amira, you wouldn't have missed this. In Srinagar, you'll be all kinds of a hero. 'Personal servant to Mr. Haardt.' Think what face that will give you."

"Oh, yes, sir. Servant to my master; that is worth much trouble."

### NEWSPAPERS AGAIN

That day of rest at the Catholic Mission outside Liangchow is full of happy memories. In touch with the world again! I devoured one *North China Star* after another, the latest news only 20 days old! Morizet, finest of colleagues, dropped in, taking an almost pitiful delight in the fact that he could bend his knees a bit after six weeks of rheumatic fever. Père Teilhard, that remarkable combination of liberal churchman and paleontologist, discussed religion with Jacovleff and me; and at evening time, framed in the back door of the radio car and flooded by the lights of his transmitter, Kervizic was at work. I knew he was sending off New Year's greetings to millions of friends of the Expedition in America, but in imagination I saw him back there at the "Camp of Resistance" near Urumchi, broadcasting the message that so thrilled us in the Himalayas when both the radio car in Srinagar and the portable set at Peshwari picked up the clandestine appeal ghosted through space to a French gunboat off Shanghai (see text, page 532).

A cold ride down a rough trail between miles of grave mounds brought me to the somber-walled city of Liangchow for the last day of 1931. Earthquakes, whose center was farther east,* had swept the region years before, but isolated idols still rose above the wreckage. Homeless gods, some with their heads broken off, or the straw-and-mud stumps of once regal arms sticking out into the cold haze (see pages 537 and 539).

The city within the walls had also been touched with destruction, against which new life was making brave but slow progress.

### NEW YEAR'S WISHES IN RED AND GOLD

On the main street red-and-gold posters were being pasted on the wooden posts. This was a special act of political piety, dutifully paid to the newly accepted official calendar, for the people still hold to "China New Years" in February as their popular festival.

If the Chinese indulged in holiday resolutions, opium-smoking was certainly not under the ban. Great greasy gobs of the drug were displayed for sale and pipe-bowls, lamps, and all the complex paraphernalia of that most exacting of vices lined the street. I felt a bit ashamed at photographing this, and it was a relief to turn to a jolly cobbler, whose smiling face would show friendliness even in reproduction (see page 538).

As I finished, an English-speaking Chinese said, "It is a shame for China that you take picture of such a man."

This snobbish viewpoint is one which no conscientious photographer can accept.

"Why is it a shame? This man is a worker. He is clean. He seems reasonably happy and honest. He represents the real China. He is neither imposing exor-

* See "Where the Mountains Walked," in the NATIONAL GEOGRAPHIC MAGAZINE for May, 1922.

Photograph by Maynard Owen Williams

A NINGSIA TEMPLE ON THE MAIN EAST-WEST STREET

Oriental cities are frequently divided into four parts by two principal streets crossing at right angles under a central tower. On an artificial hill above this Ningsia street is a temple not yet converted to secular uses.

bitant taxes nor gratifying personal ambition at the expense of the poor. Far from discrediting your country, his picture will help offset stories of maladministration and hatred of 'foreign devils.' He and I coöperated in that picture through a tacit understanding. In this limited sense, we like each other. No such evidence of mutual friendliness can dishonor your land."

BURG RHEINSTEIN IN A DISTANT LAND

On returning from the walled city, we had the Bishop as passenger, and our dinner in that Mission dining room, with its German Christmas tree hung with tiny tinfoiled sausages, bottles, and cardboard houses, its bright paper festoons, and its fresco of Burg Rheinstein, was one not soon to be forgotten.

We joined songs of the Vaterland as far as we could without spoiling them, and Reymond, our naturalist, astonished all by singing, in German, "Ich hatt' einen Kameraden." Then the Bishop spoke a few simple words.

"You are thirty and you have your own supplies. Were you twice as many and without food, you would be welcome. You are French. We are Germans. Enemies? No. Here, so far from our homes, France and Germany seem like two provinces of a single fatherland."

To his lifted glass we rose as one.

"To your success, my European brothers." And I had my own particular thrill, for thanks to the participation of the National Geographic Society, itself international in membership, America was represented at this happy gathering of men diverse in speech but united in brotherhood.

From Liangchow we must turn north and the "Da Han," or "Great Cold," was due. We were halfway from Urumchi to Peiping, but the harder portion lay ahead.

Le Fèvre thus records his impression of the route between Liangchow and Ningsia:

"Two hundred and fifty miles! A six-hour motor ride on a modern route. Here, though advancing twenty hours out of twenty-four, it is a six days' struggle

Photograph by Citroën-Haardt Expedition

THE "SILVER CRESCENT" PLAYS SUBMARINE AT MIDNIGHT

Eight hundred exposed films and plates are still in the tractor, and the author is pulling off his sheepskin to rescue them. Remillier, perched on the submerged hood, acts as ice-breaker after having withdrawn his car from the hole in the foreground (see, also, text, page 565).

across this eroded, worn-out, humpy no man's land, obstructed by rocklike hunks of earth and hollowed by gullies, amid which the trail is usually only a half-choked gullet between walls of loess which must be crumbled with a pickax before our seven-ton cars can pass."

### EASTWARD ALONG THE GREAT WALL TO THE YELLOW RIVER

On January 5, 1932, the "Silver Crescent," the "Heavy Cinema," and the "Frigate" truck left in the direction of Ningsia to blaze a trail toward the Yellow River, along the line of the Great Wall. At half past 2 in the morning we stopped at a dirty little inn at Tatsing, where sixty 10-gallon tins of gas had been safely stored.

We found Kwan Yin Miao, the Temple of the Goddess of Mercy, outside the Great Wall instead of inside, as shown on the map, and rolled slowly on through bitter wind, over an awful trail, until—just before sundown—Piat broke a fork in his gear box. By night we went on over one long succession of crevasses, rocks, and side slips. The sigh of relief at arriving in the seemingly deserted village of Hungshui soon died away in sound sleep, with the thermometer at 8 degrees below zero, Fahrenheit.

When strangers arrive in a Chinese village at night, prudence suggests quiet, for requisitions are common. Hungshui, which had seemed deserted until we had paid our bill, suddenly blossomed into life, and a considerable crowd came outside the walls to see what manner of men and machines we were.

A rocky run down a dry stream bed and a stretch of desert sand brought us to Pa Tun. Before reaching a low pass, we came upon a memorial stone saying that "the Christian General," Feng, together with 33 friends, had here, as in many other regions, built a "road."

### "GOOD ROADS" SPECIFICATIONS IN KANSU

Although many an "automobile road" is a mere track in the desert, with bridges with holes in their centers to prevent their use by horse-drawn carts, this unusual

Photograph by Maynard Owen Williams

A MONGOL WATER WAGON AT NEW YEAR'S TIME

The camp of Prince Hsi Ssu Nying is set at some distance from the well, and during the New Year's celebration several ox-drawn water wagons ministered to the needs of the guests.

stretch of hill-climbing road was worthy of the memorial stones which marked its termini.

Cart tracks were here a far greater difficulty than in Central Asia. In Kashgaria the width between the wheels may be as great as eight feet and even the deepest ruts may be taken "astride"; but near the Great Wall, cart tracks having the same tread as our front wheels often ran between high banks, thus squeezing our wide tractor bands toward the middle and breaking the "talons" which guide them between the drive wheels. Sand, swamp, and rocky going were less troublesome than these twin ruts into which even five tons of weight could not squeeze our tractor bands.

"CHINA'S SORROW" IN A HAPPY MOOD

Beyond Kai Tong Tze we got the sand dunes (see page 541). It was slow but dramatic going, from which we extricated ourselves only to face more and higher dunes beside a curve of the Yellow River, or Hwang Ho. Finally, attaining a height of 600 feet and rising steeply from the water's edge, they definitely blocked our path. The ice flats along the bank were too broken and weak to afford us a passage.

In winter the Yellow River is a far-from-dirty stream, and masses of emerald ice afford a pleasing contrast with ruddy cliffs and golden sand reflected in clear blue water (see Color Plate XIV). We found "China's Sorrow" in a happy mood. After two wallowing miles of dune-bucking, we crossed forty yards of ice, waddled aboard an archaic ferry, which tried to slip from under, and floated downstream for a mile before landing on the same bank, beyond the wall of sand (see page 555).

After each load was carried downstream, the awkward barge had to be towed up by manpower against a swift current. A violent sand storm blotted out the sun, and we had just unloaded our third car when a Chinese servant came running to say that Haardt, with seven cars, had arrived at the head of the ferry section.

In the afternoon I tramped through beauty along the skyline, with the curving river a mere ribbon below and an ever-changing trail winding among the shifting dunes, amid which an isolated and spotless

temple was saved from burial by ceaseless shoveling. Then I strode down in giant strides upon our friends, finding them sorely fatigued by their forced march. They had left Liangchow two days later than we and were now on our very heels. Haardt's remarkable nerve still held good, and as we slipped and stumbled on our way along the river bank back to our cars, Audouin-Dubreuil and I discussed the pluck and persistence of the chief with whom he had been so closely associated through many adventures.

Three cars a day could be barged downstream. Ours were already past the break. Haardt had seven, for at Kanchow we had added a trusty Ford truck to our nine Citroëns. Our men helped the first cars ashore as they arrived, leaving all possible workers at the upper end of the water jump. Meanwhile, I photographed the donkey caravans, which here climb the high dunes to avoid the dangerous river-side route. Just before dark the "Crescent" headed for Chungwei, making excellent time along a sandy route to catch up with the two other cars of our light party.

Our companions, fearing detention, had not entered the walled town, but had left a guide to conduct us to a house beyond, where we were all to partake of Chinese noodles, the kitchen car being with the main group.

While the mother mixed the paste, two youngsters played on the bed platform, at the end of which a wrinkled granny, lying on one side in the yellow glow of the opium lamp, went through the minute details connected with smoking the drug, her beady eyes watching the smoky gob on its long needle or peering down at the blunt pipe into which she forced the drug with fingers as bony and dark as those of a mummy.

After the noodles we rolled on until 2:30 and started again at 4. From here on we entered another world. The route was relatively good. The people were well dressed and clean. Not a beggar did we see. The wide plain beside the Yellow River had a rich look about it, even in winter, and skirted men riding bicycles gave us a sense of arriving somewhere.

We stopped at a tomb of a general of 250 years ago and, although the stone lions seemed to turn up their noses at it, found the deeply sculptured memorial arch surprisingly fine.

At Ta Pa tiny eavesdropping temple bells were murmuring in the evening breeze, and narrow temples with steep curving roofs were delightfully framed in city gates or reflected on the night-dark ice of small pools.

Twenty miles south of Ningsia we came upon another rococo temple, characteristic of this region. The custodian promptly offered his services, and we took the paper dust-covers off some bright new temple standards, found lads to hold them, and photographed the details of the painting before we had to hasten on. Although it lacked simplicity and classic sweep, this little temple was so rich in details and fresh in coloring that I was delighted with this brief break in the journey. In a larger party such a stop is seldom possible, for nine lusty motors snarl at every delay, and their mechanics, to whom progress is the ideal, seldom find ways of silencing their impatience.

### SAD NEWS FOR THE TIRED MECHANICS

One truck had gone to Ningsia for gas and oil. When it returned, there were welcome letters from home, offset by the sad news that our fourteen completely mounted tractor bands, to replace the patched and broken ones now almost at the point where the "one hoss shay" broke down, had all been stolen by bandits.

It was well that the new inn, chosen by the Belgian Father Léon Van Dijk, GEOGRAPHIC contributor,* seemed almost palatial, for this was a severe blow. The bandits had failed to get the teeth, talons, and a few "nude" bands, out of which enough complete bands must be assembled to carry us along (see, also, page 578).

The Christian missionaries of Ningsia have laid their impress on the people. Both Father Van Dijk and the Scovilles, American missionaries of the China Inland Mission, had so treated the Chinese that a walk with either was a friendly introduction to all classes. Despite anti-foreign propaganda, personal relations between Chinese individuals and sympathetic foreigners are all one could desire; but the missionaries in Ningsia had built up an

* See illustrations for "Raft Life on the Hwang Ho," in the NATIONAL GEOGRAPHIC MAGAZINE for June, 1932.

Photograph by Maynard Owen Williams

A ROADSIDE BOOKSTORE IN LIANGCHOW

Despite the difficulty of the language, Chinese literacy is increasing rapidly. Posters showing modern dress are a subtle but constant influence. Disease, flood, and famine have in the past offset China's high birth rate, increased by ancestor worship and tradition. A taste for modern luxuries is retarding marriage, reducing the size of families, raising the Chinese standard of living, and worrying the old folks.

exceptional friendliness, from which we profited.

### NEW SCHOOLS IN OLD TEMPLES

Ningsia, not too remote when bandits do not close the roads, is caught between the old and the new. In the former Confucian temple is the First Provincial Middle School, and on the second floor of the central Drum Tower, decorated with blackboards and the usual picture of Sun Yat Sen, the Kuomintang has its regional headquarters, to which I was cordially welcomed (see, also, page 579).

Several temples are abandoned. Others are occupied by soldiers, whose officers begged me to photograph their men.

The China New Year was approaching and gaudily colored prints lined the streets. Some of these were the old block prints of kitchen gods, mythologic or theatrical scenes; but others were modern color prints of pretty Chinese girls with permanent waves and modern dresses (see illustration above).

China is denuded by fuel-hunters, yet excellent coal, rich in heat units and almost free of ash, underlies vast regions. In my room at Ningsia a single small fire, free from smoke or gas, heated a stove at the end of a bed platform, beneath which flues carried the heat. Excellent coal costs ten cents a camel-load at the mines. But animal transport quickly multiplies the cost.

### CROSSING A "DELAWARE"

North of Ningsia, at midnight, the "Silver Crescent" crashed through thick ice and my camera suddenly went afloat in icy water between my porous leather boots. The headlights were well under water, and still lighted, before I could turn off the current and join my companions on shore by way of a scramble over the roof.

Hundreds of films and color plates, expressly stored as high as possible, were

still unharmed, but we were settling fast. Every man was busy at his own tasks, but Pecqueur immediately helped me bridge the watery gap and drag to safety the heavy trunk of photographic records.

Flashlights threw the chaotic scene into wild relief (see page 562). Remillier, mounted on the radiator, wielded a piston-like crowbar against the thick ice, the car wallowed lower and lower, finally submerging the entire hood, and after more than an hour of feverish struggle in bitter cold, three other tractors dragged our car, like some submarine monster spewing out water, to the opposite bank. Thirteen hours' delay.

Having reserved the normally high and dry space for photographic equipment, I found all my clothing frozen into solid blocks—a sort of galantine of shirts and socks which was later melted out by the Sisters at San Cheng Kung. Any embarrassment at having my masculine garb invade their cloister was overcome by gratitude at finding one could handle it without ice tongs.

San Cheng Kung is built like an ancient city of refuge. Within its fortified walls, defended by men and boys with flintlock blunderbusses, a Christian community lives with its cattle and sheep. When bandits threaten, men of all faiths are welcomed within the protecting walls (see page 557).

On Sunday, January 24, we set out with a following wind. Each car moved slowly ahead in an opaque dust cloud. Dust filled our nostrils and mouths. With cold-cracked fingers we scooped out gobs of grit from between our lower teeth and lips. Dust crept through our cylinders as if no air filters were there. Pistons developed unusual wear and oil fouled the spark plugs. While a trifling repair was being made, the water froze about the cylinders. A camel or a horse would have seemed very efficient.

### THE ETIQUETTE OF DEALING WITH BANDITS

While pistons were changed, small parties on horseback came to visit or spy on us. Among them a hard-riding Amazon, who ordered her retainers about like slaves, looked dangerous. At midnight we started toward a region against which we had been warned.

"Don't talk when you should fight and don't fight when you should talk," Governor Ma had said in Ningsia. At Lunghingchang clean, alert officers came to inspect our passports and invite us into one of the two walled towns. Walled towns were a nightmare to us. From several we had escaped only after long negotiations and exchanges of presents which amounted to levies.

We skirted the walls and gaily continued our ride toward the east, with railhead at Paotow only a day or two away. At Patsebolong armed and uniformed men, whose exact status no one knew, pointed their guns at us and then jumped upon our running boards, asking for information, which we gave without halting. Hundreds of unarmed but uniformed men were in sight, but we passed through the town without trouble.

Farther along, just before nightfall, the "Silver Crescent" came to a narrow bridge to which the approach was difficult. The two Citroën trucks had passed some minutes before. The "Golden Scarab" was well ahead.

### SAVED FROM THE WATER, THE "SILVER CRESCENT" GETS BAPTISM OF FIRE

Audouin-Dubreuil and Commandant Pecqueur were in the back seat, closed in by curtains with small windows. Gauthier was busy guiding car and trailer. From my seat beside him I looked into the barrel of a gun held by one of the handsomest young Chinese I ever saw. At three or four miles an hour, it took a long time to roll past that swinging rifle barrel.

When we were a few feet past the Chinese, who were ambushed behind chest-high mud walls, four or five yards away on each side of us, a salvo of shots rang out. Eleven bullets took effect on the "Silver Crescent" and its trailer. All of them had been fired from slightly or wholly behind.

Deploying behind a diagonal bank, we brought our arms into action.

"Fire high or at a wall," ordered Audouin-Dubreuil. Balourdet handled his arm like the soldier he was.

"The idea was to make them know I had a machine gun, but not waste ammunition."

His plan was masterly. Four rapid shots. Then a wave of silence. Four

Photograph by Citroën-Haardt Expedition

JOURNEY'S END FOR THE CITROËN-HAARDT TRANS-ASIATIC EXPEDITION

Although Tientsin gave the explorers a royal welcome a few days later, the climax of more than ten months of effort was the arrival in Peiping, where foreigners and Chinese alike acclaimed the explorers and showered them with honors. The same nine cars had left Peiping in April, 1931. For four of them it had been a 6,000-mile trip, heavily overloaded and in low gear. In the distance looms the northwest gate of the Tatar wall.

more shots. Silence. Four more shots. He had fired twelve cartridges in all when a flag went up over the Chinese headquarters. Men from both sides advanced to a conference, from which Point, bareheaded and laughing, returned.

"This is a terrible country. They had the nerve to call it a 'slight misunderstanding.'"

But after having tea with the officers, at which the handsome young Chinaman who held his fire served me, both sides agreed to call it that.

One of our cars had been disabled before reaching the scene of the disturbance, so that four of the tractors arrived after dark. It would be necessary to tow the disabled car through the night between low mounds, perfect for ambush, with our headlights, necessary to our progress, making splendid targets. But we were unmolested. Soon after midnight we had passed into Inner Mongolia and stopped at an inn near the Ula Shan.

The next day a 1919 Dodge, laden with 22 men so deeply coated in dust that they looked like dummies, arrived, *en route* to Lunghingchang. Before arriving there, three were killed, the rest stripped of everything.

Night was settling down when we approached Paotow, where there were amazing electric lights and the strange, nostalgic whistle of a train. We hadn't heard such a sound for seven months.

For all of us, there was a joyous reunion with our Secretary General, André Goerger, to whom we had waved good-bye as our houseboat slid down the flooded Jhelum, way back there beyond the Himalayas.

### TWO GEOGRAPHIC REPRESENTATIVES MEET IN PAOTOW

For me there was the exceptional pleasure of personal contact with the National Geographic Society through the presence of my colleague, W. Robert Moore.

He had left America while we were in Kashmir, and while waiting for us had made excellent use of his time in a seven-month study of Hawaii, Japan, Chosen, and China. To have him there to represent The Society at the arrival of the Expedition and to take charge of my photographic records was a vast relief.

Before we ourselves reached Peiping he had returned to that city and had developed enough of my 1,500 films and plates to make sure that, although they had been loaded in the cars in Paris in January, 1931, and had passed through temperatures ranging from 120 degrees above to 30 degrees below, Fahrenheit, they were still in excellent condition. A photographer who has feared everything and been sure of nothing can imagine my delight that these records, which had escaped flood and bandit fire, had not succumbed to deterioration caused by Old Father Time.

From Paotow we headed north for the Mongolian plateau.

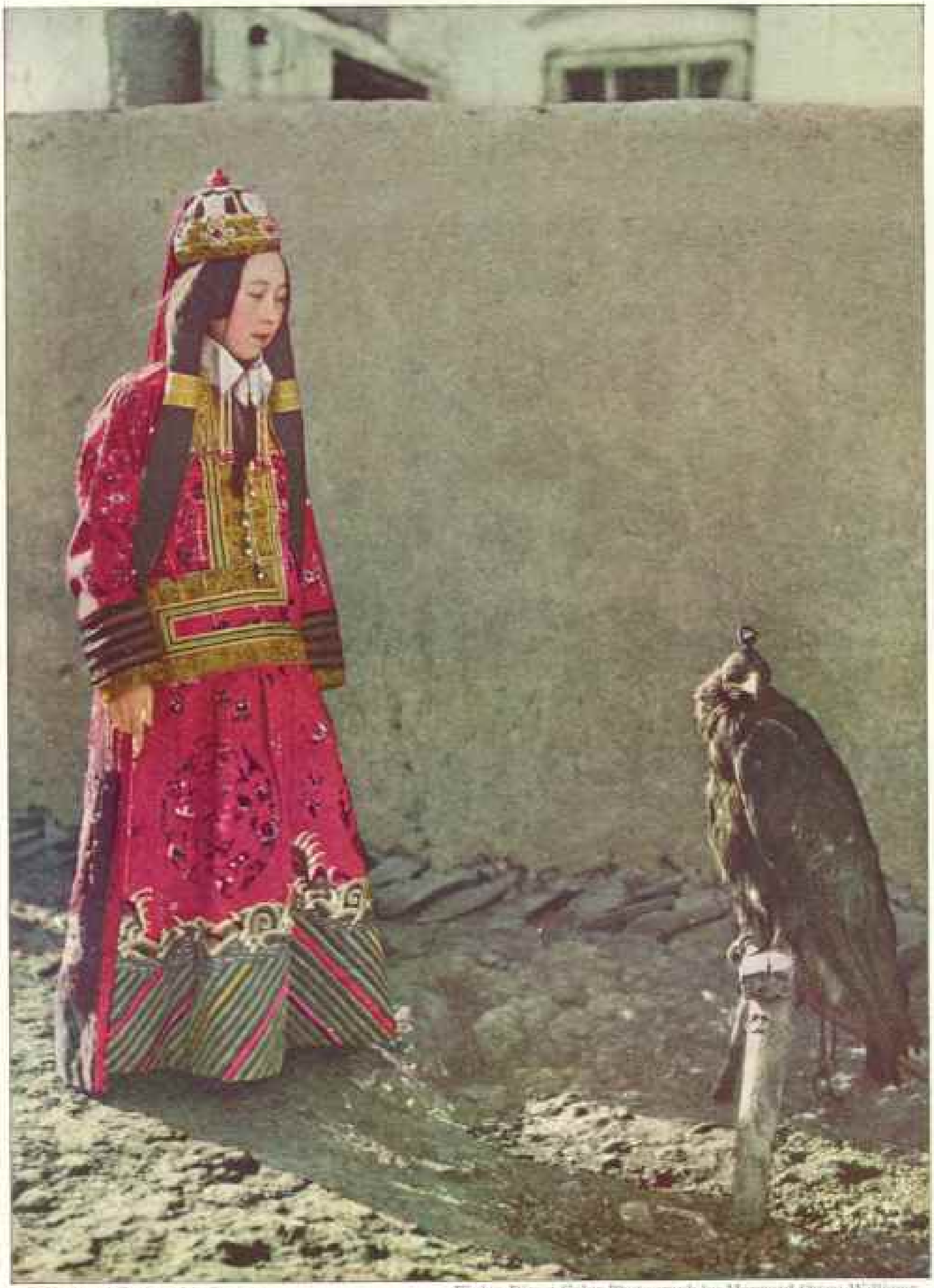
### HACKIN USES DIRECT ACTION IN POLITE CONVERSATION

Great herds of gazelles lightly leaped across our line of march much of the way to Peilingmiao, where we hoped to make a sound-cinema record of a lama ceremony (see Color Plate XII). We paid a ceremonial call on Gai Ming, Lamaism's representative to the Nanking Government, who received us in a spotless yurt. When Hackin avoided the compound fracture of speech translated from French to Chinese, Chinese to Mongol, and Mongol to Tibetan by writing Tibetan characters on a sheet of paper, spontaneous cordiality overflowed the felt hut, with its neat central platform holding a stove heated by camel dung.

Later we called on the local lama chief, sitting amid a score of brass vessels into which odorous grease or butter had been poured. We made a contribution to the lamasery and a second gift contingent upon permission to photograph a lama ceremony. Sauvage and Sivel, Morizet and Specht fought cold and weak light to make the record a success.

After a day of inactivity, this second gift was returned, for public opinion overrode priestly authority, and the lamas refused to stage a service in the open air. The lama temples were being decorated for China New Year's, and two lamas, with much "hush-hush," spirited me into a courtyard and asked me to photograph them with some New Year's gifts.

For weeks I had been a prisoner on a slow-moving tractor car, from which any general pictures of the whole expedition in movement were impossible; but Mongolia was safe enough, so that the trucks could



 Finlay Direct Color Photograph by Maynard Owen Williams

PRINCESS NIRGIDMA OF TORHUT WITH HER HOODED HUNTING EAGLE AT URUMCHI

This Mongol princess studied English in Peiping and French and medicine in Brussels. She translates Mongol folk tales, tames Mongol ponies, and embroiders the Mongol costumes she wears.

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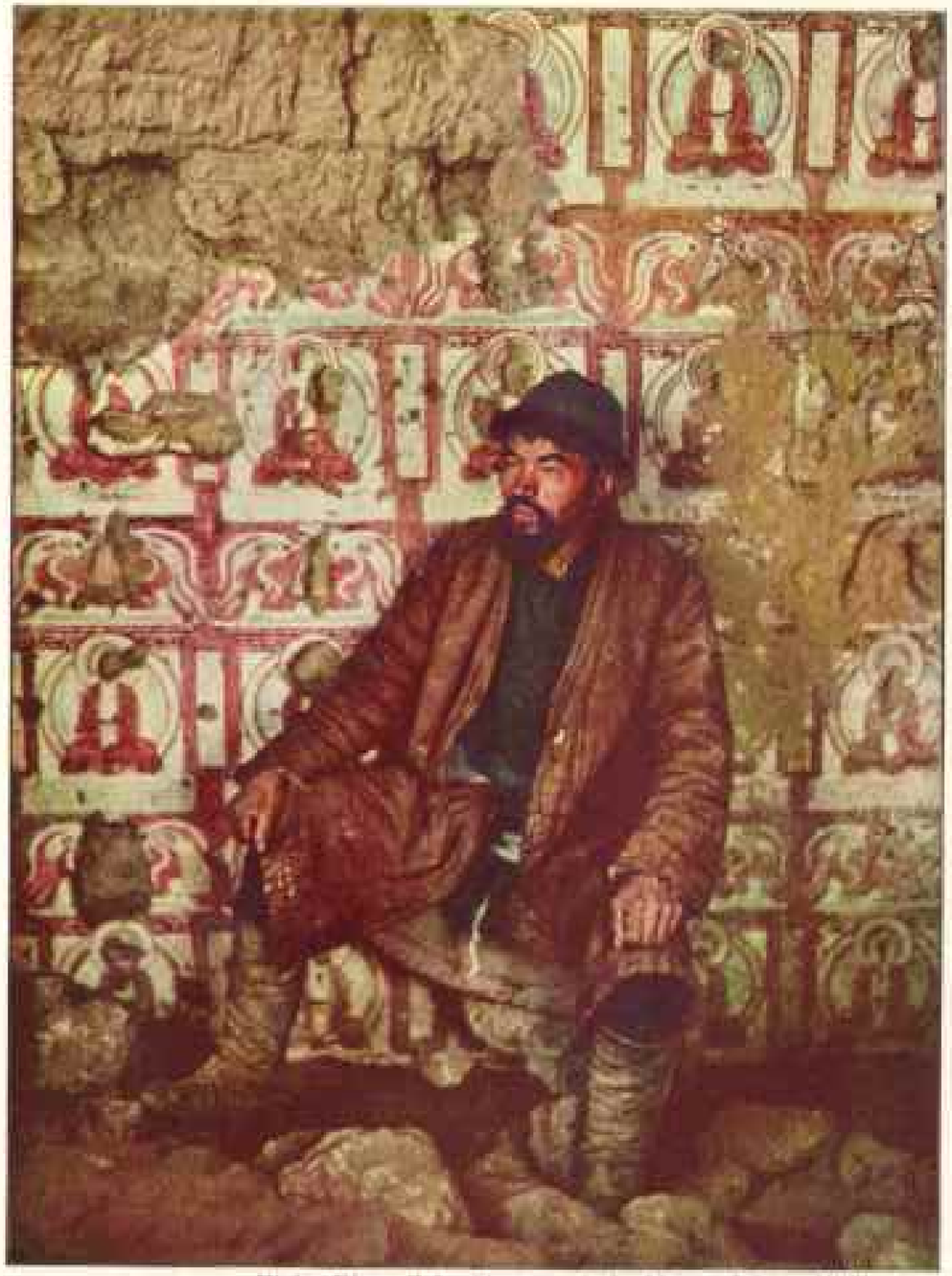
A CELESTIAL BAND FRESCO IN A BUDDHIST GROTTO AT BÄZÄKLIK, SINKIANG

The best of the Bäzäklik frescoes are now in the Ethnological Museum in Berlin. This fragment, with its individualized faces, is far different from the stenciled Buddhist saints in the illustration to the right.



Finlay Direct Color Photographs by Maynard Owen Williams

A TURKI PORTER AMID STENCILED BUDDHIST SAINTS IN A BÄZÄKLIK GROTTO

The ninth century was the best period at Bäzäklik, but there is evidence that the existing frescoes date from widely separated eras. The cliffs formed an admirable setting for a monastic settlement.

© National Geographic Society

THE SLEEPLESS EYES OF A "SLEEPING BUDDHA" OF SUCHOW NEAR THE WEST END OF THE GREAT WALL

There are many temples of the "Sleeping Buddha" in Kansu. A better name would be "Reclining Buddha," for the eyes are open. This statue, fifty or more feet long, is surrounded by attendant figures, some of them of heroic size.

Finlay Direct Color Photographs by Maynard Owen Williams

A CHINESE CHRISTIAN GIRL OF SAN CHENG KUNG REPAIRS HER WINDOW WITH A EUROPEAN NEWSPAPER

Although wool is common in many parts of China and wool felt has many uses, the Chinese seldom weave wool and the winter garments are quilted with cotton. This red costume is uncommon, dark blue being the usual color.

SOUND-CINEMA EQUIPMENT READY TO RECORD, FOR THE FIRST TIME, A LAMA SERVICE AT PEILINGMIAO

The most modern American apparatus for recording sights and sounds was carried across Asia and many miles of motion-picture film were exposed. No other continent contains so many varied human types and customs.

© National Geographic Society Finlay Direct Color Photographs by Maynard Owen Williams

M. GEORGES-MARIE HAARDT INSPECTING MONGOL FINERY FOR AN ETHNOGRAPHIC EXHIBITION IN PARIS

Many antique and modern treasures obtained in the Near East and China are now on exhibit in Paris. A similar collection, made during "The Black Journey" across Africa, deeply influenced French styles.

MONGOL MILLINERY FOR A NEW YEAR'S RECEPTION BY THE PANTSHEN LAMA AT A CAMP IN MONGOLIA

Visitors came from far and wide and the variety of colors and costumes was remarkable. In Mongolia, the peacock-feather hat-plume and the "Mandarin button," former features of official dress in China, are still worn.

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MONGOL VISITORS SITTING OUTSIDE THE CEREMONIAL YURT OF PRINCE HSI SSU NYING IN INNER MONGOLIA

Although the camp of this Mongol chief has several brick buildings, receptions are held in a huge felt yurt with a wooden vestibule. In Marco Polo's day, yurts were sometimes mounted on oxcarts having axles 20 feet long.



Finlay Direct Color Photograph by Maynard Owen Williams

THE MURDEROUS YELLOW RIVER IN A PLEASANT MOOD

Known as "China's Sorrow," the Hwang Ho has repeatedly spread death and destruction far across north China. But in winter the yellow sediment, or loess, which colors and names both the Yellow River and the Yellow Sea, is absent. The river, reduced to a third its summer volume, then wears a mask of beauty and peace. Note the huge water wheel on the left.

© National Geographic Society

TURKI GIRLS OF MURTUK BESIDE A LOAD OF COAL

In Sinkiang there are many groups of Turki-speaking Moslems, sometimes called "Sarts" or "Chantos," but the exact racial make-up is complex and obscure.

Finlay Direct Color Photographs by Maynard Owen Williams

A CHINESE LAD BEFORE A SUCHOW TEMPLE GATEWAY

Time has softened the tones of this fire-breathing dragon, and a cordial welcome is extended by the priests of the old temples inside the west wall of Suchow (see also Color Plate XI).

 Finlay Direct Color Photograph by Maynard Owen Williams

A MONGOL VISITOR OUTSIDE THE PERMANENT GUEST-HOUSE OF PRINCE HSI SHU NYING'S DESERT CAMP

Hundreds of Mongols from far across the wintry desert assembled here for the Chinese New Year on February 6, 1932, to be received by the Pantshen Lama, spiritual peer of the Dalai Lama of Lhasa (see also Color Plate XIII).

run on ahead, and as guest of Petro, in one of the trucks, I had one of the greatest experiences of the trip.

We lunched at Sharamuren, a lama settlement so glittering white that I dubbed it "Spotless Town" (see page 558), and rolled rapidly on across the plateau toward Kalgan.

### FIREWORKS FLASH IN THE SKY

Just after dark, fireworks blazed in the sky and Petro realized that we were approaching the "camp" of his friend, Prince Hsi Ssu Nying.

When we stopped, scores of old-world figures, too bright and colorful to believe, stepped into the glare of our headlights. The Russian chauffeur of the Pantshen Lama, back from a considerable auto tour, came alongside to chat. Then the attractive young secretary returned to announce that we were invited to be the guests of the Prince, to attend the solemn ceremonies of the Chinese New Year's, and to take any pictures we could.

Here was a chance of a lifetime, for although the Prince could not force his guests to pose for us, and in the crush and movement of the reception and religious ceremonies formal posing was impossible, the fact that we were his guests assured us every courtesy (see, also, page 559 and Color Plates XIII and XVI).

In bitter cold, there was a meat offering to the rising sun, and most of the day gaily dressed Mongols passed in and out of the compound reserved for the Pantshen Lama, whom the Mongols consider the peer of the Dalai Lama at Lhasa.

As long as the light lasted we waited here, photographing this unusual spectacle at a "camp" composed of scores of felt yurts and several permanent buildings. A whole row of motorcars was lined up in the farmyard, together with scores of shaggy Mongol ponies. Then we set out across the rolling desert, toward the tiny cluster of yurts, in one of which lives the mother of Kong Bo.

I have no desire to glorify this companion whom Petro picked up in Mongolia and with whom he shared so many Central Asian adventures, but he was certainly one of the most gentlemanly and cultured among us. He was better dressed and cleaner than most of us. One day Petro said to me:

"Williams, some day you will get all shaved up again, with a fine bath, a clean shirt, and a tuxedo, and it will surprise you to discover that you are still a gentleman."

To us desert life, without adequate rest or comfort, was a strange interlude. To Kong Bo it was the normal existence. And, being so, he lived it like a gentleman. To see him welcomed by his mother and attractive niece was to have great respect for this nomad of the Mongolian plateau.

He would have died for Petro, or perhaps for any of us. But he was nobody's servant. No task was too humble for him, and he would come back across the desert in his gay Mongol boots with a bushel of dry camel dung carried in the skirts of his purple robe. But no man gave him orders.

Quizzical, patient, silent, but ever polite, Kong Bo was a man to know. The Princess Palta taunted him for using Chinese expressions and counting time according to the years of the Chinese Republic instead of the Mongol method, by lunar or zodiacal signs, but to me Kong Bo was nearly perfect. The story this princely nomad might tell of this first motor expedition across Asia would be a racy human document.

### THE PENNANT OF THREE EXPEDITIONS WINS A NEW STAR

At high noon, on February 12, 1932, the Citroën-Haardt Trans-Asiatic Expedition swung into the grounds of the French Legation in Peiping, was welcomed by the élite of many nations, and came into well-earned glory. In 314½ days Georges-Marie Haardt and Louis Audouin-Dubreuil, partners in the first motor conquest of the Sahara and the first motor crossing of Africa, had blazed a 7,370-mile trail across Asia, the first overland exploration from the Mediterranean to the Yellow Sea since the days of Marco Polo.

Peiping, with its high honors and social pleasures, after months of barbaric living, is already a memory—a memory in which, despite the lavish praise and cordiality of the foreign colony, the friendly reception by the Chinese, our real hosts, remains the dominant and satisfying note.

When our men of the China Group reached Nankow Pass, after an absence of ten months, they could hardly believe their eyes. The Chinese had so improved the route up which they had struggled that the

Photograph by Maynard Owen Williams

RUBBER BANDS THAT SPANNED A CONTINENT

Outside the endless rubber band, one-third of which was in contact with the earth, are 60 metal plates, each with a thick rubber tread. Secured to the inner edges by steel bolts are 120 rubber teeth, which fit the cogs of the driving wheel. In the middle are 60 *talons* to prevent the band from slipping sideways.

descent from the Great Wall was almost a pleasure ride. The door to the Gobi lies open as never before.

It is a matter of years rather than decades before many existing motor trails will be joined into larger systems. But what comes later cannot rob my companions of their epoch-making achievement.

Others will follow their lead. Even the mountain heart of Asia, which stopped our east-bound cars, may ultimately be crossed; but the credit for the present success goes to these gallant Frenchmen, whose struggles it was my privilege to observe and to share. To live with these men, to see them in action, to help record their triumph, was the greatest adventure of my life. They were a grand group.

YEARS OF WORK ACCOMPLISHED IN A SINGLE TRIP

Were they to do it again, these French friends of mine would make many changes. But what Haardt and his men might have done doesn't matter. They set themselves a hard and hitherto-unaccomplished task, and they did it. Not since the Middle Ages had the journey been made in its entirety. Soon it may become a commonplace. The Haardt party rehlazed old trails along which world life once richly flowed and may soon flow again.

We were to have returned across southern Asia, a hurried and relatively featureless trip through well-known lands and along main-traveled roads. The death of our great leader, Georges-Marie Haardt, from pneumonia, at Hong Kong, March 16, 1932, halted the Expedition at a time when French Indo-China had arranged a thousand-mile triumph in his honor.

Without any fixed base, dependent upon the supplies which fifty tons of men and motors must have if they are to advance, the Citroën-Haardt Trans-Asiatic Expedition moved on to complete success.

The findings of the explorer gain value not from the fact that they are entirely new, but that they are more widely shared. In one year, thanks to Citroën and Haardt, a considerable body of scientists traversed

Photograph by Maynard Owen Williams

ONE OF NINGSIA'S TWO MAIN STREETS FROM THE CENTRAL TOWER

Even in winter a Chinese city enacts much of its life in the open. The larger stores, with their bright banners designed for those looking along a narrow street rather than across a broad one, are protected by windows and doors; but cobblers, ropemakers, street restaurants, second-hand dealers, and women quilting clothing or bedding with cotton use the street as their workshop. Looking from Kuomintang headquarters toward the east gate.

Photograph by Maynard Owen Williams

BRIGHT STANDARDS IN A ROCOCO TEMPLE NEAR NINGSIA

In some parts of China a shrine is neglected except on religious holidays, when standards are carried in procession by hired or interested participants wearing rich costumes. Here the fresh brightness of the temple standards had been preserved by paper sacks (see text, page 564).

our largest continent, across which civilizations have been scattered in bewildering confusion, and studied many diverse conditions within the limits of a single trip.

Other explorers have studied specific localities with more thoroughness, but the progress of this motor caravan across Asia was headline news because it was new. What its ultimate results may be no man can say.

The sands which blocked the Romans were no barrier to the Arab. The camel may advance where a motor becomes a derelict on the sea of sand.

Had we traversed Asia by horse or camel, it would have been a great exploit; but carrying thirty men and fifty tons of equipment by motor caravan from Beyrouth to Peiping was an achievement as modern and as important as any of recent times.

Thousands of friends stuck Tricolor flags in sketch maps of Asia, as they followed our progress toward that Central Asian rendezvous and out to Peiping and Tientsin. Millions more must have turned their eyes to Asia because it was the scene of this significant adventure, brought to success through Western ingenuity and Oriental coöperation—an inevitable combination in this interdependent world.

Our aim was not to court adventures, but friendships. And when, amid the treasures of the Forbidden City, the Chinese custodian presented the congratulations and best wishes of the Governor of Sinkiang, it was like the accolade of a medieval monarch reaching us across vast stretches of space and time. We had bridged the centuries as well as a continent. Our personalities as well as our motors had won "face."

# PHOTOGRAPHING THE ECLIPSE OF 1932 FROM THE AIR

## From Five Miles Above the Earth's Surface, the National Geographic Society-Army Air Corps Survey Obtains Successful Photographs of the Moon's Shadow

By Capt. Albert W. Stevens

*U. S. Army Air Corps*

Author of "Exploring the Valley of the Amazon in a Hydroplane," "Flying the 'Hump' of the Andes," etc., in the National Geographic Magazine

IT HAS been said that many astronomers are too busy during eclipses of the sun to watch the phenomenon itself. Without particularly trying to establish such a record myself, I find that I have flown in three eclipses, have photographed the corona, and yet have never gazed directly upon it!

My first eclipse flight, on September 10, 1923, was over Ensenada, Mexico, where Capt. John Macready and I flew on an unusually foggy and cloudy day. Skimming along the coastline a hundred feet above the water, we got to Ensenada and bored our way up through the clouds to 19,000 feet, the limit of our airplane's performance. There were still more clouds above us—a full mile or more of them! We never saw the sun once, and as we flew back and forth in the clouds, the eclipse took place.

Never to be forgotten was the ominous twilight, like that before a great storm, and then the sudden, swift rush of utter darkness. For three minutes we were "night flying" in the daytime. It was so black that we could not see any of the instruments in the cockpit, and long, writhing flames of blue came from the exhausts of the engine, exactly as at night. Through the clouds, at all points of the compass, was a golden glow indicating the sunlighted world outside the shadows. Then, as suddenly as it came, the shadow was gone.

### When the Moon Shadow Cone Barely Scratched the Earth's Surface

The next experience was at Honey Lake, California, where a very unusual eclipse took place April 28, 1930. The moon was just farther enough away in its orbit so that its accompanying cone of darkness barely touched the earth's surface, resulting in a shadow only half a mile in diameter. The shadow traveled at a speed of more than half a mile per second, and there was only the briefest instant of totality of eclipse.

I made no attempt whatever to watch for the corona, but concentrated on looking for the shadow, though I had little idea how it would appear, or what it would look like. As the minutes slowly passed and the sun's crescent became narrower and narrower, Lieut. John D. Corkille turned the plane into the plotted path of the eclipse, in the direction of San Francisco. We were at an elevation of nearly 20,000 feet and two miles below us a sea of white clouds extended in every direction to the horizon.

### Plane Races Swift Moon Shadow

We were in a world of our own, a very white world, with a billowy floor of fluffy cotton, a great dome of dark-blue sky overhead, and in this sky a dazzling crescent that steadily narrowed to a thin line of light. In contrast to the previous eclipse, we were not in the clouds but above them, and the reflected sunlight from the upper surface gave good visibility, particularly in the distance.

As I looked in the direction of San Francisco, I was startled to observe that a mountain peak had thrust its summit through the cloud layers. Its rounded, dark-blue summit was clearly visible to the southwest, forty or fifty miles away. Dumbly I revolved facts in my mind: "Clouds over two miles high; mountain through clouds; no such mountain near by." Suddenly I shouted, "Johnny, that's the moon's shadow! Let's get busy!"

With a maneuver that had been practiced day after day for this particular occasion, Corkille swung the plane into

Photograph © Harris and Ewing

PRESIDENT HOOVER VIEWS THE ECLIPSE

Ideal weather prevailed in Washington for observing the phenomenon, which attained 89 per cent totality in the Capital. Everybody in Washington, from the Chief Executive, Cabinet officers, and diplomats to school children, centered their interest for a while on Nature's spectacular display. With the President, in the White House grounds, is Secretary Lawrence Richey.

Photograph from Wide World Photos

A STUDY IN INTEREST AND EXPRESSIONS

Throngs gathered on the observation platform of the Empire State, world's tallest building, to see the partial eclipse visible in New York City. Interest in the remarkable spectacle which the eclipse afforded caused a general exodus of workers from New York's myriad office buildings. Many found points of vantage on the roofs, while other throngs gazed skyward from the streets.

Photograph by B. A. Stewart

ASSEMBLING APPARATUS FOR THEIR "FLYING LABORATORY"

Captain Stevens (right) and Lieutenant McAllister are inspecting three cameras (see text, opposite page), with which more than 40 exposures were made during the eclipse. In the foreground is the instrument used for recording the intensity of cosmic rays, which the lofty flight, away from terrestrial interferences, afforded exceptional opportunity to study.

exactly the position required for photographs, but at the same time gave me a backward glance, just the briefest turn of his head. I could guess what he was thinking, for I was thinking the same thing myself. There was the moon's shadow, supposed to be moving at a speed greater than the fastest rifle bullet, and yet it was motionless! We gazed at it, fascinated. Since we were in the path of totality, it was moving directly at us. It had no apparent side motion; it simply increased in size during a minute of time. From a clear-cut, dark-blue ellipse, it became on the cloud tops a more irregular figure of softened outline and color, and as it swept over us it seemed like a great grayish fog.

As quickly as one could turn one's head, it had come and gone!

Corkille spun the plane around, and the automatic motion-picture sound camera, recording radio time signals from the Navy Yard at San Francisco, caught the shadow again as it passed to the northeast.

Astronomers would like particularly to photograph the track of the moon's shadow on the ground, to see how close the actual path comes to the predicted path.

Our effort was wasted, for the camera and film had been arranged for photography of the shadow against the earth, not against the clouds, and the image was barely visible on projection because of lack of contrast. However, we were now better prepared for another eclipse, for we knew that the shadow was easily visible for a minute and a half before totality, and that it must be photographed from a fairly great distance if we were to record its shape.

### NATIONAL GEOGRAPHIC SOCIETY AND ARMY AIR CORPS ARRANGE AERIAL SURVEY

Needless to say, I wanted to be at the eclipse of 1932, whether I flew or drove or walked! Never, probably, was there such advance publicity for an eclipse. Hundreds of scientists were to transport elabo-

rate equipment to Maine and New Hampshire and Canada; hundreds of thousands of people were to view totality; millions were to observe the partial eclipse. There were grandstand seats for the greatest spectacle on earth, along a belt hundreds of miles long and a hundred miles wide, for the mere taking, provided you got there! Time of performance was scheduled to the very second, and no power on earth could modify or change matters in the faintest degree!

### PHYSICAL AND MECHANICAL DIFFICULTIES IN HIGH FLYING

Questions naturally arose whether flights incident to the eclipse possessed any military value whatever. They did prove to be of value, for we learned things about propeller settings and carburetor adjustments that gave us more altitude, about oxygen equipment that gave us stronger pipe lines, about cameras that gave us better insulation against low temperatures.

The National Geographic Society already had a ground party in the field to study various phases of the eclipse, and was interested in obtaining air views, especially of the moon's shadow. The shadow in this instance was so long, some 100 miles, that it could have been photographed only from high altitude. Also, if clouds obscured the eclipse for ground observers, an airplane might still get views of other phases of the phenomenon. Thus The Society generously coöperated with the Army Air Corps in arranging an aërial photographic survey.

In practice flights at Wright Field we reached 28,200 feet with the airplane. These practice flights are matters that are seldom written about, but they are as necessary to the success of an expedition as weeks of training are to a football squad.

Day after day, pilot and observer go to elevations where consciousness can be retained only by the use of oxygen, and where the temperature is that of arctic winter. Frequently it happens that the ground temperature is 80° or 90°, Fahrenheit, above zero, while at the highest ceiling of the airplane the temperature is 30° below zero.

On still higher photographic flights that have been made in the past at Dayton, a temperature of 72° below zero has been encountered. This is the cold that exists, summer and winter, at elevations of 39,000 feet above the earth's surface.

The chief difficulty of high flying is due to the physical limitations of the respiratory system. Oxygen, even if available as pure gas in ample quantity, is not absorbed properly by the blood under the conditions of lowered atmospheric pressure. Eventually, then, with increased altitude fainting will occur, and if the altitude be maintained death will ensue.

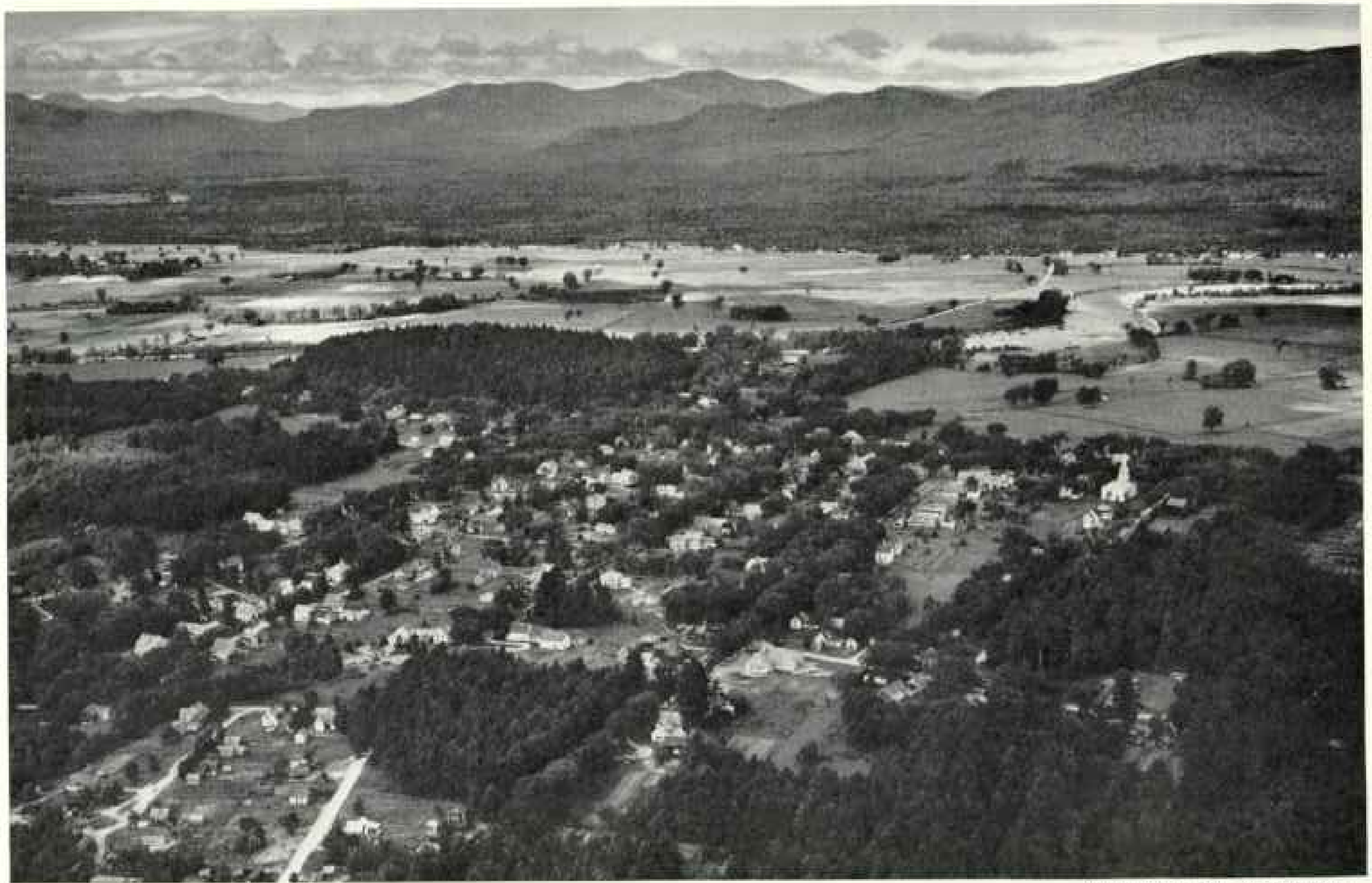
As for the airplane, it does not mind altitude at all, except that it becomes clumsy and awkward to handle when it is climbed at steep angles. Mechanically, it is the engine that puts a stop to higher and higher flights, because its horsepower drops off with increasing thinness of air. A device known as a supercharger is fitted to engines that are used for high flights. This supercharger is a blower that sucks in the thin air from outside the cowling and compresses it in a pipe that leads to the carburetor. It is thus possible to maintain sea-level pressure of air to the engine, even though the airplane is several miles up. Eventually with increased altitude the supercharger fails to keep up sea-level pressure, and then the engine power gradually falls off, so that a point comes where the airplane will go no higher.

### FLYERS REHEARSE BEFORE THE ECLIPSE

The flights preliminary to the eclipse were as much for testing the engine and propeller setting as for testing the cameras, for we hoped to make pictures at a much higher altitude than ever before at an eclipse.

We had three cameras: one of long focal length for photographing the corona; one of medium focal length fitted with a "G," or orange-colored, ray filter; one of short focal length. The last two were for photographing the shadow. The shutters had been changed from their normal speed of 1/150th of a second to as slow as a seventh of a second. It was fortunate that this was done, for it proved during the eclipse that a very fast lens, without a filter and with the fastest film procurable, gave surprisingly little image of white clouds that were in the center of the path of the moon's shadow (see, also, opposite page).

Finally the mechanical arrangements were completed and it was felt that the apparatus as a whole was in good working



Photograph by Capt. A. W. Stevens

WHEN A QUIET MAINE TOWN BECAME ROME FOR A DAY

All roads led to Fryeburg, Maine; also, to the Conways, New Hampshire, and other points in the center of the band of totality. Cow pastures became observatories, cottages became inns for a night, farm hands were "bell hops." Remote railroads with infrequent trains ran fleets of excursions; dirt roads which knew no traffic police were patrolled by State troops; refreshment stands and smoked-glass venders flecked every major highway. No other modern spectacle of Nature ever attracted the crowds that thronged to view the total eclipse of August 31, 1932.

Photograph by Capt. A. W. Stevens

THE ECLIPSE MADE CLOUDS RESEMBLE A BOILING SEA

During partial phases of the eclipse the crescent shafts of the sun's light seemed to give different tone and quality to many terrestrial scenes. The top surface of this plain of clouds was 11,000 feet above the southwest coast of Maine.

order. But the human element was still to be considered, for even with oxygen one can do strange things at altitude. One can fail to do things in the proper order or fail to do them at all. Consequently, each flight involved a rehearsal. Some of the flights were made during the days immediately preceding the eclipse, at the exact time in the afternoon when it was scheduled to appear and over its predicted path.

As a further precaution, I wrote directions to myself, in very large letters, on strips of tape attached to apparatus, reminding myself to do this or do that. It is often a conscious effort to do anything at high altitude. One must even devote a certain amount of thinking to the matter of breathing, for it will not do to forget to draw in oxygen at very regular intervals. Written directions, in large letters, eliminate need for reasoning and reduce nerve strain by an appreciable amount. Time seems to pass swiftly at altitude; five minutes pass as quickly as one at low altitude. Yet we were to make dozens of photographs in less than a hundred seconds of actual time.

In the thin upper air sounds do not carry well, nor do the vocal cords always behave; a shout mysteriously becomes a squawk, a yelp, or a shriek. So Lieut. C. D. McAllister and I agreed that two yips, grunts, or bellows was the signal to turn right, and that more double yips meant more turning to the right. Similarly, one yip meant turn left. He was to follow over the predicted path of the eclipse until I could see the shadow coming, and then turn directly into the sun, which would be somewhat south of west, and at the same time strain his ears for my vocal offerings.

From one side of the airplane it was expected that I could get most of the shadow on one negative, but because of one wing and part of the tail, it would be necessary to swing the airplane to right and left at the proper times to get the remainder of the shadow. Please remember that we had bitten off a rather large order: to photograph a spectacle approximately 100 miles across and 50 miles deep, moving at a speed greater than that of an army rifle bullet.

Our base was at the Boston Airport, and preceding the eclipse we went to North Conway, New Hampshire, to confer there with A. H. Bumstead, Chief of the National Geographic Society's Cartographic Department, with Charles Martin, Chief of The Society's Photographic Laboratories, and with J. R. Hildebrand, Chief of School Service. They were established on Mount Black Cap, with cameras, clocks, barometers, and other apparatus for their ground observations.

## PHOTOGRAPHING THE GREAT SPECTACLE FROM FIVE MILES UP

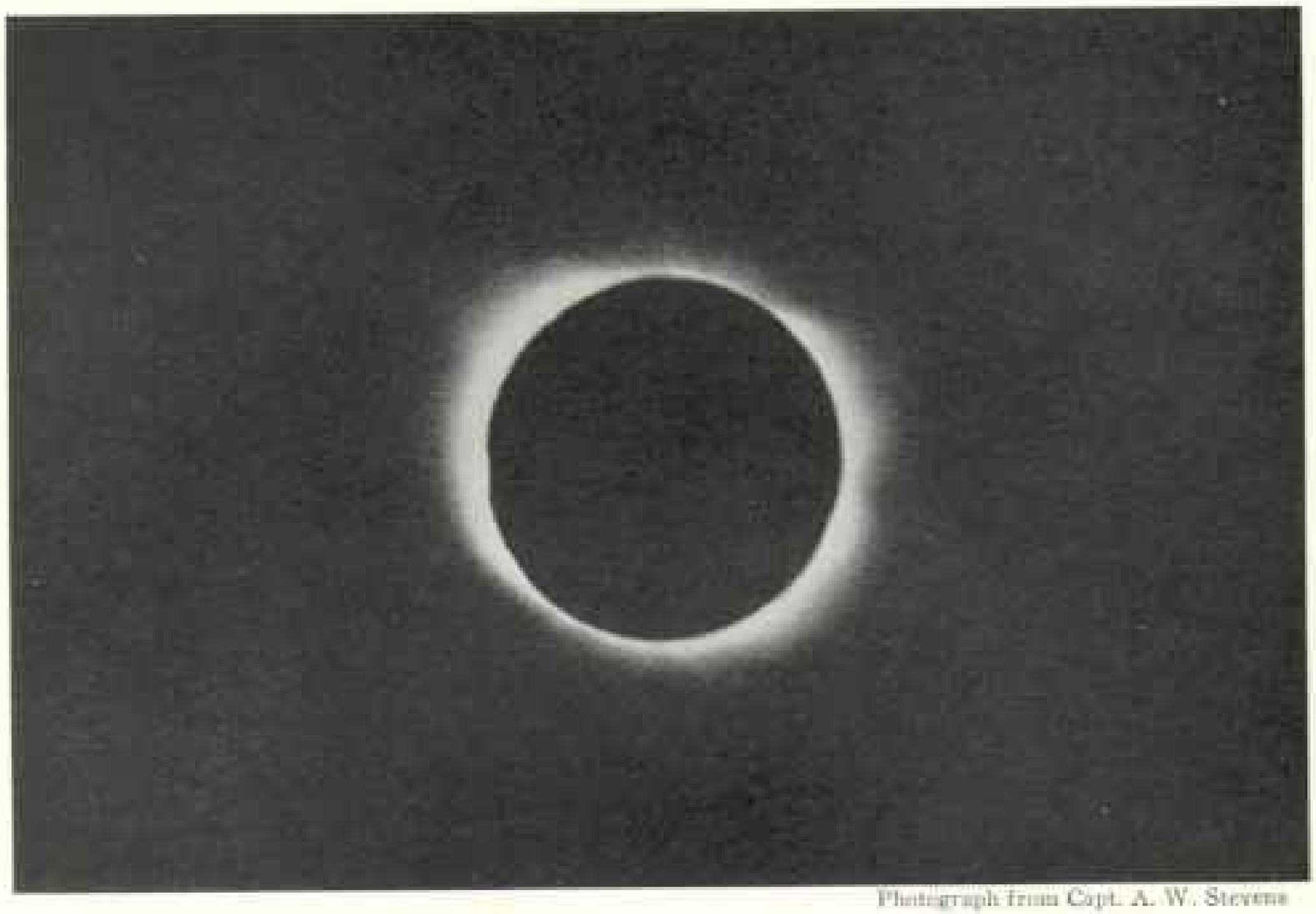
The hours preceding the eclipse found us, then, at 27,000 feet, over the southwestern coast of Maine. Flying for twenty minutes parallel to the path, we took readings repeatedly with an apparatus containing a Wulf-type electroscope, built by Dr. Lewis Mott-Smith, for the measurement of intensity of cosmic rays (see page 584).

As soon as I could make out the shadow of the moon, Lieutenant McAllister swung the airplane into the sun at right angles to the path of the shadow. With the 12-inch camera, carrying an orange-colored "G" filter, I included the shadow in the finder as it came on and on, and photographed its broad face, which extended across the clouds that spread northward and westward three miles below (pages 590-1).

Then I seized the 8-inch camera and had the airplane swung to the left. A few shots and then the plane was pointed to the right, and then back to the sun.

The huge shadow, 100 miles across, swept toward us like a great bluish-gray wave, and the silvery white cloud tops became light gray, then dark gray, then almost black. I dropped the wide-angle camera to the floor, hastily pressed the charging switch for the electroscope, grasped the long-focus camera and thrust it through the open window beside my comrade's head. Through this window came a blast of air that seemed to be from the North Pole itself. My oxygen tube snaked itself around the camera and I lost a few precious seconds dislodging it lest my supply be cut off. Under the bitter blast my ungloved hands became numb and my eyes blurred momentarily.

From previous flights at mid-afternoon I knew that while the pilot could get in a position to look at the sun, there was no way for me to hold the camera and at the same time see the sun, unless we lost time swinging the airplane. Therefore I had mounted a 45-degree mirror on the camera



Photograph from Capt. A. W. Stevens

THE CORONA LIGHT WHICH NOBODY SEES

The dramatic feature of this corona photograph is the fact that it was successfully made with the use of the infra-red filter, which shuts out all light visible to the human eye. The light halo here shown exists, yet is beyond human vision.

in such a position that I could train sights along the camera cone on the sun. In this mirror, then, I got my only sight of the corona, but even as viewed in a mirror it was the most magnificent natural spectacle that may be seen (see above and p. 600).

The very instant that the last point of sunlight disappeared, the corona flashed out from around the black disk of the moon, exactly as if at the sudden snapping of a switch. Although I had been present at other eclipses, I was awed by the situation. Miles underneath us was the somber blackness of the great shadow. Inside the airplane the darkness was not so intense, and was furthermore relieved by two half-voltage lamps that had been wired temporarily for the occasion; to the northwest a bright planet could be plainly seen. High in the west was the corona, like a great jewel glowing with a bluish-white light.

MC ALLISTER DOES SOME QUICK THINKING IN AN EMERGENCY

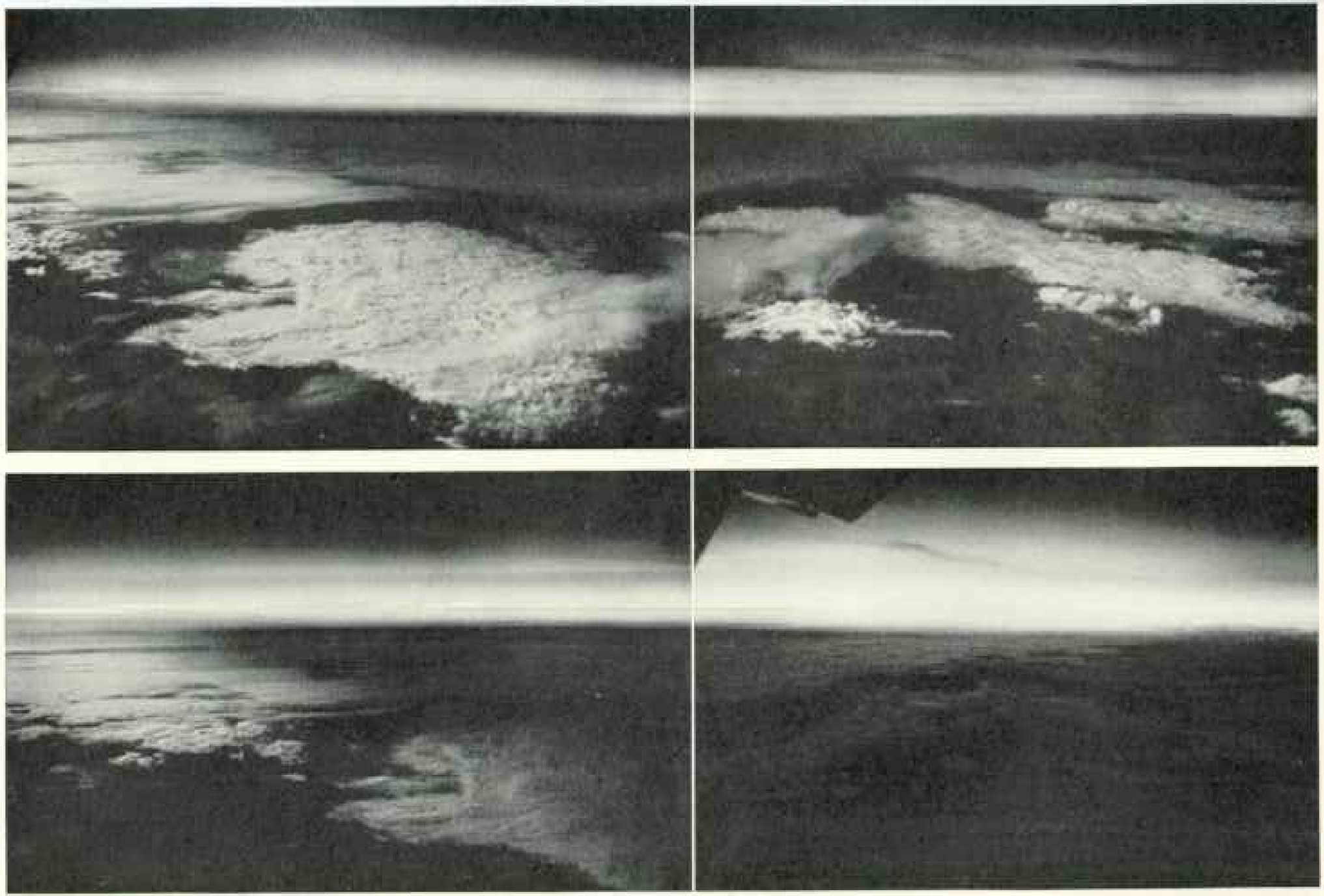
I had made only a few exposures when something happened that stopped all my activities. The plane seemed to slide backward, then it dived and drunkenly rose again, shivering and quivering. For one mad instant I thought that we were caught in some terrible disturbance in some way caused by the eclipse. The explanation, however, was simple: The loop on Lieutenant McAllister's left glove had caught in the throttle lever, and he had inadvertently lost his engine power. At high altitude, one is hanging on one's propeller, and when the engine quits things happen fast.

Like a good pilot, McAllister dived the plane before it could start to spin, got his glove loose, and thrust the throttle open again. Then he beat his gloved hand against his head to indicate that he had "pulled a boner." Of course, I did not understand at the instant about the throttle accident. All I knew was that McAllister was beating against his head as if he were in agony. I looked at his nearer cheek. Ordinarily a rich russet color from many hours in the open air, it was now, to my horrified gaze, more of a purple color and was swollen, because of the altitude, beyond the confines of his leather helmet.


Photograph by Capt. A. W. Stevens

THE AERIAL CAMERA REVEALS THE EFFECTS OF THE MOON'S SHADOW

The fleecy clouds in the foreground, which are 11,000 feet above the earth, are typical of the appearance of those in the darker area, just beyond, only a moment before this photograph was taken. In the sunshine area, in the distance, are more clouds of the same kind. The dark part of the sky along the upper edge of the photograph marks the near rim of the shadow in the upper air. Captain Stevens was flying at about 27,000 feet when he took this picture.



THE FIRST MOON SHADOW PANORAMA PHOTOGRAPHED FROM FIVE MILES ABOVE THE EARTH

The upper panorama consists of two untouched photographs, which together reveal a vast expanse of the huge oval shadow of approximately 100 by 55 miles which the moon cast in the path of totality. The shadow in both photographs is cast upon layers of identical clouds two miles above the earth. Above the light-colored clouds in the foreground is the darkened sky. On the far side of the shadow the sky is illumined by the unobstructed rays of the sun. The lower panorama shows the same area when the giant racing shadow is beneath the plane. The sun again is shining on clouds to the right of this panorama, now beyond the far edge of the shadow. Edges of the shadow (to the left) fade from darkness to light over a band from 3 to 5 miles in width. The pictures in each panorama were taken in quick succession by Captain Stevens.

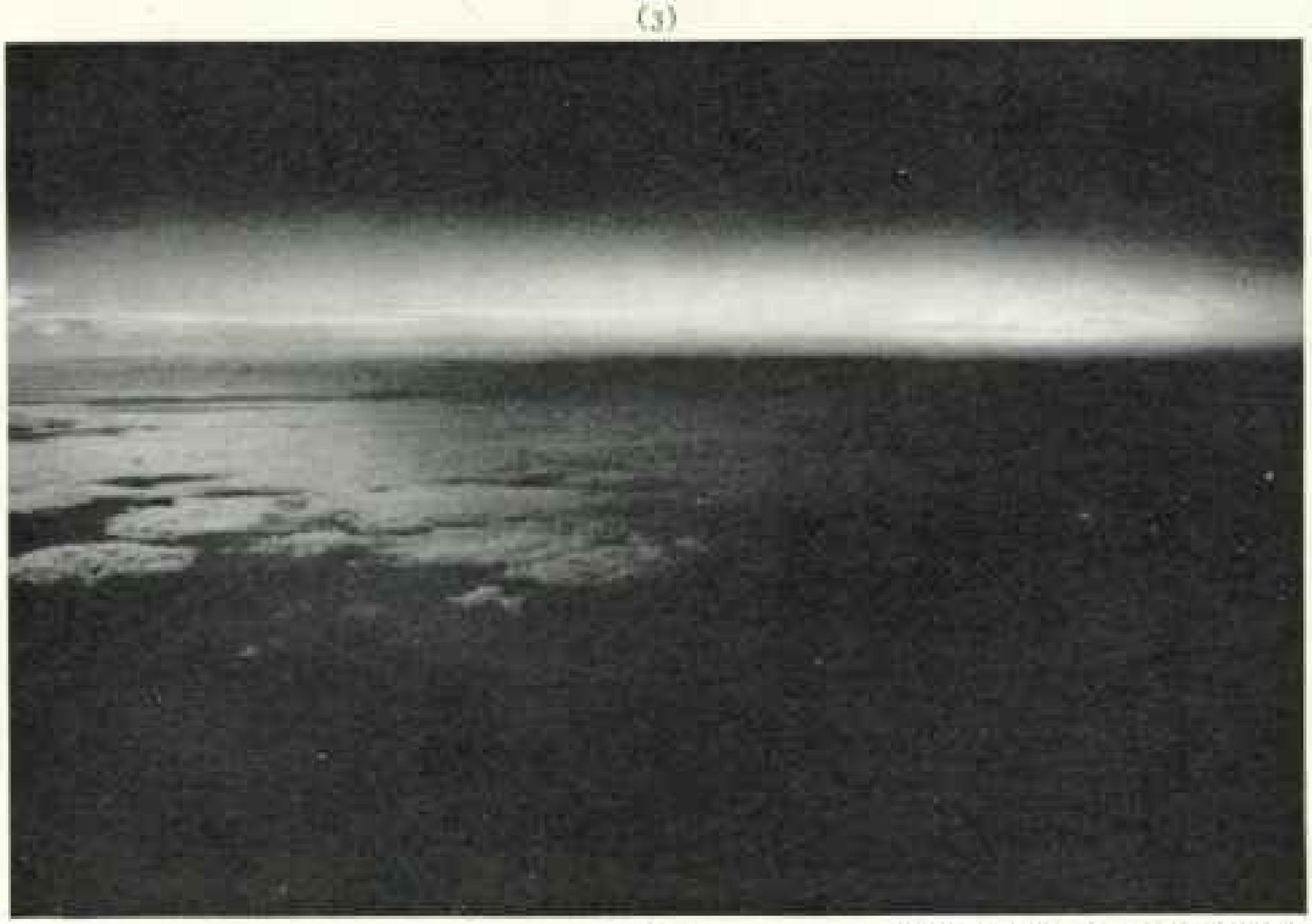
(1)

(2) Photographs by Capt. A. W. Stevens

LIKE A MAMMOTH BLACK PALL, COMES THE ONRUSHING SHADOW

The remarkable series of four numbered photographs on this and the page opposite are the first ever taken of a total eclipse from more than five miles above the surface of the earth. Even from that altitude the complete shadow could not be included in a single exposure. The western side of the huge oval shadow is shown in 5-second intervals of its advance, the center of the shadow being at the right edge of each of the four photographs. The large white cloud in the foreground grows gray, then dark, as the shadow races toward the plane, until in the fourth picture it is practically invisible.

(3)



(4)

Photographs by Capt. A. W. Stevens

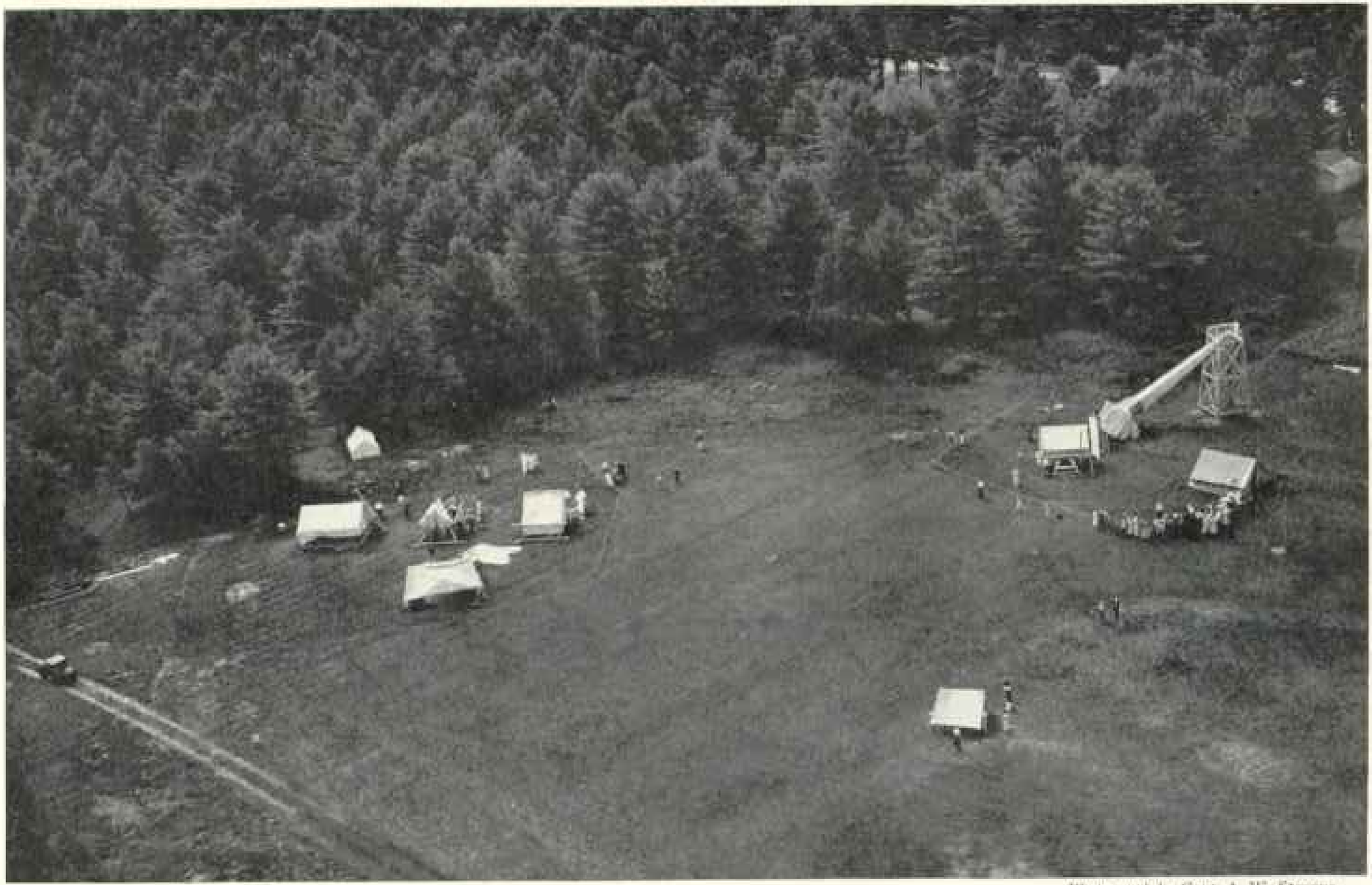
THE MIGHTY SHADOW ENVELOPS THE RACING PLANE

Haze and thin clouds of the sky above have caught the crapelike shadow, yet beyond the shadow, some 60 miles from the plane, the sun is shining and its light is seen above on the distant horizon. To the left, in each photograph, the sun still is shining on an almost unbroken expanse of clouds. One reason the light band does not extend higher is because the upper, far-distant atmosphere does not reflect so much light. The distant, illuminated atmosphere had a saffron color, adding to the weird, eerie quality of the strange skyscape. The airplane wing appears in the upper left-hand corner of several photographs.

Photograph by Capt. A. W. Stevens

A FINAL GLIMPSE OF THE MOON SHADOW AS IT PASSES OUT TO SEA

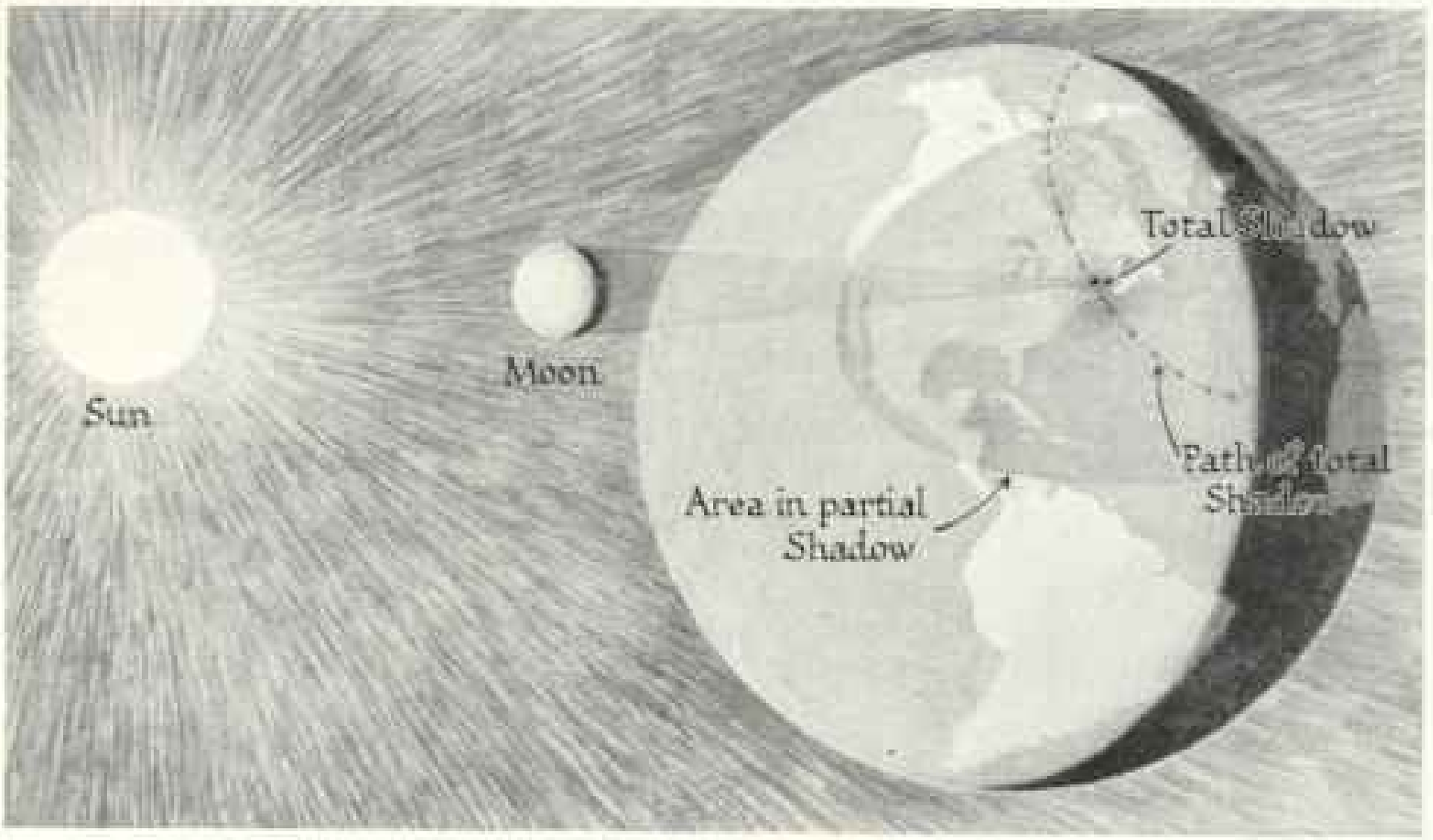
To obtain these photographs the plane flew at 27,000 feet, inland and over the coast of Maine. The irregular black line on the horizon denotes the position of the shadow receding to the southeast.



Photograph by Capt. A. W. Stevens

WHEN SCIENTISTS TOOK TO NEW ENGLAND PASTURES

This aërial view shows the Lick Observatory Station, to the left, and the University of Michigan Expedition Camp, with its huge camera, like a giant caterpillar rearing its head from the field. These "tourist-camp observatories," like many others, have valuable instruments of great delicacy; so they are roped off to keep out casual spectators. Railways halted trains to avoid jarring apparatus during the eclipse observation period. Near this site, at Fryeburg, Maine, was the Georgetown College Eclipse Expedition Observatory. The National Geographic Society's ground station was located just across the New Hampshire border, on Mount Black Cap, while Capt. A. W. Stevens was flying more than five miles above areas of both States to obtain his remarkable aërial views.




Drawn by A. H. Bumstead

THE EARTH AT THE MOMENT WHEN THE ECLIPSE WAS TOTAL IN MAINE

The sun and moon (not drawn to scale) are added to the drawing to explain how the partial and total shadows are formed. To draw the sun and moon in their correct sizes and distances on the scale that the earth is shown would require that this page be extended half a mile to the left, where a circle 24.4 feet in diameter would represent the sun. The moon would be shown by a circle three-fourths of an inch in diameter and at a distance from the earth of six and three-fourths feet.

"Oh, oh," thought I, "the pilot is about to pass out!" Only a week before we had seen one of our men become unconscious at 25,000 feet, even with oxygen, and remain unconscious for ten minutes, until the plane was brought down to a much lower altitude, where he came to. So I had visions of having to climb upon McAllister's prostrate form and bring the airplane down until he came to, if ever! But I had misjudged him, for I heard him swearing softly, and knew that something must have happened to the equipment and not to him.

At this time the most remarkable sight, except the corona itself, was the horizon, beyond the shadow, to the northwest. The far edge of the shadow was defined by a narrow band of a saffron color and was distinctly seen to be curved. The air between seemed to be of an indigo color. Under the airplane, through openings in the clouds, the earth's surface, five miles below, could be dimly seen.

With the very first point of light from the sun itself the corona instantly disappeared. The point became a thin line, the line a narrow crescent, and then daylight seemed to be with us once more. From the other side of the plane, the shadow passed out to where it was less marked, against the darker background of the ocean, although it could be traced in its movement by the disappearance of white cloud caps in the far distance. The ninety-odd-second eclipse of 1932 was a matter of history.

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# OBSERVING A TOTAL ECLIPSE OF THE SUN

## Dimming Solar Light for a Few Seconds Entails Years of Work for Science and Attracts Throngs to "Nature's Most Magnificent Spectacle"

By Paul A. McNally, S. J., Ph. D.

*Director, Georgetown College Observatory*

NOT in recent times has an eclipse of the sun awakened a more general public interest than did the total solar eclipse of August 31, 1932. Occurring during the vacation season and to be seen to best advantage in a famous resort region, it was featured far and wide as an added attraction of the picturesque districts through which it would pass. Few who had passed fifty years of age could hope to see another total solar eclipse in the United States, and the newspapers, especially in the East, with their interesting drawings, pictures, and accounts, made the eclipse worth seeing for persons of all ages.

Late August found groups from far corners of the world making their way toward the vantage grounds in Canada and New England, fearful, yet hopeful, that some kind disposition of weather would bless the spot they chose, so that they might stand beneath a cloudless sky and enjoy Nature's most magnificent spectacle. Judged from a weather average of more than eleven years, the chances were not very great that anyone would see the totality. This factor of uncertainty, however, instead of quenching, seemed to fan the flame of enthusiasm to greater heights.

Suddenly the meeting of Sun and Moon became a great National Occasion and people from all walks of life made ready to join their fellows in doing homage to Nature's beauteous showing in the sky. Whatever the contributing causes, and there were many, the fact remains that the recent total solar eclipse stands quite unique as a phenomenon of Nature awakening an enthusiastic interest in a vast multitude of people.

### CAUSES OF THE PHENOMENON

While the causes of the popular enthusiasm may be difficult to determine, the causes of the phenomenon itself can readily be understood. When a dark object is brought into the neighborhood of a source of light, it will cast a shadow, and if there be a surface of some sort properly placed to catch the shadow, the size and shape of the shadow can be studied.

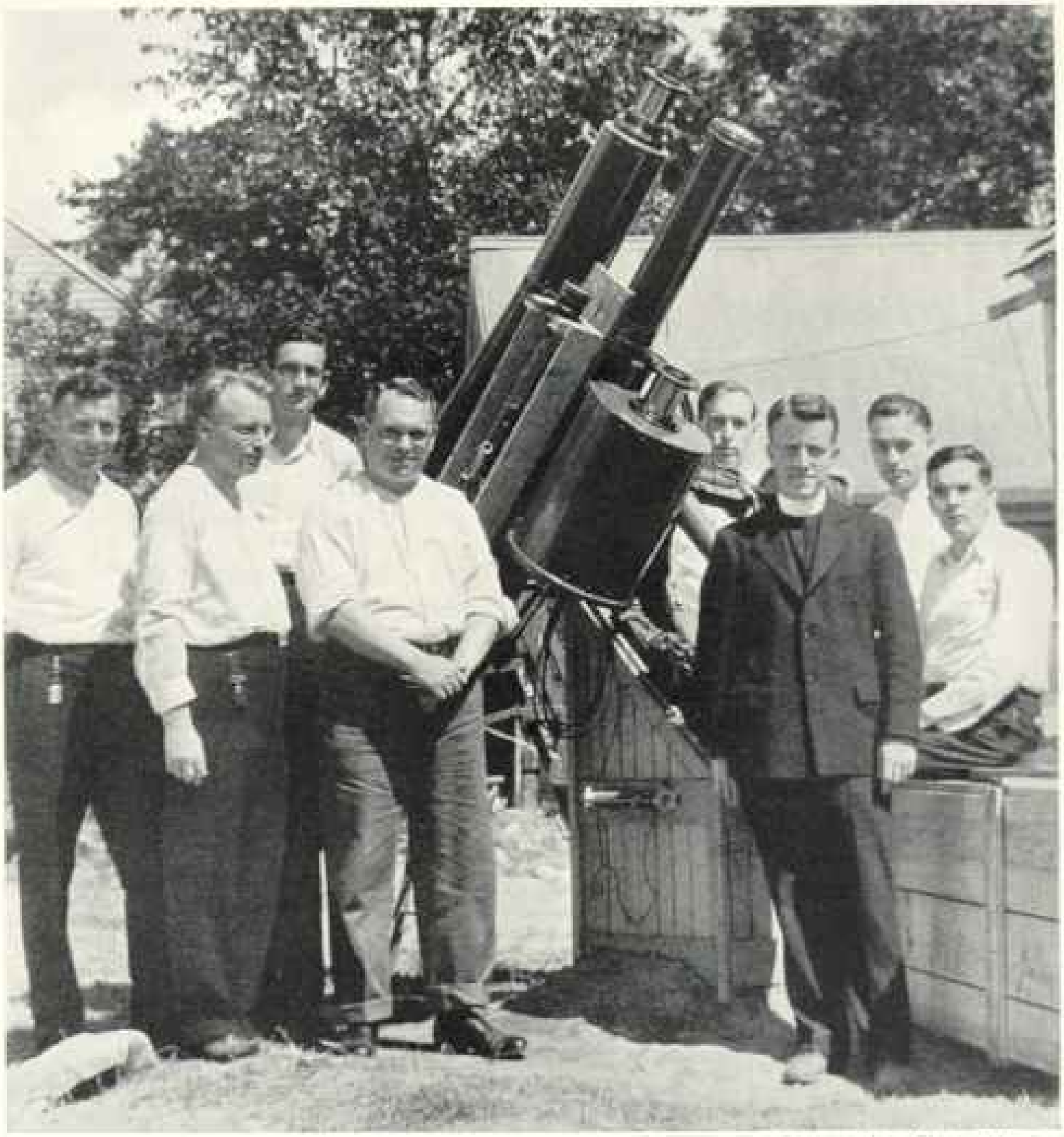
This is exactly what we have in the solar system. The sun is the earth's great source of light, and the planets and their satellites are all dark objects casting shadows in the direction away from the sun. As the members of the solar system are all approximately spherical in shape, the shadows cast are long cones stretching through space along the line joining the center of the sun and the center of the planet or satellite.

### ECLIPSES VARY IN TIME, PLACE, AND DURATION

Were it possible to visit at will the neighborhood of the various members of the solar system, the spectacle of an eclipse could be seen again and again, as each planet and satellite is constantly casting its long conical shadow out through space. That we do not see these shadows is due entirely to the fact that in most cases there is no surface on which they are cast. The earth is in such a position that it comes, at fairly regular intervals, into the shadow cast by the moon, and then we have a solar eclipse (see, also, page 596).

It is clear, then, that the first necessary element for a solar eclipse on the earth is that the three bodies—sun, moon, and earth—should be in the same straight line. However, this condition is sometimes present and yet no total eclipse is seen, because, the moon at the time being too far from the earth, the long shadow cone does not quite reach the earth and the edges of the sun can be seen all around the moon. This kind of eclipse is called annular or ring-shaped.

Relative to the earth, the shadow of the moon where it touches the earth is small, averaging about 80 miles in width; so that the portion of the earth from which a particular eclipse may be seen is restricted.



Photograph by Charles Martin

AN ASTRONOMIC BATTERY TRAINED UPON THE SKY AND A GROUP OF SCIENTIFIC MARKSMEN

Dr. Paul A. McNally stands to the right of an array of astrographic cameras on an equatorial mounting, driven by a motor timed exactly to keep the instruments constantly pointed toward the eclipse sun. This group comprises the Georgetown College Eclipse Expedition at Fryeburg, Maine. To the right is the edge of a shed which housed the photographic darkroom and radio equipment for recording time signals.

Beyond the narrow confines of the shadow-path, the sun will be seen to be partially covered by the moon. This constitutes a partial eclipse. The recent eclipse of August 31 was partial throughout the United States and Canada, but total only in the narrow path running in a southeasterly direction through Canada and the northeastern part of the United States.

Much variety is found in eclipses. Of principal interest to the general reader is the variation in time, place, and duration. If the sun, earth, and moon were all moving in circular paths in the same plane and at uniform speeds, then our eclipses would all take place at regular intervals and be visible as total or partial in fixed localities. Actually, the path of the earth around the

sun and of the moon around the earth are ellipses, not in the same plane; hence the relative distances of the three bodies are constantly changing. This influences the length of the shadow of the moon and also its direction with reference to the earth.

Added to this is the fact that the moon is drawn away from a regular elliptical course about the earth by the attraction of the sun and of all the planets of the solar system, the force of the attraction depending upon the size and distance of the attracting body. A number of other factors of lesser moment, but still very real in their effects, contribute to the waywardness of the moon; so that an exact determination of the path of the moon is one of the most complicated problems known to the astronomer.

Though truly remarkable progress has been made in calculating the constantly varying positions of the moon, an element of uncertainty still remains, and the predicted time, place, and duration may be in error by an appreciable amount. This amount, though only a small fraction of a mile in distance and a few seconds or less in time, becomes a very serious matter if the earth at the time of eclipse is near the vertex of the shadow-cone, for then the period of totality will be very short and confined to a small area on the earth.

In such a case an observer a few hundred yards from the exact central line would miss entirely the spectacle of a total eclipse. It was to avoid just such a mishap that the Lick Observatory Expedition of 1930 set up three observing stations—one on the computed central line of totality, one about a third of a mile north of it, and a third an equal distance to the south. The average eclipse, however, with a duration of about three minutes, presents a wide band of totality, and the slight errors of prediction in time, place, or duration can have no serious effect upon the observation of the total phase of the eclipse.

Many years before 1932 the path of the eclipse of August 31 had been computed with fair accuracy. With improved positions of the moon, determined from observations made within a few months of the eclipse time, the path of the eclipse was computed with a very high degree of accuracy, and the various eclipse parties were able to select their sites and arrange their programs with a certainty of a few hundred yards and an exactness of a few seconds of time.

To the professional astronomer an eclipse, though not a new thing, has always a special interest. This interest has increased rapidly in recent years with the growth of astrophysics, a science that has helped so much in furthering human knowledge of the general make-up of the universe.

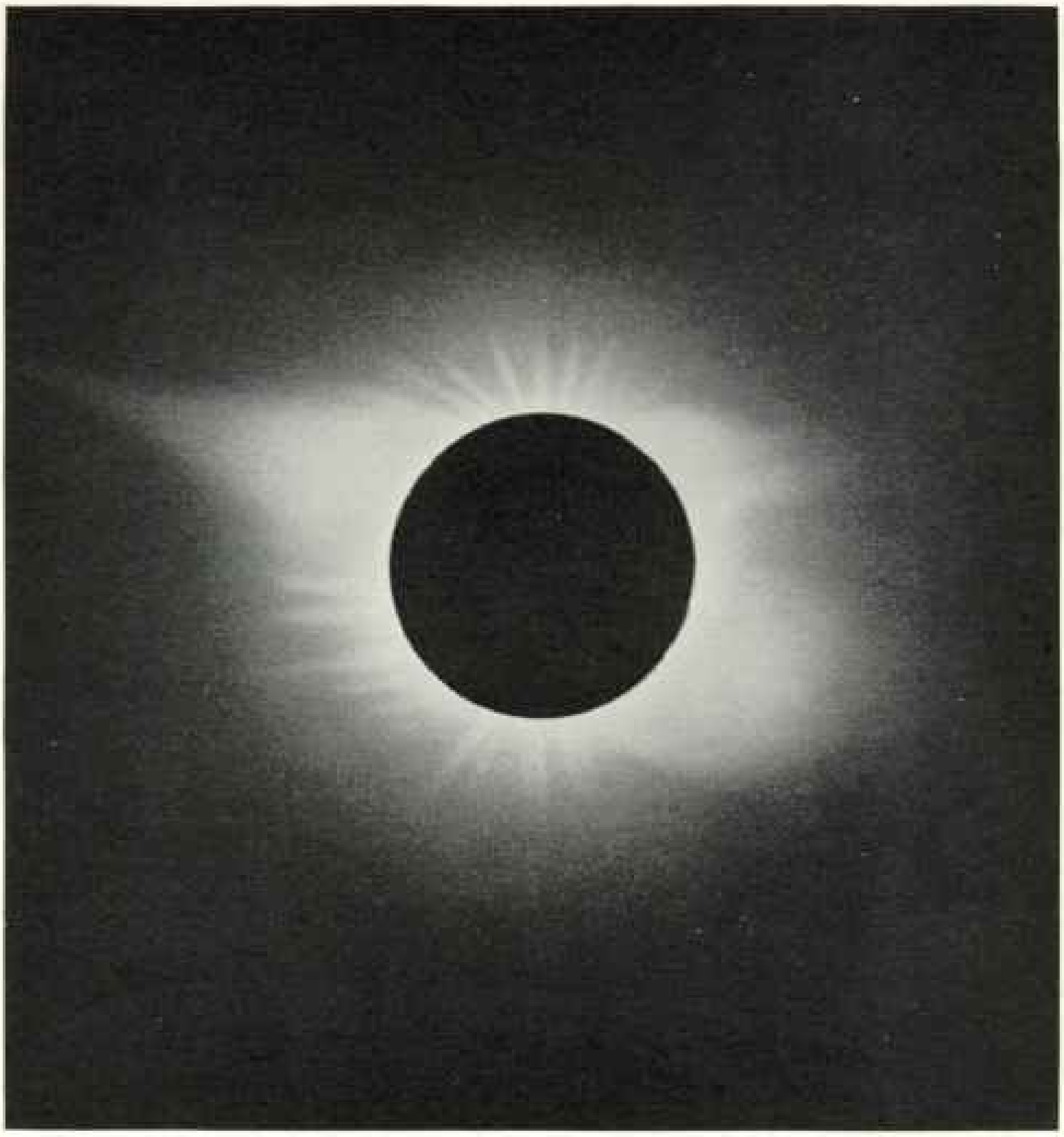
### VALUE OF THE SPECTROSCOPE

Before the development of the spectroscope and its application to the study of the stars, the astronomer's interest in an eclipse was mainly concerned with determination of the time of the phenomenon, from which the relative positions of the sun and moon could be deduced and a more accurate system of prediction for future eclipses formulated; or with the form of the corona, which varies with each eclipse. When, however, the spectrograph made possible the analysis of light, placing in the astronomer's hand a magic instrument that allowed him to reach forth into the depths of space and study the composition of the great heavenly bodies—their heat, their movements—then indeed was opened a new era in astronomy; and again, in a new and greater sense, astronomy merited the name of Queen of Sciences.

As recently as the late nineteenth century, the known universe was tiny in comparison with what it is to-day. The number of stars was roughly estimated as several billion, and the distance of the most remote object was considered to be about 15,000 light years (a light year being the distance light travels in a year while going at a speed of approximately 186,000 miles a second).*

To-day objects more than 100,000,000 light years away are known, and there seems no reason for supposing that we have yet reached the outer limits of the universe. The number of stars is now known to be many billions—so many, indeed, that any estimate is only an approximation. The sun is the nearest of the stars, a specimen body for the astronomer's examination. From our knowledge of the

* See, also, "Exploring the Glories of the Firmament" and "Interviewing the Stars," by Dr. William Joseph Showalter, in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1919, and January, 1925, respectively.



Photograph by Dr. Paul A. McNally

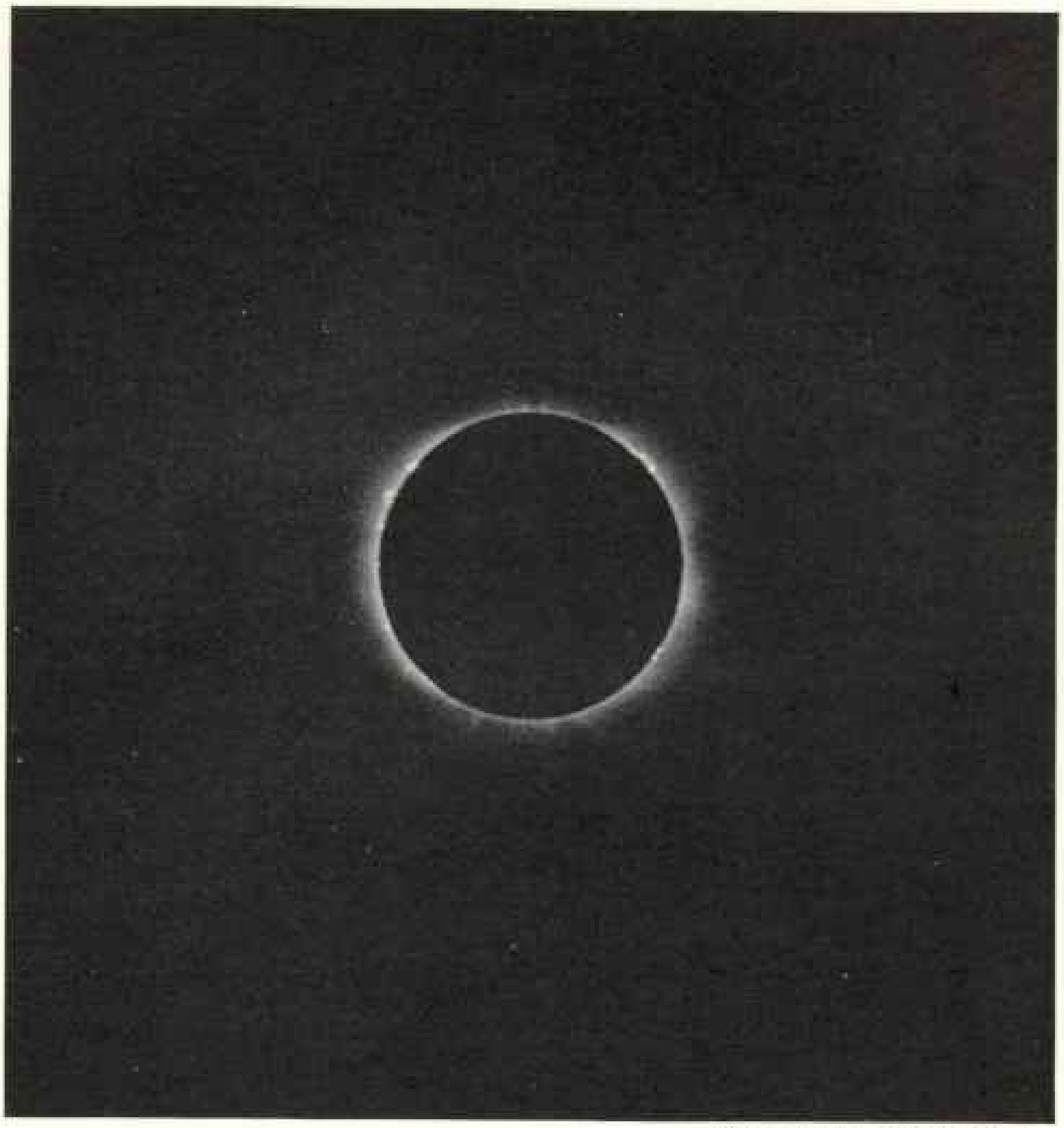
THE HALO OF "NATURE'S MOST MAGNIFICENT SPECTACLE"

This remarkable photograph shows the vast extent of coronal light. Astronomers previously have noted that the shape of the corona is dependent upon the period of the cycle of sun spots. Although the time of the 1932 eclipse is a minimum sun-spot period, the photograph records an unusual extent of coronal light. The spirelike pinnacle piercing the sky to the left reaches approximately 1,200,000 miles from the surface of the sun (see, also, text, page 603).

sun many conclusions may be drawn as to the nature of other stars and of the universe in general.

Certain aspects of the sun can be studied only during a total eclipse. These include observations of the reversing layer, chromosphere, and corona by means of the spectrograph; measurements of the intensity of the coronal light, and determinations of the heat radiated by the corona.

Also, there are the examination of the extent of light polarization in the outer regions of the sun; accurate determinations of the relative positions of the sun and the moon, and direct photographs of the eclipsed sun and the surrounding sky and brighter stars in the neighborhood, which furnish data for testing Einstein's general relativity theory (see, also, illustration, page 602).



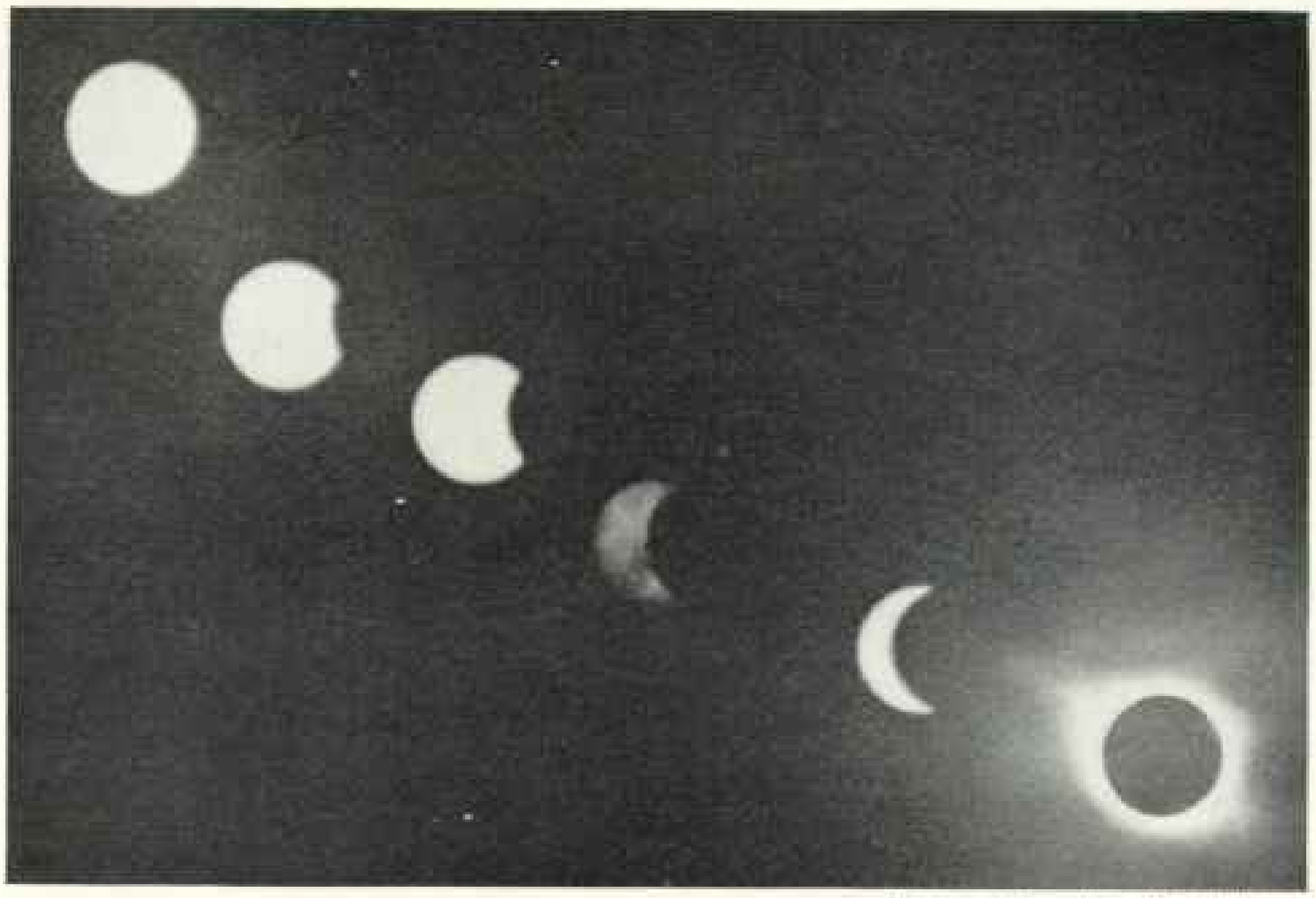
Photograph by Dr. Paul A. McNally

HUGE PROMINENCES, LIKE CARBUNCLES, PUNCTURE THE CORONA

These conspicuously red prominences, apparently on the edge, once were thought appendages of the moon, but are now known to be vast flames of incandescent hydrogen, rising to enormous heights of thousands of miles. They often change their shape during the brief period of totality (see text, pages 603, 604). The exposure was timed briefly to reveal these protuberances, thus eliminating the outer and dimmer area of the corona.

These are only a few of the problems that depend for their solution upon a total solar eclipse, but the list is sufficiently long to indicate how extremely important to the astronomer are the few minutes during which the sun is hidden by the eclipsing moon. With so many avenues of investigation open before them, the astronomers are busy, months before the general public knows that there is to be a solar eclipse, planning the experiments they will perform and setting in order the complicated instruments necessary for the observations that must be taken. Nothing can be left to chance, the time is truly golden, and not even a fractional part is to be lost.

Let us suppose that the preliminary preparations have been completed, and that the party of scientists with all their equipment has arrived at the eclipse site. It takes a month or more from the first determination of the north-south line until



Photograph from Wide World Photos

THE MAJESTIC PROGRESS OF THE ECLIPSE

This series of photographs was taken at the Northwestern University Observation Station at Fryeburg, Maine, showing stages of the eclipse from the unobscured sun to totality. In the fourth exposure from the left clouds have dimmed the crescent sun. The curve of the sun's path is so wide that these pictures should lie along a practically straight line. Their unevenness was caused by a movement of the camera between the times of exposure.

the instruments are in their places and accurately adjusted for the work of the eclipse.

### STAGE REHEARSAL FOR SCIENTISTS

When all is ready, about a week before eclipse day, the rehearsals are begun and each day and often several times a day the members of the party go through their various assignments, while some one, who has been given the task of keeping the time, announces the second counts, so that all the party may hear.

The nervous tension is heightened as the day comes nearer and nearer. Each movement of a hand is estimated, each possibility of error considered and eliminated. The pessimists of the party see in each fleecy cloud that passes an evil portent of bad weather for eclipse time; the optimists are sure the heavens will be clear; but all go about their work with great diligence, so that nothing may be overlooked that could improve or impair perfect coördination at the time of the eclipse.

It is eclipse day at last. Along a stretch of more than 300 miles in Canada and New England the various eclipse parties make the few final adjustments and are ready for the dramatic "Go!" of the starter. The photographic plates are all in their places, the driving clocks that keep the instruments always pointed exactly at the sun are running, and a certain hush of expectancy grips everyone as the predicted time of first contact is at hand.

Those who are to observe the exact moment when the moon first touches the edge of the sun are supplied with dark glasses of some kind and stop-watches similar to those used for timing races. The timer announces 2:15 p. m., eastern standard time (the near approach of first contact), and the watchers settle themselves comfortably for recording the exact moment.

How many were successful in this observation during the recent eclipse is not yet known, but those in the neighborhood of Fryeburg, Maine, met only disappointment as great billowy clouds covered the sun

completely just a few seconds before the observation was to be taken. During the seventy minutes between first and second contacts, some of the expeditions took moving pictures of the decreasing crescents of the sun. Others tried for single pictures with long focal length cameras. Most of these efforts by professional astronomers were spoiled because of the white fluffy clouds that filled the sky.

As the moon kept eating into the brilliant sun, the light upon the surrounding landscape grew less intense. For more than half an hour this fading was scarcely noticeable, but then a weird hue, often described as greenish, began creeping ghost fashion over the land. This unusual light effect tends to make one feel very uncomfortable. One astronomer, well seasoned in eclipse work, was heard to remark when talking on this subject: "I have seen a number of eclipses, but I still do not like that period before totality when all the world looks so unreal." He seemed to be echoing Milton's thought:

> "In dim eclipse disastrous twilight sheds
> On half the nations—and with fear of change
> Perplexes monarchs."

### DRAMATIC MOMENTS PRECEDE TOTALITY

Suddenly the timekeeper's warning startled those watching the melting crescent of the sun. "Five minutes before totality, all take your places!" In silence each one moved to his allotted task. These men, who have gone through so many dress rehearsals in the last week or more, were ready now for the last crucial performance of their various movements, and there must not be a slip.

In one of the camps during the recent eclipse an astronomer who had spent weeks perfecting every particular of his elaborate apparatus, at the five-minute warning reached for the switch that controlled the motor drive of his equatorial, pushed it into place, and had the unpleasant experience of seeing nothing happen. The motor was dead! The fact that he had thought of all emergencies saved his eclipse work from utter failure. Close at hand was a box of fuses. With the speed of despair, a faulty fuse was found and replaced, and the sound of a spinning motor became suddenly, for him, the sweetest sound on earth.

"Two minutes before totality!" The tension grew inversely as the time. "One minute!" The timekeeper's voice became tense. Those standing expectantly beside the instruments saw the much-talked-of shadow bands dancing their fantastic movements on the white shirts of those near at hand. "Fifty seconds!" . . . "Forty seconds!" . . . "Ten seconds!" His voice rang with the regularity of a human metronome. One of each party was designated to observe the disappearance of the last vestige of the sun. At his announcement — "Go!" — the timekeeper began the count, "One . . . two . . . three," and the period of totality was on.

### THE WONDROUS SPECTACLE OF THE ECLIPSE

A scattering of lacelike clouds covered the eclipsed sun as seen from Fryeburg, but the astronomers had no time to notice that; and, like machines geared for precision, their hands flew back and forth, drawing a slide, changing a holder, turning a handle, opening a lens shutter, each movement governed by the steady beat of the human metronome's count: "Twenty-one . . . twenty-two . . . twenty-three . . ."

While the astronomers bent diligently to their tasks, the thousands of spectators feasted themselves on the incomparably wondrous spectacle in the sky. Each second it seemed to take on new splendor. Out toward the east, like the lofty spire of some great Gothic cathedral, stretched one portion of the corona, more than 1,200,000 miles in height, brilliant at its base, marked with the fiery redness of several prominences, and shading to a blurry softness of palest blue toward the vertex. On the western side a more abundant spread of coronal light was visible, in shape not unlike two great masses of pulled-out cotton, that seemed to change in color with each succeeding moment. To north and south spears of light shot out to immense distances (see pages 600, 601).

Too soon the sun seemed to become conscious of the many million "eye power" fastened upon the beauties of his usually hidden splendors, and to have brushed the veiling moon from before his face. The faithful timekeepers were announcing the first counts in the nineties, when suddenly, with the speed of lightning, appeared the western edge of the sun flooding the countryside with white brilliance. Totality was over!

Photograph by Joseph Reese

THE FEAT THAT THOUSANDS ATTEMPTED

This photograph is one of many "accidental pictures," as the astronomers call them, of the eclipse. It was obtained near Dayton, Ohio, with a hand Kodak loaded with standard film, and the location of the photographer and the clouds within range of his lens give a beautiful setting for the crescent. The clouds chanced to be of sufficient thickness to act as a natural filter and prevent halation of the film.

For an instant the startling spectacle of the diamond ring appeared, the shadow bands returned to dance on cottage walls, and on large white sheets that some had spread to catch their fanciful movements. The strange darkness lifted, clouds veiled the growing crescents of the sun, people spoke again, newspaper men ran to and fro, gathering the first reports of the astronomers.

Everywhere was confusion. The eclipse of 1932 was over. Highways and byways were crowded with the returning sky gazers. At the observation sites only the astronomers remained, already busy with the task of packing instruments and tearing down the structures that had served their purpose so well.

ESTIMATING THE RESULTS OF THE ECLIPSE

At this date it is far too early even to hazard a guess about the contribution the recent eclipse has made to the vast fund of scientific knowledge. Few not intimately associated with the work realize the days and months and years necessary for the evaluation of the material gathered during the ninety-odd seconds of total eclipse.

In 1843, during one of the first eclipses to be seriously observed by modern scientists, the prominences were considered to be protuberances on the moon, and the corona an atmospheric effect. After the eclipse of July 28, 1851, although many prominent astronomers were then convinced that the prominences belonged to the sun, Faye still considered them appendages of the moon. The question was not definitely settled until the eclipse of July 18, 1860, when De la Rue and Father Secchi secured photographs of the prominences. At that time also the corona was definitely allotted to the sun.

Although the prominences were observed to be conspicuously red and it had been suggested from researches of Kirchhoff that they were therefore probably composed of hydrogen, it was not until the eclipse of August 18, 1868, that Janssen

observed the spectrum of prominences and identified the red line as that of hydrogen.

The famous green line in the spectrum of the corona was first observed at the eclipse of August 7, 1869. Although some progress has been made in the accurate determination of the wave length of this line, the nature of its substance remains a mystery.

It was only a few months ago that some of the spectroscopic results secured at the 1905 eclipse were evaluated and published by the Lick Observatory.

It is startling to realize what substantial progress has been made, although astronomers are restricted to an average total eclipse observation time of only one minute a year.

On a single spectogram there may be as many as a thousand lines to be measured. When this labor is completed, the investigation is only begun, as each line is a special study in itself; its contour, height, and density, each offers separate problems.

To the lay evaluator, the direct photographs are much more interesting; and yet these, too, require long hours of examination for the scientists. Each coronal streamer must be measured for its density and its length. If the pictures have been taken with different screens that allow light of only one color to register on the plates, then each plate must be compared with the others and the relative amount of the different kinds of light determined.

These are only a few of the problems the returning astronomer must face and solve.

Photograph courtesy Mrs. George Harrington

SPLOTCHES OF LIGHT FROM A "CRESCENT SUN"

Explaining this photograph, taken on Long Island, Mrs. Harrington writes: "A large tree in the yard intervened between the eclipse and the wall. The interstices, or small openings between the leaves, acted as in the case of a camera lens, and projected images of the eclipse on the wall. As the bright part of the sun from our location was exposed only in the lower limb, the photograph images are inverted."

Here and there throughout the world, hidden away in observatories, men and women are now reading the scientific meaning of the eclipse records; and their findings will be added to the rich store of knowledge that man through the ages has amassed. For, after all, it was no puny task that man accomplished when he reached forth 93,000,000 miles and probed the secrets of the mighty sun during the ninety-odd seconds that marked the duration of the total solar eclipse of 1932.

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RALPH A. GRAVES

1882–1932

The Board of Trustees and Officers of the National Geographic Society, with profound regret, record the death of Ralph A. Graves, Senior Assistant Editor of the NATIONAL GEOGRAPHIC MAGAZINE. High ability, thorough scholarship, extensive travel, and unswerving devotion marked Mr. Graves's association with your Society's editorial staff since 1916. He contributed important articles to the NATIONAL GEOGRAPHIC MAGAZINE, directed researches which verify and check every statement published in The Magazine, and helped conduct the extensive researches and correspondence which, supplementing field surveys, have gone into the making of The Society's maps, distributed among its membership.

# THE MAID OF FRANCE RIDES BY

## Compiègne, Where Joan of Arc Fought Her Last Battle, Celebrates Her Fifth Centenary

By Inez Buffington Ryan

Author of "The Land of William the Conqueror," in the National Geographic Magazine

"HAVE no other thought than to strike!"

Five centuries ago the voice of an 18-year-old girl rang out in fierce command above the clash and clamor of battle on the River Oise. Joan of Arc, the Maid of France, was trying desperately to rally her retreating men.

"Make haste!" they shouted. "Get back to town, or we are lost!"

Yet still she cried, "Be silent! It rests with you to defeat them. Strike again!"

A dominant figure she was, in shining armor and scarlet *huque*, a surcoat broidered in gold, conspicuous on her plunging horse. Hence enemy English and Burgundians, now strongly reinforced, swarmed thick about the girl commander. Could they capture this French witch?

Overwhelmed by a new onslaught, the smaller French force, dragging Joan with them, fell back to the bridge entrance. Here the crush was tremendous, the French trying to cut their way across, the English and Burgundians crowding in hotly. The commander of the town, anxiously watching from the wall and fearful lest the enemy sweep forward through the Water Gate, raised the drawbridge. So Joan, with those near her fighting in the rear guard, was cut off to her doom.

### DEFEAT, MOCKERY, AND DEATH

In a frenzied onrush the enemy forced the French down the embankment into the meadows and pulled them from their horses. A burly archer fighting with troops allied with Burgundy's seized Joan by the coat and dragged her to the ground. The Witch caught at last! What a prize for Burgundy!

Though it all happened so long ago, on May 23, 1430, Compiègne has never forgotten that day; for Joan fought her last battle for king and country in the meadows just across the river from this old town, 52 miles north of Paris. Now remained for her a year and seven days of imprisonment, sale to the English, mockery, anxiety, mental torture, and finally condemnation and agonizing death by fire.

Compiègne celebrated the fifth centenary of the Maid's arrival and her last day in the field with an elaborate pageant. It evoked, with historical accuracy, the scenes and events, the costumes and arms, of Joan's day. Out of medieval twilight rode Charles VII and his courtiers, the Maid and her comrades at arms, knights and horses in glittering panoply of war—truly a living page of history, a moving, unforgettable spectacle.

### THE MAID RIDES FORTH

As the bell in the old belfry pealed out, the ceremonies began. First the Maid herself rode forth—a proud, erect figure in shining armor. This was all as it should be, for Joan's contemporaries describe her as a handsome, well-built girl, with dark hair cut short like a soldier's. Her face was bright and smiling, her personality gracious; she had no fear of pain, fatigue, or physical risk.

Her armor—we know she was "passionately fond of beautiful armor"—was what she used to call "white" armor, of unbrowned steel highly polished. Her first suit of it had been made the year before in Tours, famous for its armorers, when she went there to equip herself to take the field for the Dauphin. At Tours, too, a Scot made her a banner and a pennant, the one broidered with the King of Heaven holding an orb, the other with the Annunciation, with an angel bearing a lily. From Tours also she sent to another city for a sword bearing five crosses. Could it, historians ask, have belonged to Charles Martel himself—the very one with which "The Hammer," in 732, drove from France another invading enemy?

Joan's horse, in its gorgeous trappings, also reminds us that she was ever a lover of spirited war steeds and liked to have them splendidly caparisoned.

Behind the resplendent figure of the Maid came pages, halberdiers, and her co-

terie of captains, represented by descendants of Joan's 15th-century companions. Some of their garments bear the lilies of France, others the arms of Compiègne.

Advancing to meet her, by torchlight, came another procession of 300 choir boys, two cardinals, parish clergy, and other dignitaries. With them, behind the banners, came the municipal authorities.

Borne between hundreds of lighted tapers came relics in exquisite shrines; and soon, with a burst of color, appeared the craft guilds of five centuries ago, all dressed in appropriate liveries and displaying the banners of their patron saints.

Trumpets flourished and 100,000 spectators cheered as the two cortèges mingled to form a brilliant procession to the vast square in front of the Château of Compiègne. Speakers on the platform erected here retold the touching story of the Maid's capture in the meadows across the river.

Next day, again to the ringing of bells, the fête resumed. A solemn service at old St. Jacques's, where Joan heard mass before she rode forth to her last battle, was attended by representatives of the Government and the diplomatic corps. A repetition of the procession and a tourney of the knights before Charles VII and Joan brought the celebration to a close.

### JOAN'S 3,000-MILE ODYSSEY FOR LIBERTY

M. Courtellemont's natural-color photographs bring the Maid and her times very close to us. To M. Fournier-Sarlovèze, the mayor, the NATIONAL GEOGRAPHIC MAGAZINE is indebted for his cooperation with the photographer in obtaining these superb results.

Compiègne's celebration was, however, only one link in the chain of festivals commemorating the Progress of Joan of Arc from Vaucouleurs to Rouen. In cities and hamlets, at bridges and crossroads associated with her 3,000-mile Odyssey for the liberty of France, tablets and statues were unveiled and pageants staged in memory of the young peasant girl who, while tending her flocks, saw heavenly visions and heard heavenly voices bidding her rescue her Dauphin and country.

At Vaucouleurs her great adventure began. "Go; and let come what may!" said its commander resignedly. So friends here equipped her with a page's suit and a horse, and at last she rode off in great joy to find the Dauphin.

Chinon, Tours, Orléans, Reims—how vivid are their memories! At Chinon she told the Dauphin of her heaven-sent mission; at Tours she equipped for battle; at Orléans she raised the siege; at Reims she saw the Dauphin crowned as rightful King of France.

It was after the coronation that the English, alarmed, determined, with the aid of the Burgundians, to recapture Compiègne, bulwark of Paris. Joan had too few men with whom to oppose them, but she did not waver. "By my staff!" she exclaimed. "We are enough. I will go to my good friends at Compiègne!"

So one May morning she rode in at sunrise. Though she did not know it, her short but ever-memorable period of activity—just about a year and a half—was to end with the setting of the sun.

After her men had rested from their night's ride, Joan decided to make a sortie against the Burgundians encamped directly across the river from the town; the English camp was farther off. Chances of breaking up the Burgundians seemed very good; so, at 5 o'clock that same afternoon, Joan, resplendent in white armor, galloped across the bridge at the head of 500 men. By nightfall she was a prisoner; a year later she died at the stake in Rouen.

But she had lifted France from the bitter despair of a 100-year struggle with foes within and without, and had given it a courage and a unity which it has never lost.

And so Compiègne, like all of France, remembers the Maid, tenderly, reverently. There is a statue to her in the square before the City Hall and a memorial altar in St. Jacques's Church. The Water Gate through which she hastened to her last battle is gone, and of the old bridge only a few arches remain; but the street down which she rode bears her name, and a tablet marks the site of the house where she is believed to have lodged. Across the river is another tablet marking the approximate spot where she was captured.

Compiègne, since that day, has stored up memories of other battles and sieges and bombardments; but it has none more vivid, none more poignant, than that of a May morning, 500 years ago, when a Maid in shining armor came riding up from the south.

"I WILL GO TO MY GOOD FRIENDS AT COMPIÈGNE!"

Galloping to the relief of the beleaguered city on the Oise, the Maid of France rides in at sunrise on May 23, 1430. By nightfall she has fought her last battle for France, and is a prisoner in Burgundian hands. She wears her famous suit of white armor, over which is a rich *huque*, and on the trappings of the horse can be seen part of her armorial bearings.

 Natural Color Photographs by Gervais Courtellemont

ARTISANS AND CRAFTSMEN ASSEMBLE TO CHEER THE MAID

These clothiers, workers in wood, tanners, and painters are members of early 15th-century trade corporations (see also Color Plate III). Their womenfolk wear the hennin, a high, pointed bonnet popular at that time.

"HIGH HATTING" BECAME FASHIONABLE IN MEDIEVAL COMPIÈGNE

Millinery creations of the time took many curious shapes—huge, fat hearts, double horns, crowns, turbans, miters, towers, and others.

 Natural Color Photographs by Gervais Courtellemont

"THE SOLDIERS WILL DO BATTLE AND GOD WILL GIVE THE VICTORY"

So spoke the Maid at Poitiers, at her examination by the learned doctors. These halberdiers wear the coat of arms granted to Compiègne by Philip II (Philip Augustus). At the same time he granted the city's motto, *Regi et regno fidelissima*—"Most faithful to king and realm."

TRADE GUILDS DISPLAY THE BANNER OF A PATRON SAINT

Dressed in their best liveries, and with banners flying and music playing, craftsmen of the Middle Ages marched in gorgeous pageantry on great occasions.

 Natural Color Photographs by Gervais Courtellemont

A COURT GALLANT FINDS THE DAUGHTERS OF COMPIÈGNE MOST FAIR

His hat is a form of the fashionable roundlet. Some of the women in the cart wear the pointed hennin (see also Color Plates I, V, and VI), which was first called "Syrian bonnet," from the belief that Crusaders introduced it from the Near East.



Natural Color Photograph by Gervais Courtellemont

THE BEAUTY, CHIVALRY, AND VALOR OF THE COMPIÈGNE OF 500 YEARS AGO

Princes and courtiers and steel-clad knights, lords and ladies, squires and dames, prelates, archers, and halberdiers, gaily caparisoned steeds—all these evoke a glittering, stirring picture out of the medieval twilight. During the Hundred Years' War between France and England (1337-1453), which the victories and influence of Joan of Arc did so much to hasten to a close, the hunting seat of French kings was besieged and captured several times.



"A POSY FOR YOUR SWEETHEARTS, GOOD MASTERS?"

Natural Color Photographs by Gervais Courtellemont

COMPIÈGNE BELLES SUCH AS JOAN MIGHT HAVE SEEN

A FIFE AND DRUM CORPS SWINGS THROUGH THE STREETS OF COMPIÈGNE

Probably the fifers of Joan's day piped not only martial airs, but also those mournful laments of a peasantry war-ridden for 100 years. And, of course, they would know by heart the simple ditties written in honor of their Maid, the savior of France.

 Natural Color Photographs by Gervais Courtellemont

THE HURDY-GURDY PLAYS SWEET MUSIC FOR THE MAID

It is not the mechanical street piano of to-day, but a stringed instrument. To vibrate the strings, the right hand turns a crank at the end, setting in motion a resined wheel inside the sound box; the left hand depresses the keys on the fingerboard to stop the strings at diatonic intervals. The hurdy-gurdy is a development of the larger instrument known as organistrum.

FUN-MAKERS OF THE MEDIEVAL SCENE

Throughout French history, in days now gay, now somber, the fantastic figure of the professional fool or jester flitted through court, manor, and bishop's house. Strolling clowns and buffoons also performed antics for the populace in the marketplace.

 Natural Color Photographs by Gervais Courtellemont

WEARERS OF THE MOTLEY, THE CAP AND BELLS

The jester's distinctive dress was usually a coat of two or more colors, and hose with each leg a different color. The head-covering bore asses' ears or a cockscomb, and bells hung here and there from the garments. The bauble, or scepter, was tipped with a droll head, or was sometimes attached to an inflated bladder, for sham whippings.

"A DREAM OF DELICIOUS FACES" PEERS FROM THE MISTS OF TIME
From the headdresses flows the gauzy veil much admired 500 years ago.

 Natural Color Photographs by Gervais Courtellemont

A CARTFUL OF MERRYMAKERS BOUND FOR THE MAID'S FESTIVAL

Quite a different vehicle, in quite a different scene, is this from the shabby executioner's cart in which Joan, crowned with the paper miter of infamy, rode to the stake in Rouen, only a year and seven days after she had fought her last battle for France at Compiègne.

# A NEW WORLD TO EXPLORE

## In the Tree-Roof of the British Guiana Forest Flourishes Much Hitherto-Unknown Life

By Maj. R. W. G. Hingston

*Leader of the Oxford University Expedition to British Guiana*

*With Illustrations from Photographs by the Author*

"YET another continent of life remains to be discovered, not upon the earth, but 100 to 200 feet above it, extending over thousands of square miles of South America. At present we know almost nothing about it. Up to now gravitation and tree trunks swarming with terrible ants have kept us at bay, and of the tree-top life we have obtained only unconnected facts and specimens. There awaits a rich harvest for the naturalist who overcomes the obstacles—gravitation, ants, thorns, decayed trunks—and mounts to the summit of the jungle trees."

So wrote Dr. William Beebe, who, though he had made several successful journeys to British Guiana in pursuance of his wide range of biological investigations, had not penetrated the tree-roof to make a detailed study of its wonders.

### VIRGIN BIOLOGICAL GROUND BECKONS

Here, indeed, was a place worth every effort to investigate—a rolling, wind-tossed sea of green extending for several thousand square miles and teeming with a life which was biologically unknown. Lured by its promise, a group of Oxford men under my direction decided to examine an area of forest on the right bank of the Essequibo River.

We equipped ourselves with a variety of climbing apparatus, such as line-shooting machines and rocket-firing guns for propelling ropes over high branches, thousands of feet of cordage for making hauling constructions, pulleys for use in block and tackles, iron spikes for building spike ladders, and wooden scaling ladders capable of extension. Long-range spray pumps were procured for shooting poisons at insect warriors that would obstruct our invasion of their homeland.

The area selected was ideal for our survey; for it was as nearly primeval forest as could be found. Here everything was in an unaltered state, with all the trees in their natural associations, as they had no doubt existed for a thousand years or more.

The forest was composed of tall, straight trees. Some were monsters, with broad buttressed bases which, like pillars, supported the overhead roof. The vast majority, however, were of smaller size, crowded together by thousands, all competing, struggling, jostling with one another in their efforts to get their heads into the tree-roof. Every tree we examined was perfectly straight. Hardly one had a branch until near the canopy, where, at a height of about 70 feet, occurred division into a simple fork.

Bush ropes of every degree of thickness spread about in this thicket of straight poles. Some swung across in pendent loops, or hung down like loose, swinging cordage; others twisted themselves round the great tree trunks in strangling, serpentine coils. Mosses, epiphytes, lichens, and ferns crowded the trunks and high branches in tropical profusion. Overhead the tree tops made a green roof, and the fallen vegetation covered the floor with a thick, soft carpet of mold.

Throughout the forest were glittering lights, bright spots, streaks, and luminous patches, where shafts of sunlight, breaking through the roof, were reflected from the underlying foliage as from a multitude of suspended mirrors. On every side was the richest fertility; and, contrastingly, in the prostrate trunks and rotting leaf mold was equal evidence of death and decay. The silence, the gloom, the stillness, the luxuriance were most impressive.

### TREE TOPS WEAVE A RAGGED ROOF

The oval-shaped heads of the trees came close to one another and interlaced their branches, and creepers and bush ropes linked them together to form a sort of

EIGHTY FEET UP THE IMPROVISED ARMCHAIR ROCKED GENTLY AS A CRADLE

Thanks to the ingenuity of Indian helpers, the problem of comfortable observation posts was solved. An investigator, once he became accustomed to the height, could sit in such a seat and observe life in the tree tops for hours without becoming tired (see text, page 629).

roof, though not such a perfect thatch as books on equatorial forests often lead one to imagine. In places the tree crowns stood out somewhat separately. The sky was by no means completely hidden. Here and there were windows, skylights in the canopy, through which the sunlight streamed lancelike to illuminate the "cellar" floor.

From the ground we could catch only passing glimpses of the life in the foliage. Monkeys would go crashing through it now and then. The larger birds, such as parrots and toucans, might be seen here and there, splashes of color in its shadows. Smaller songsters were evident only by their voices, for in the gloom it was difficult to locate a bird through the mass of foliage. Occasionally, with powerful glasses, one might see through a canopy window a lofty tree covered with blossoms, about which flitted bright butterflies.

Our knowledge of that zone of life was confined to what a gun could bring down from it for museum purposes. Of the intimate lives of its birds and mammals it is fair to say that biologists knew very little; and, so far as its smaller fauna was concerned, its reptiles, insects, arachnids, and other creatures, we were in almost complete ignorance.

It was not difficult to move about in this primeval forest. Secondary growth is somewhat tangled, but the primitive bush is more open and accessible. There was no need to hew a way through it with an ax. What checked progress was usually a fallen tree-trunk or a pile of roots or an impassable swamp. Nor did thorny vegetation cause trouble. There were some palms with spiny trunks or stems, but never such barriers of prickles as are common in less humid forests.

### NEITHER LANDMARK NOR HORIZON

We soon found how easy it was to get lost in the forest. On account of the sameness of the vegetation on every side and the absence of both horizon and landmarks, it was a problem to recover bearings once one became confused. To wander only 50 feet from a trail was dangerous, unless friendly voices were within earshot as a guide.

Some of the great trees were most arresting. There was the stilted tree, or *awasakuli*, whose roots thrust themselves above the ground and incline to form a pyramid supporting on its apex the tall, straight trunk. Another striking kind was the fluted tree, or *yurara*, with the whole length of its trunk marked by deep longitudinal grooves, as if it were composed of a thick bundle of smaller saplings. More abundant, but none the less attractive, was the *mora*, the immense trunk base of which was drawn out into buttresses like the witches' seats of Channel Island chimneys, some of them often following a sinuous course before they reached the ground. The bush ropes were of all varieties and patterns designed to give them strength. Some were twisted with such perfect regularity that one could scarcely tell the difference between them and ropes made by man (see illustration, page 639).

### ESTABLISHING CAMP

In setting up camp in the midst of this prodigal vegetation, the first thing to do was to make a big clearing, for camping over a long period would be almost impossible in the untouched forest. It was absolutely essential to have an open space that would let in the air and light. The clearing of about 2,000 square yards necessitated felling hundreds of trees (page 623).

In this clearing we spread tarpaulin shelters, attaching them to poles and forked sticks. We had separate shelters for sleeping, eating, cooking, working; for laboratory, equipment, and stores. It was our business to be as comfortable as circumstances permitted, for we were not out for adventure and excitement. Our objective was concentrated scientific observation, the maximum of work in the minimum of time; and accident or misadventure would have been the penalty of bad organization.

The camp established, we cut trails in all directions to give easy access to the forest fastnesses. It is not easy to move silently enough in uncut forest to avoid disturbing the wild creatures that dwell within it; but even a narrow trail solves this problem and enables one to see many different animals, birds, reptiles, and insects which pass along or across the track. We made perhaps 12 miles of trail in all directions around the site of our camp, including a number of main pathways about 12 feet broad, excellent places both for observation and collecting, and far more fruitful than the uncut bush. Clearings of about 1,000 square yards in area were added

THE EXPEDITION PERSONNEL MADE A BOATLOAD

Fortunately for the comfort and safety of the scientists, the Essequibo is a placid river and affords an easily navigable waterway to the area in which their camp was cleared.

AT BARTICA THE EXPLORERS LOADED EQUIPMENT INTO OPEN BOATS

Supplies of the desired sorts were available in this frontier village, 45 miles from the mouth of the Essequibo (see, also, page 622).

HUNDREDS OF TREES FELL BEFORE THE ARAWAKS' AXES

Rude platforms had to be built to lift the choppers above the buttressed bases of the forest giants they attacked. Often the wood was too hard for spikes to be driven into it.

ONE BOTANIST SPECIALIZED IN SMALL TYPES OF FLORA

Fungi, lichens, and ferns occupied his attention. And what a plant-lover's paradise he found to explore!

BARTICA SERVED AS A BASE OF OPERATIONS

This frontier village, at the junction of the Essequibo, Mazaruni, and Cuyuni rivers, is also the point of departure from which prospectors go into the interior of Guiana to search for gold and diamonds.

CLIFFLIKE, A FOREST WALL SHUTS IN THE ESSEQUIBO RIVER

CAMP HAD LITERALLY TO BE HEWN OUT OF THE FOREST

Only 2,000 square yards of clearing; yet hundreds of trees had to be felled to let light and air into the small space (see text, page 619). Tarpaulin roofs afforded shelter from direct downpours of rain, but nothing could shut out the dampness. Beyond the cut-over area the dense wall of wood closed in on all sides.

"ROADS" CUT THROUGH THE FOREST WERE RICH COLLECTION AREAS

These open spaces permitted reasonably easy travel, and their light and air brought out many species of fauna and flora not to be discovered in the gloomy fastnesses (see text, page 619). Vegetation is tropically prodigal, ferns towering to greater heights than trees grow in less humid climes.

later; for in them plants not found in the primitive forest spring up quickly, and animals not to be seen elsewhere soon begin to appear.

### DAMPNESS IS THE EXPLORER'S WORST ENEMY

Our chief trouble in the forest came from dampness. When we arrived, the wet season was at its height. Every day rain fell in torrents; the air was 80 per cent saturated with moisture; every leaf in the forest dripped. A step into the bush meant getting soaked to the skin; and, once wet, our clothes never dried. We had to become accustomed to starting off each day in the sodden clothing of the evening before. As a consequence of this continual moisture, our boots and everything else of leather soon were covered with a green mold; animal skins and specimens rotted; photographic plates refused to dry. Much has been written of discomforts in a tropical forest, but few writers impress on their readers that the real trouble is persistent dampness.

EVEN HAMMOCK BEDS NEAR THE ROOF WERE DAMP

Torrents poured on the tarpaulin shelters and mists rose from the ground until everything in camp was sodden. There was much in the explorers' experience to remind them of a sailor's life on a windjammer (see, also, illustration, page 635).

We had, of course, our share of insect pests, of which the chief were the ticks and the *bête rouge*. These minute creatures, speklike in size, lived freely on the forest vegetation. While wandering about, we collected them on our clothes, underneath which they soon found their way to the tenderest parts of our skin. The bête rouge, an almost invisible harvest mite, was much the more annoying of the two. It burrowed into the skin, making a red irritation that felt like an attack of nettle rash. The only way to deal with these tiny creatures was to go over the whole body carefully each day and pick them off. The penalty for neglecting this all-important duty was a sleepless night of scratching.

### DIFFICULTIES EXAGGERATED

A peculiar unpleasantness that became increasingly acute after we had been in the tropical forest for a month was the feeling of being completely shut in. There was no horizon. On every side was a wall of vegetation. Our relief was immeasurable on getting back at last into the open and

SEEN FROM ABOVE, THE TREE-ROOF APPEARS A ROLLING, FLOWER-SPANGLED PLAIN

It is as if the whole earth's surface, glowing with color, had been lifted on gigantic stilts. Life atop the canopy is entirely different from that in the strata below, affording a representation in Nature of the ancient theory of the many-tiered universe.

THE BO'S'N'S CHAIR PROVED UNCOMFORTABLE

The author found the trip to the canopy comparatively easy; but sitting in the backless seat was tiring, and striking unprotected parts of the body against the tree was annoying (see text, page 628).

LINE GUNS THREW THE ROPES TOO FAR

The missile which is being propelled from the muzzle of the device will soar to the tree-roof and above it, only to become hopelessly tangled in the interlacing branches (see text, page 628).

INDIAN CLIMBERS SUPPLANT LINE GUNS

With an anchor rope about his body and a pair of spikes on his boots, the "balata bleeder" could mount to dizzy heights, throw a rope over a fork, and bring the end back to earth.

enjoying the feeling of spaciousness and freedom after the closeness of the bush.

A week after reaching camp we were in a position to start toward our main objective, exploration of the tree-roof itself. We anticipated difficulties of many kinds, for they had been impressed upon us before we left England. The trees, we had been warned, were too tall and straight and branchless for climbing; their timber was too hard to take climbing irons; their crowns were too full of dangerous rotten branches to afford footing; the foliage, everything, swarmed with armies of venomous ants; and even if we did get into the canopy, we should be able to see very little in the dense vegetation. Such were the difficulties that had been predicted for us. Fortunately we found that they had been considerably exaggerated.

### LINE GUNS PROVE INFERIOR TO INDIAN CLIMBERS

The first tree we attempted to climb was one that we had left for the purpose in the center of our camp clearing. Confidently we brought into action our rocket apparatus and the line-throwing gun, but both proved virtually useless. They sent their missiles forcibly enough—too forcibly in fact—not only into the canopy but far above it! It was impossible to aim the rope over the branch selected and to bring the end back to earth through the tangle.

The devices of civilization thus failing us, we engaged the services of two Arawak Indians, who provided much more satisfactory help, since they had been accustomed to climb and tap for its milky gum a sort of rubber tree known as the *balata*.

By using loops of rope passed around their bodies and the tree trunks, these "balata bleeders" could make ascents in any part of the forest. Indeed, unless a tree trunk was hopelessly decayed, or surrounded with a dense tangle of bush ropes, it would always yield to their agility.

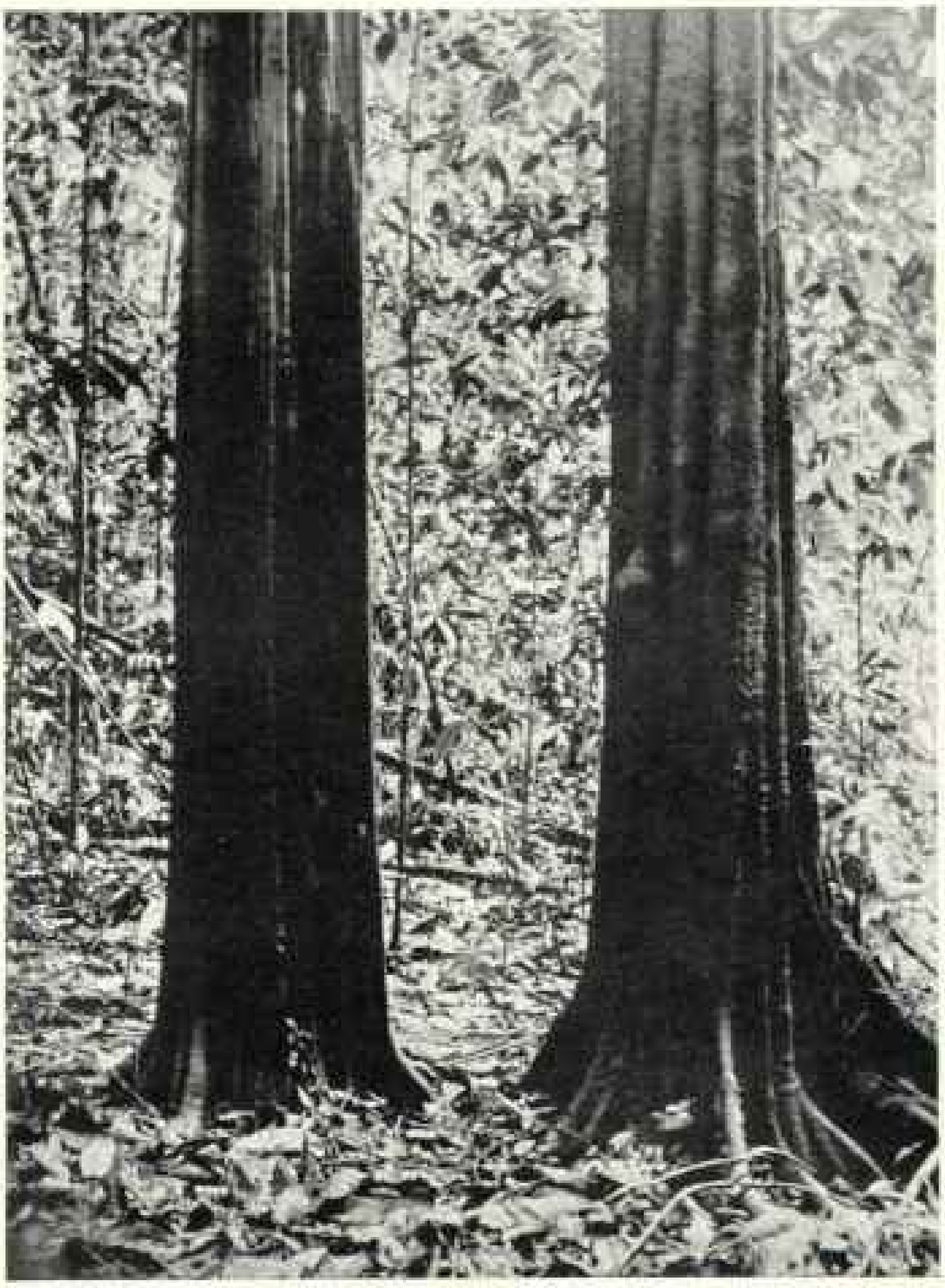
They first attacked the camp tree, climbing it by means of spikes on their leather boots, and carrying a light line with them up to the first fork at 75 feet. Meantime a block-and-tackle apparatus had been got in readiness. The upper end of it was made fast to a suitable branch; to the lower end was attached a seat made of straight pieces of stick cut in the forest, somewhat after the fashion of a bo's'n's chair. Seated

on this, one could be hauled to the point of fixation in the crown of the tree (page 627).

### OBSERVING CANOPY LIFE FROM AN ARMCHAIR

The seat was fairly satisfactory, but it tended to swing about and bang one against the tree trunk. In consequence we substituted a parachute sling of the pattern used in the Royal Air Force. But this made matters much worse; it swayed and gyrated in such an alarming manner that it was quickly pitched to one side. Our men saved the situation by making for us a kind of armchair from forest sticks and pieces of empty ration boxes.

This chair answered our purpose admirably. One could be hauled in it with comfort to the crown of the tree and remain seated there all day making observations on the canopy life. The original intention had been to build platforms in the branches, but these observation chairs proved so comfortable that we kept them as permanent lookout posts. Indeed, so restful were they that sometimes we accused one another of going aloft to have a quiet nap!



YURURU TREES PRESENT CLIMBING DIFFICULTIES

Though the trunks are straight, the deep grooves make footing uncertain. Here Nature produces a giant's bundle of growing fagots (see text, page 619).

### INTO AN UNKNOWN INSECT KINGDOM

The camp tree was 120 feet high, and the observation post was established in it at a height of 80 feet. Of course the tree was not properly in the canopy, since it stood alone in the clearing. But its isolation was in a way a particular advantage, especially to the bird observers, for whom it provided a lookout across the empty space into the ring of canopy that surrounded the clearing. There was thus a good view into the canopy, but none over the forest roof.

Our second invasion of the canopy was at a site chosen by the entomologists in a dense and untouched part of the forest believed to be rich in insect life. The tree was a large *morabukea*, 16 feet in girth and 136 feet high. Our Indians climbed the trunk to the first fork, about 80 feet above the ground, and passed a line through, by means of which one end of a rope ladder was hauled up and made fast at the fork. The ladder was then hauled out until it inclined against the tree trunk somewhat as do the shrouds against the

Photograph by Capt. Albert W. Stevens

OVER THOUSANDS OF SQUARE MILES OF SOUTH AMERICA THE TREE-ROOF GLOOMS

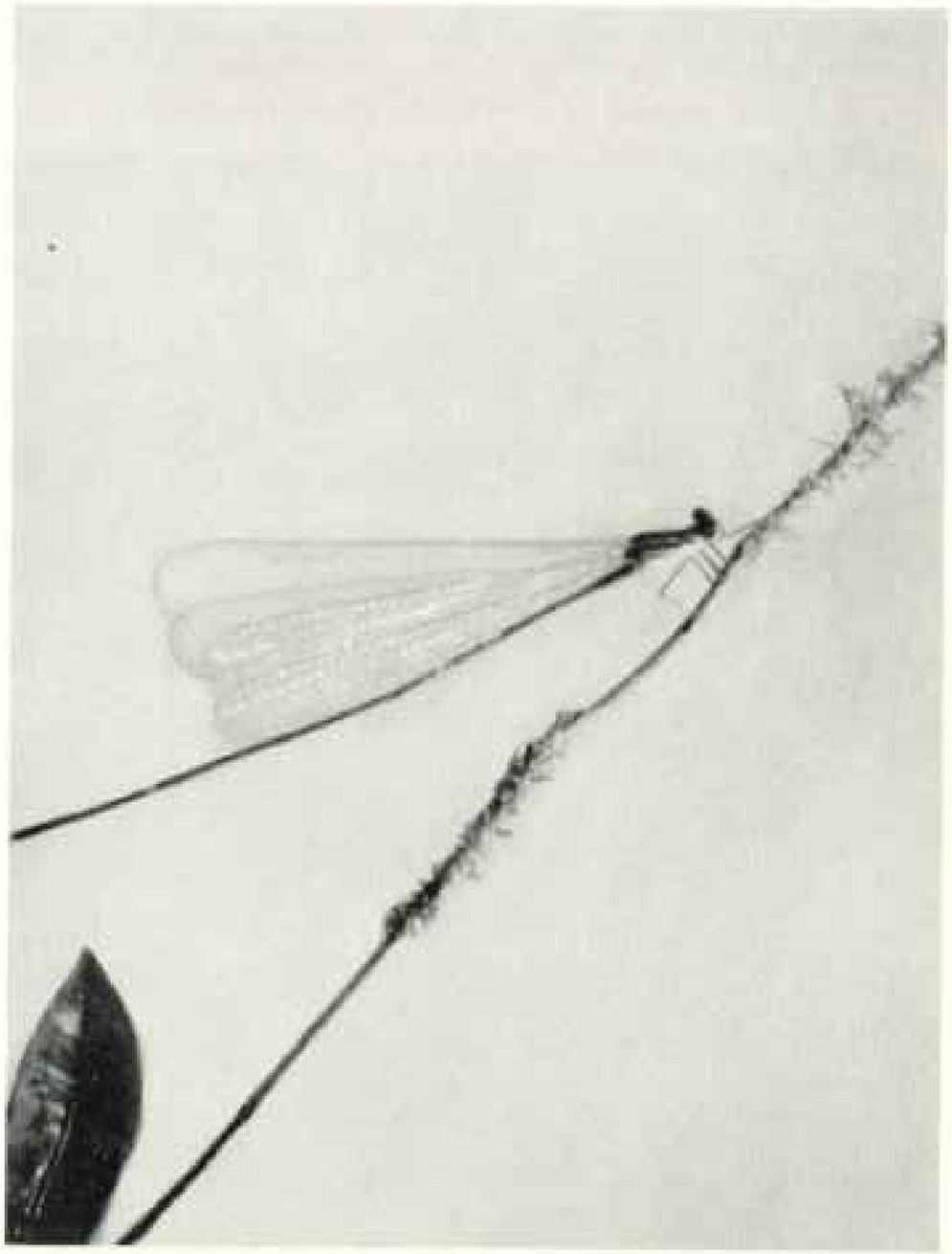
This forest, on the Orinoco Delta in Venezuela, is similar in appearance to the great stretch of dense woodland into which the Guiana expedition made its way. Zoölogists who examine the tree-roof have years of study before them.

LONG-HANDLED BUTTERFLY NETS PROVED USEFUL

With these it was possible to sweep through the different strata and obtain many living specimens. They were also used from the observation chairs to sweep branches in the tree-roof.

MORA TREES RISE FROM BUTTRESSED BASES

Some of these root formations are more than 10 feet high. They complicate labor for the choppers, who must build platforms above them to reach the ironlike trunk.



GOSSAMER WINGS CARRY THE SLENDER DRAGON-FLY

Years of study will be required to classify all the hitherto-unknown species of life discovered by the expedition.

HUGE BEETLES WERE HUNTED WITH 12-GAUGE SHOTGUNS

These enormous creatures of the buprestid type soared through the canopy like wild fowl. They are as large as clay pigeons.

BINOCULARS SPY ON STRANGE BIRDS

Little detailed study was possible from the ground (see text, page 619). Even the ornithologist, peering through specially powerful lenses, could seldom discern the smaller songsters.

INDIANS HELPED GATHER BOTANICAL SPECIMENS

Armed with axes for heavy vegetation and cutlasses for undergrowth, they went into seemingly inaccessible places to fill their baskets. Many seemed to be born naturalists.

TRAINING A SPRAY GUN ON THE ENEMY

Grim tales of bloodthirsty ants frightened the explorers into providing themselves with weapons for throwing up a barrage against insect warriors, most of which were unnecessary.

mast of a ship, and the lower end was anchored to the ground.

After it was guyed at the sides to prevent its twisting, this arrangement gave satisfactory access to the crown of the tree; but, since the canopy here was particularly suitable for entomological investigations, we decided to make it accessible in all directions. This was done by spreading rope ladders through it both vertically and horizontally. Putting up the ladders was a sweaty job in the tropical climate, but one that well repaid all the trouble it required; for it was in this area that we made the largest collections and learned most about the tree-top life. We established an observation post at a height of about 120 feet. It gave good opportunities to study the canopy, and here and there afforded favorable glimpses out over the top of the roof.

The third ascent was made by block and tackle into a tree known to the Indians as the *baromalli*. It was one of the largest in our neighborhood, standing about 150 feet high, and so tall that not only did it reach the canopy, but succeeded in pushing its head to some 30 or 40 feet above it. A point of fixation was secured at 120 feet. From this vantage a good view was obtainable not only in the canopy, but out over six or eight square miles of the forest roof.

### COLOR BLAZES ON THE TREE-ROOF

The canopy viewed from above presented itself in the form of a vast plain with plenty of color, not indeed a level plain, but rather a somewhat undulating surface with elevations and depressions in accordance with the varying levels of the ground and the different heights of the trees. Every shade of green was represented, and many of the young leaves were copper, yellow, or brown. Flowers, too, were evident in abundance, and of varying shades of purple, pink, and white. The roof top presented an altogether different picture from that of the flowerless forest underneath. There were vultures and swifts circling above it, parrots and humming birds alighting in its foliage, insects and spiders on the branches close at hand.

A fourth ascent was made in an *ulu* tree, chosen because a quantity of foliage happened to be gathered close around its trunk, and we thought that by collecting

MOUNTING TO THE CANOPY CALLS FOR SAILOR'S AGILITY

On some trees the rope ladders were attached like ship's shrouds; on others they clung close to the trunks (see text, page 629). Above the climber at the left are the muslin traps baited to attract specimens.

TRANSPARENCY NEEDS NO PROTECTIVE COLORING

A forest butterfly which escapes notice because the leaves on which it alights are visible through its wings.

MANY FOREST MOTHS BLEND WITH THEIR BACKGROUND

This one alights on dead foliage of its own color in such a way that the line across its wings becomes continuous with the midrib of the leaf.

TRAPS REVEALED SEVERAL DISTINCT LAYERS OF LIFE

These baited muslin cages attracted entirely distinct species of insects and small animals at the several levels (see text, page 639).

NUMEROUS DEVICES WERE USED TO CATCH SPECIMENS

Insect traps with lights burning inside them were hauled up every night into the canopy, where they collected thousands of winged creatures.

FOOD WAS SERVED IN A SEPARATE TARPAULIN SHELTER

Had the dampness not been all-pervading and constant, the expedition might have enjoyed the pleasures of roughing it. Everything possible was provided to insure comfort and safety.

INDIAN HELPERS ENJOYED RIDING ON THE STORE BOAT

Faithful, industrious, and trustworthy, these men of the Arawak tribe deserve much credit for the success of the expedition.

the life in this foliage we should gain some slight idea of forest fauna at intermediate heights. A rope ladder was employed in the ascent, but it did not stretch from the tree like a ship's shrouds; it hung down close against the trunk, being separated from the bark by strips of bamboo in order to give support for the feet.

Three or four days were required to get the gear on each of the trees in a satisfactory running state. It was the rule in difficult places to make use of a safety belt—that is, a leather belt with rope attached—the same kind of device that painters use when working on the outside of houses.

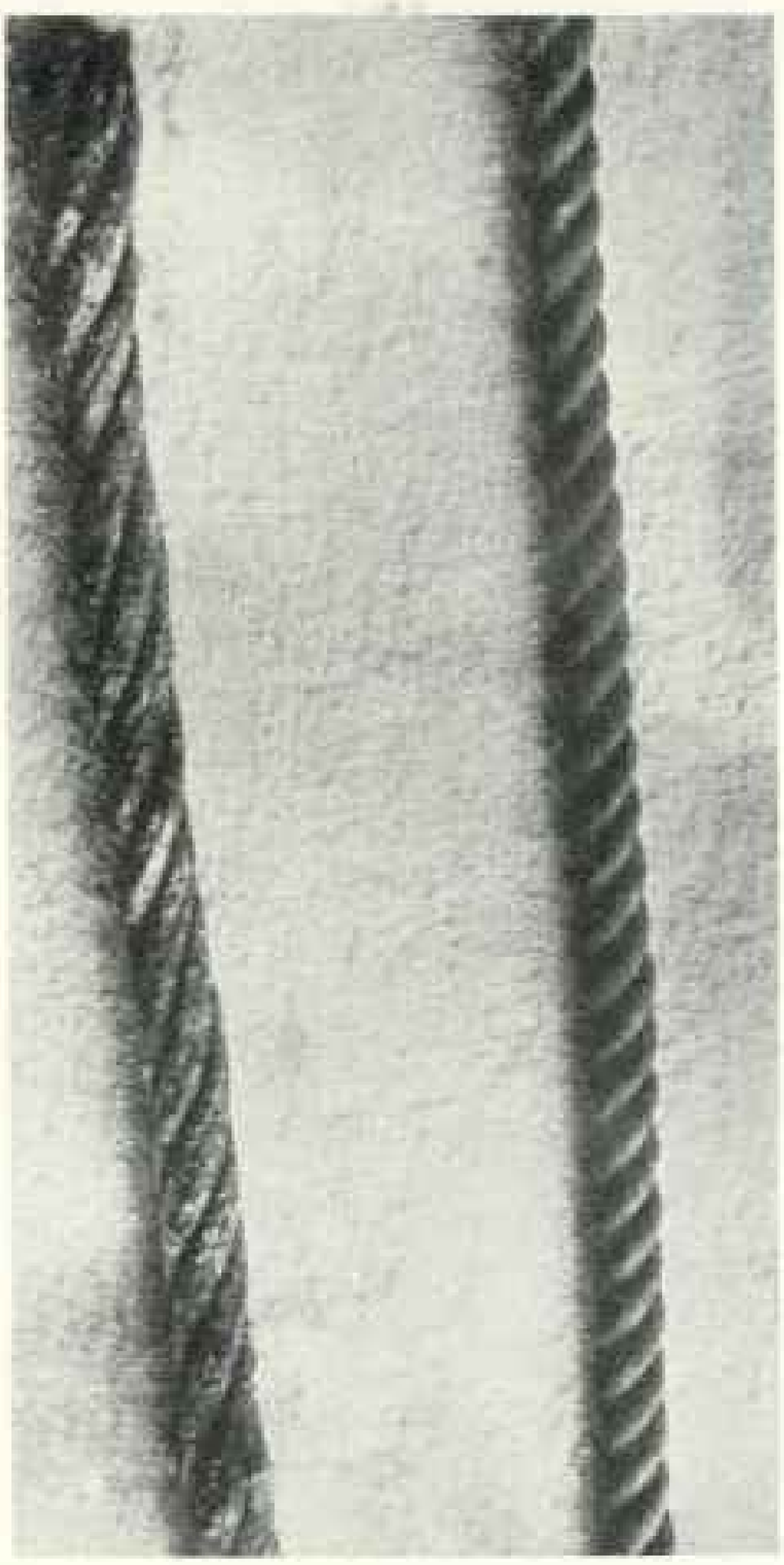
Much zoölogical material was procured along the canopy branches and the rope ladders stretched among them. Every hour of the day and night is represented in our records.

### TRAPS AID STUDY OF ANIMAL LIFE AT DIFFERENT FOREST LAYERS

We adopted all manner of devices to add to the canopy collection. One of the most successful was a series of automatic traps. These were baited muslin cages, each with a large opening through which animals could enter and an inclined barrier to prevent their crawling out again. At night lamps were placed in the traps and the apparatus was hauled up into the canopy. By day the traps were baited with bits of carrion, syrup, or other materials likely to attract the creatures we sought.

The traps added hundreds of animals to our tree-top collections. They were very useful for studying the layers of life in the forest, since we hauled them up on strings from different levels—one at 40 feet, a second at 80 feet, a third at 100 feet; and we were continually surprised at the differences in the catches of our game at the several levels. Thus was obtained the first impression of how the life of these forests is spread out in successive strata or layers (see page 637).

Dead animals lodged in the forks of the trees proved useful in attracting the carrion-feeding forms. We put spring traps in the roof to catch reptiles and small mammals, vessels containing water to entice those of semi-aquatic habits. We used nets on long handles to sweep the foliage at heights up to 30 feet from the ground. These nets could be employed also from



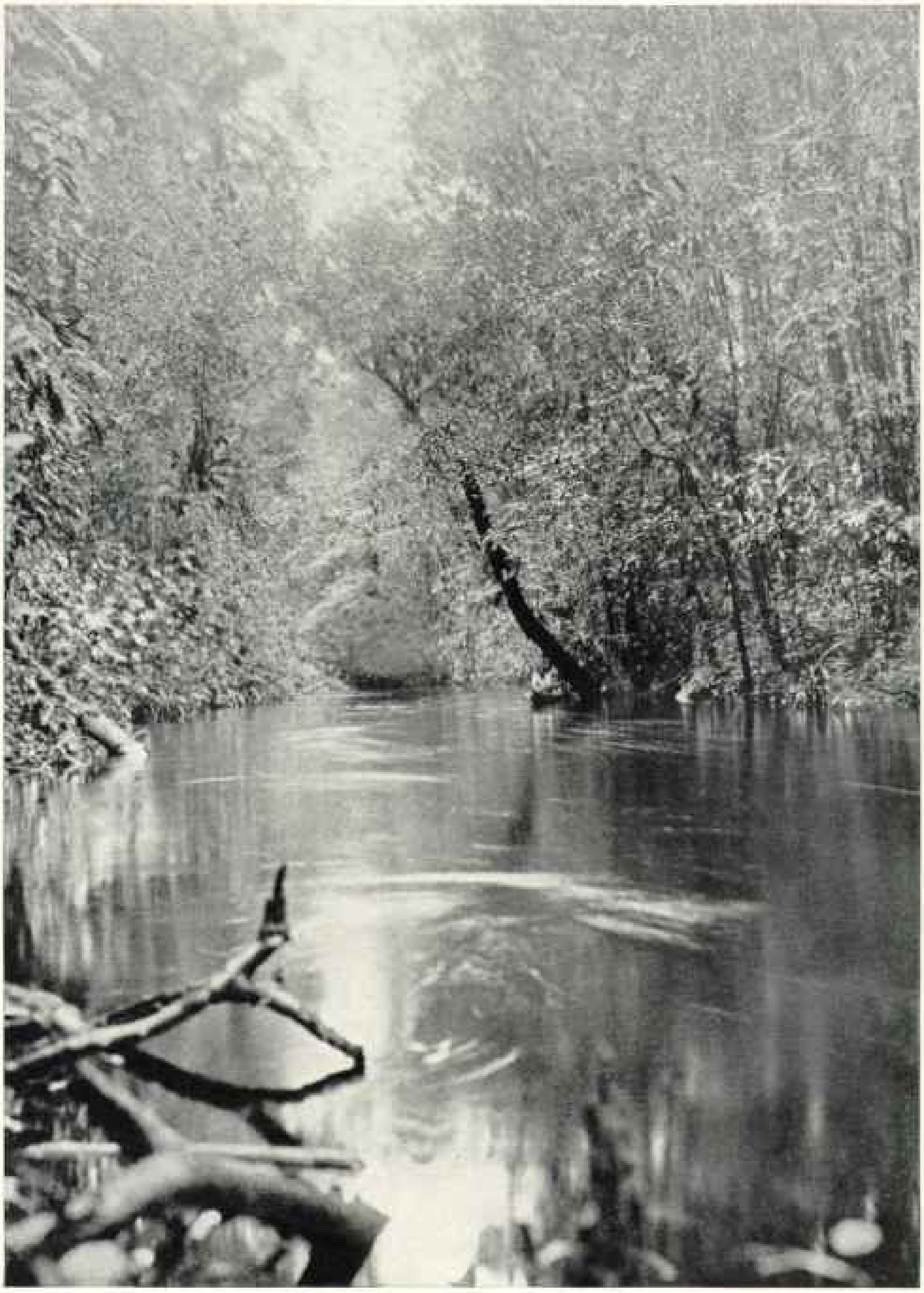
NATURE MADE ONE, MAN THE OTHER

Close scrutiny is required to distinguish the vine on the left from the rope on the right. Both exemplify the same principle of tensile strength (see text, page 619).

the observation chairs to sweep the branches in the tree-roof. Because of the scare about armies of tree ants, we had provided ourselves with a number of spray guns from which we could shoot out jets of petroleum and advance against the enemy behind a barrage (see page 634).

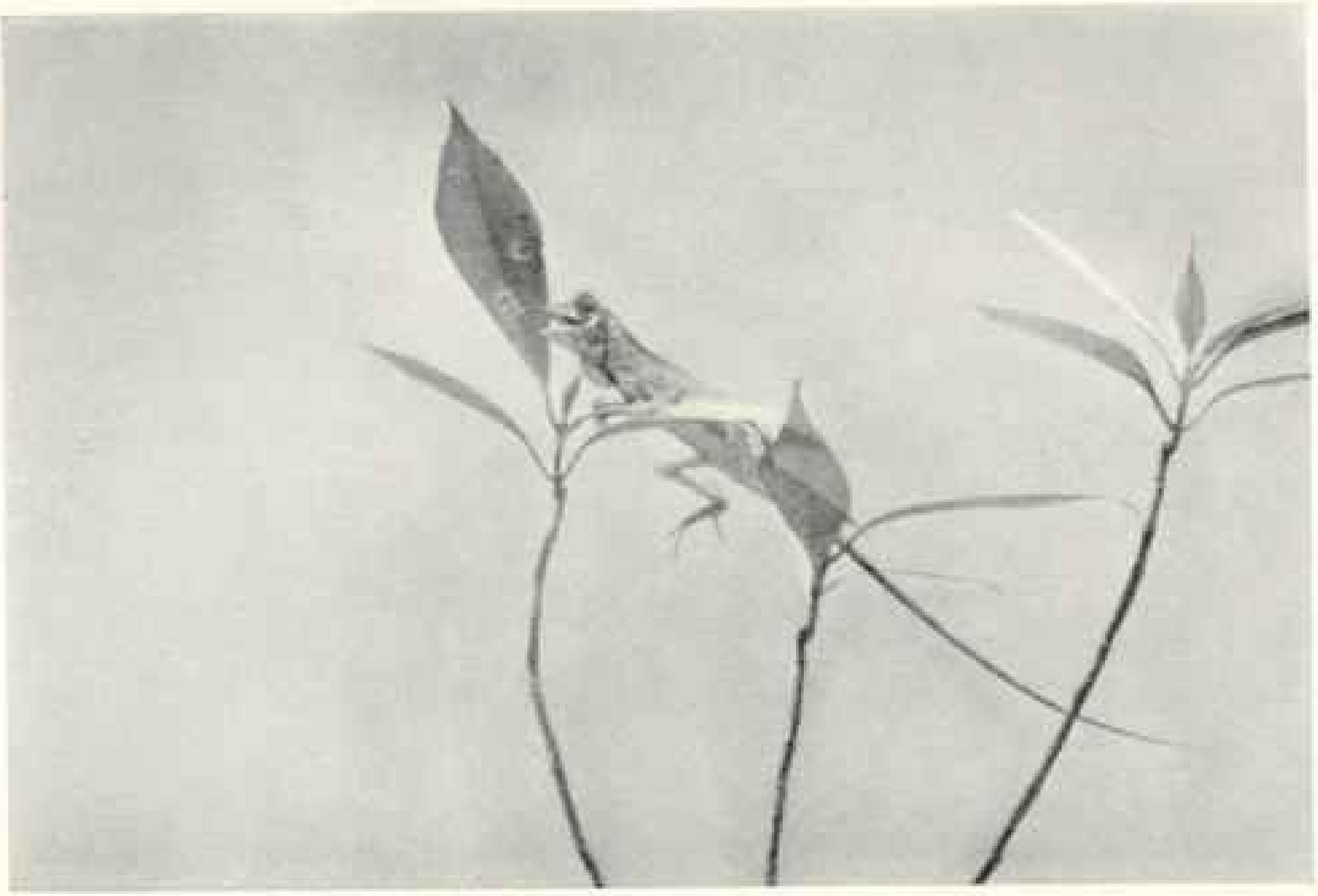
Altogether we obtained a fair sample of the life in our particular forest patch. Our catch comprised 75 mammals, 166 birds, 207 reptiles, about 10,000 insects, about 5,000 sets of plants, about 500 miscellaneous specimens.

We had been advised to bring iron spikes with which to build a spike ladder of the



A COFFEE-BROWN CREEK POURS OUT OF WILDERNESS PRIMEVAL

After paddling perhaps two miles up this sluggish stream, the explorers came to a place suitable for their camp site. Decaying vegetation colors the water and well-nigh impenetrable forest walls it in. Often the tree-roof closes above it, casting deep shadows that bring to the imagination thoughts of subterranean rivers.



ONLY A SHARP EYE CAN SEE THE LITTLE GREEN LIZARD AMONG THE LEAVES

Protective coloring conceals hundreds of tiny creatures from the sight of casual observers, but a day in the tree-roof reveals a new continent to a zoölogist.

TAXIDERMISTS WORKED UNDER THE SHELTER OF A PALM-LEAF ROOF

Thinking to improve upon the tents of the rest of the camp, they fashioned a more or less comfortable workroom out of Nature's materials.

A FAREWELL VIEW OF NATURE'S HIGHWAY TO THE JUNGLE

The broad Essequibo rivals many famous rivers in length and volume, but its upper course leads to equatorial forests and is little traversed except by explorers, or natives in their dugout canoes (see, also, illustration, page 620).

type manufactured by Mr. Allee in Panama. But in practice we found that many of the trees were too hard to drive spikes into. The grain of the mora trees was so tough that it would not admit a spike more than an inch or two. Only here and there was a tree sufficiently soft for a spike ladder.

### SUCCESS DUE LARGELY TO INDIAN AID

Our Indians proved extraordinarily helpful. Without them we could never have attained our objective. They were men of the Arawak tribe who lived on the Pomeroon River—splendid fellows, quiet and modest, full of enthusiasm for this new fancy of the white man, and absolutely trustworthy. Yet they were very independent and had to be treated fairly and kindly; otherwise they would quietly disappear. Most of them seemed to be born naturalists, with a remarkable, if primitive, knowledge of forest life. They did everything for us—paddled our boats, cut the trees, cooked our food, made our forest paths, climbed tree trunks, shot game, skinned specimens, preserved plants, and accomplished a hundred other things especially associated with life in the bush, their natural habitat.

We broke camp about the middle of November, leaving behind us a chaos of bare poles, with a litter of broken packing cases, discarded ladders, and worn-out ropes in that patch of forest which had so delighted us.

The biological results of this particular investigation will be published gradually, as the material is examined and classified. At present all we may say is that the canopy is a layer of the earth's surface which abounds in animal life; that the life of the canopy is very different from that of the forest floor underneath it, and that any thorough examination of that canopy is certain to reveal numbers of new species. The efforts I have described are pioneer in nature. They are capable of wide extension and immense improvement, for the equatorial canopy is of such vast dimensions that any single attempt to glean information from it is little more than a drop in the ocean compared with the immensity that awaits examination.

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ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

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 $55,000 to Admiral Byrd's Antarctic Expedition.

NOT long ago 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.

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# A plain statement

# ANTI-

## IMPORTANT INFORMATION FOR THE

**In an effort to clear up the confusion regarding anti-freeze, which appears to exist in the minds of many consumers, we give below the outstanding facts. The following statements are guaranteed to be correct and accurate in every particular. They are supported by the highest scientific authorities.**

THE problem of preventing freezing in the cooling-systems of automobiles during the cold weather months was one that taxed the ingenuity of car owners for many years. Salt, honey, alcohol, kerosene, glycerine and many other products and by-products were used with varying success. Within the past few years, however, there has been developed a new product, a product specially designed for this one use and purpose.

That product is Eveready Prestone. It is not a general commodity used principally for other purposes: it is an anti-freeze, and nothing else. It is a scientific development, thoroughly approved by all car manufacturers; a product which embodies all the advantages of all materials previously used, with none of their inherent weaknesses.

In developing Eveready Prestone, the laboratories of Union Carbide and Carbon Corporation, keeping in mind the requirements of the U. S. Bureau of Standards for an ideal anti-freeze, worked toward a product which would satisfy the following specifications:

**1. It must not boil away.** A boil-away anti-freeze is both an inconvenience and a poor protector against sudden changes in the weather. Such anti-freeze requires frequent renewals, and leaves the car unprotected when a cold snap follows warm weather.

**2. It must be harmless to the cooling-system.** An anti-freeze which corrodes the cooling-system is a poor product to put in a car.

**3. It must be effective in preventing freezing.** The effectiveness of the materials commonly used before the advent of Eveready Prestone varied over a wide range. Some were effective in preventing freezing; others were not.

**4. It must not affect the car finish.** The fumes of boil-away products were a source of danger to the finish of fine cars. This was a weakness which those who developed Eveready Prestone were anxious to avoid.

**5. It must circulate freely at the lowest operating temperatures.** A heavy, viscous material, which is not free-flowing, is obviously a poor cooling agent.

of facts concerning

# FREEZE

## PROTECTION OF CAR OWNERS

**6. It must be non-inflammable and odorless.** Winter driving was often made unpleasant by smelly fumes, while inflammable mixtures held the possibility of causing serious accidents.

**7. It must not "creep."** Certain materials in common use had a strong tendency to leak out of systems which were tight enough to hold water but not tight enough to hold these materials. The new product, it was felt, must have *less tendency to leak than water.* Consequently, if a car could hold water it would hold the anti-freeze.

**8. It must be packaged as a concentrated product.** Many of the products which the public was using, because of their thick, heavy nature in the concentrated form, were sold as water-diluted solutions. The cost of canning and shipping plain water was thus borne by the public. Obviously, if a concentrated product could be packaged and sold the user could be saved that expense. Furthermore, the public had no way of telling how much of these diluted solutions was anti-freeze material and how much was ordinary water. Some brands contained as much as 55% plain water: others contained less. It was decided, therefore, that the new product must be concentrated. Thus the public could be sure of buying a standard product, always the same and always of known value.

**9. It must be economical.** The laboratories which developed the new product were not interested in low first-cost per gallon. They *were* interested in low cost per season. It was felt that car owners who had been buying boil-away anti-freeze on the installment plan, a few quarts at a time, would not object to a relatively high first-cost if the *all-season* cost were low. The new product, therefore, was priced to cost, for an average winter season, no more than the cost of boil-away anti-freeze.

Thus was developed Eveready Prestone, the only anti-freeze which meets *all* these requirements. But laboratory effort did not stop with that.

### A NEW AND IMPROVED PRODUCT AT A LOWER PRICE

Further research developed the product to a point where it gave protection, not only against freezing but also against rust and corrosion in the cooling-system. And such is the *new* Eveready Prestone. Its use reduces the corrosive action of water on the metals of the cooling-system as follows: brass, copper, solder, aluminum and zinc, 75%; cast iron, 95%. No other "treated" anti-freeze compares with Eveready Prestone for the prevention of rust and corrosion.

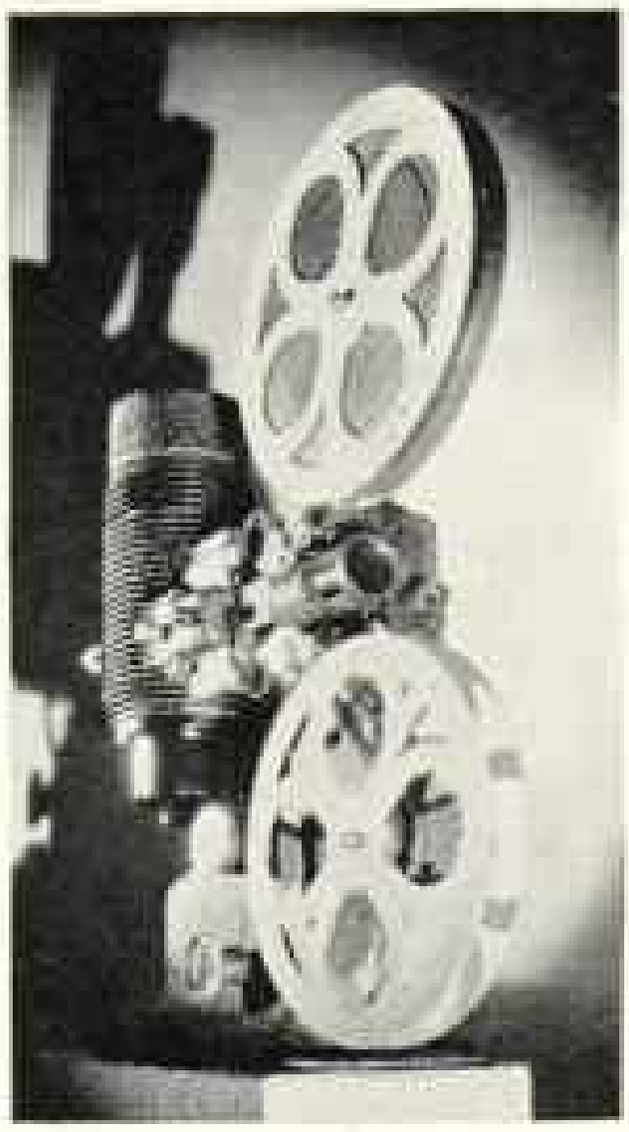
The new Eveready Prestone has been reduced in price. It now offers by far the safest and most economical protection against both freezing and corrosion. The car owner who uses Eveready Prestone is assured of complete protection through all weather changes, freedom from worry and the trouble of replacements, and a clean, rust-free radiator. He insures his car, not only against a freeze-up, but also against the costly repairs that follow a rust-clogged and corroded cooling-system. He prolongs the life of his car.

National Carbon Company, Inc., Unit of Union Carbide and Carbon Corporation, New York, N.Y.

*The World's Finest Home Movie Gift*

*is a* FILMO *personal movie*

CAMERA & PROJECTOR





● *This (right) is the Filmo 70-D Personal Movie Camera, with three-lens turret and seven film speeds, providing a versatility and flexibility which allows the merest novice to make professional-quality movies. $245 and up in Sesamee-locked case. Other Filmo Cameras as low as $92. Bell & Howell pays the Federal tax.*

● *This is the new Filmo JL Projector which is entirely gear-driven, rewinds films automatically at the touch of a button, and shows professional-quality, life-sized movies in your living room or a 2000 seat auditorium. Equipped with pilot light and easy-tilt device. $298 with case. Equipped for Kodacolor, slightly higher. Other Filmo Projectors as low as $135.*

THE finest gift with which you could thrill your family this Christmas is a Bell & Howell Filmo Personal Movie Camera and Projector. Movies you make yourself—of family and friends—at home or on your vacations and travels—are the source of the greatest happiness, now and in years to come, that you could provide your loved ones.

Filmo, being the finest, gives the finest personal movies. That's why it's the choice of kings, princes, international celebrities, and other discriminating personal movie makers. Yet it's the thrifty choice for any family, *for no Filmo has ever worn out!*

Filmos are amazingly simple to operate. Fuss and bother are completely eliminated. You take a picture merely by sighting through the viewfinder and pressing the button—and "what you see, you get." Showing movies in your living room requires but a moment to thread the film and then a press of the button . . . and fascinating, life-like movies of your children and family and friends and travels flash across the screen in brilliant, theater-quality reproduction.

Decide now that this is to be the greatest Christmas of all. Give the fine thing—Filmo, built by the makers of Hollywood's professional cameras. Ask your dealer for a demonstration today, or write for literature. Bell & Howell Co., 1804 Larchmont Ave., Chicago, Ill. New York, Hollywood, London (B & H Co., Ltd.) Est. 1907.

# BELL & HOWELL FILMO

Made by the world's leading manufacturers of fine professional and personal motion picture equipment.

• • •

*Filmo Cameras use Eastman Safety Film (16mm.) in the yellow box, available everywhere. Filmo Cameras and Projectors may be equipped (under license of Eastman Kodak Co.) for Kodacolor movies in full color.*

Bell & Howell Co., 1804 Larchmont Ave., Chicago

Gentlemen: Please send me your book on personal movie making equipment, "What You See, You Get."

*Name* .....

*Address* .....

*City* ..... *State* .....

PROFESSIONAL RESULTS WITH AMATEUR EASE

# Rain before Seven
# Clear before Eleven?

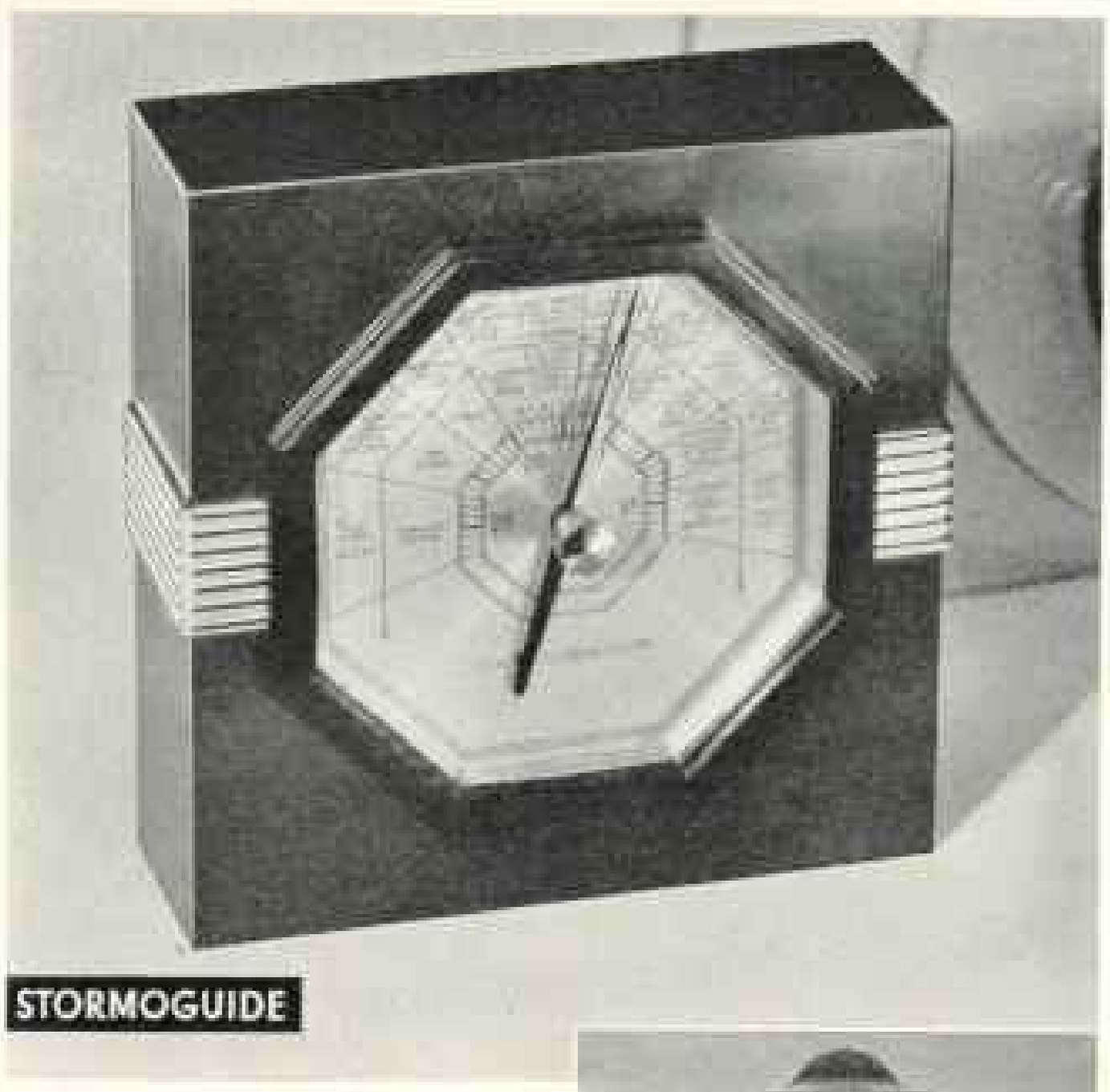
## MAYBE..MAYBE NOT

***There is a hint of truth in the old saying, for the rain clouds are often burned away by the rising sun.***

NONE of the colorful old weather-sayings are reliable, though many are based on half truths. "Rain before seven" *may* mean "Clear before eleven," if the barometer is rising, but not if it is falling—for that means the storm area is approaching.

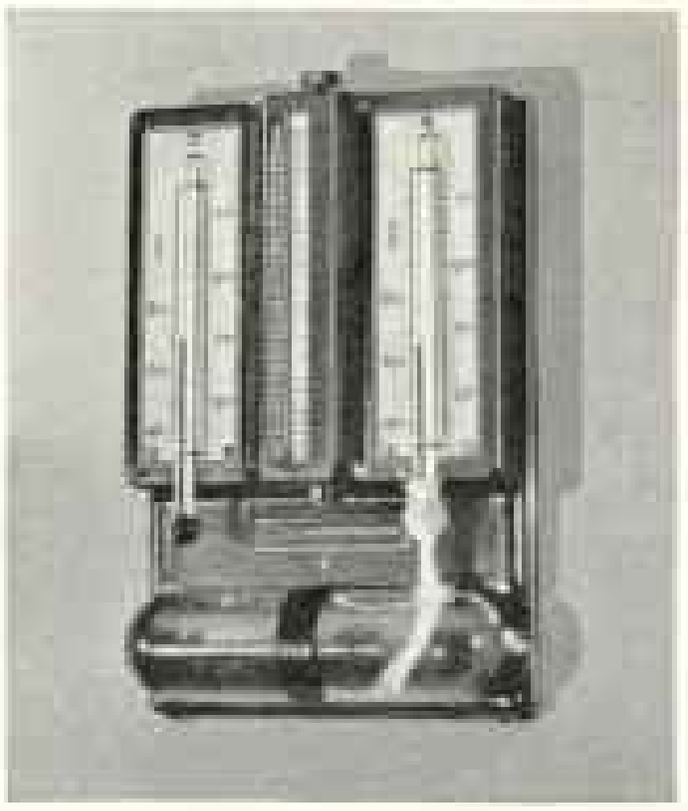
A Taylor Stormoguide in your home will tell you how to dress and what you can plan to do out of doors. It is a happy thought as a Christmas gift for anyone interested in the weather. And do you know anyone who isn't?

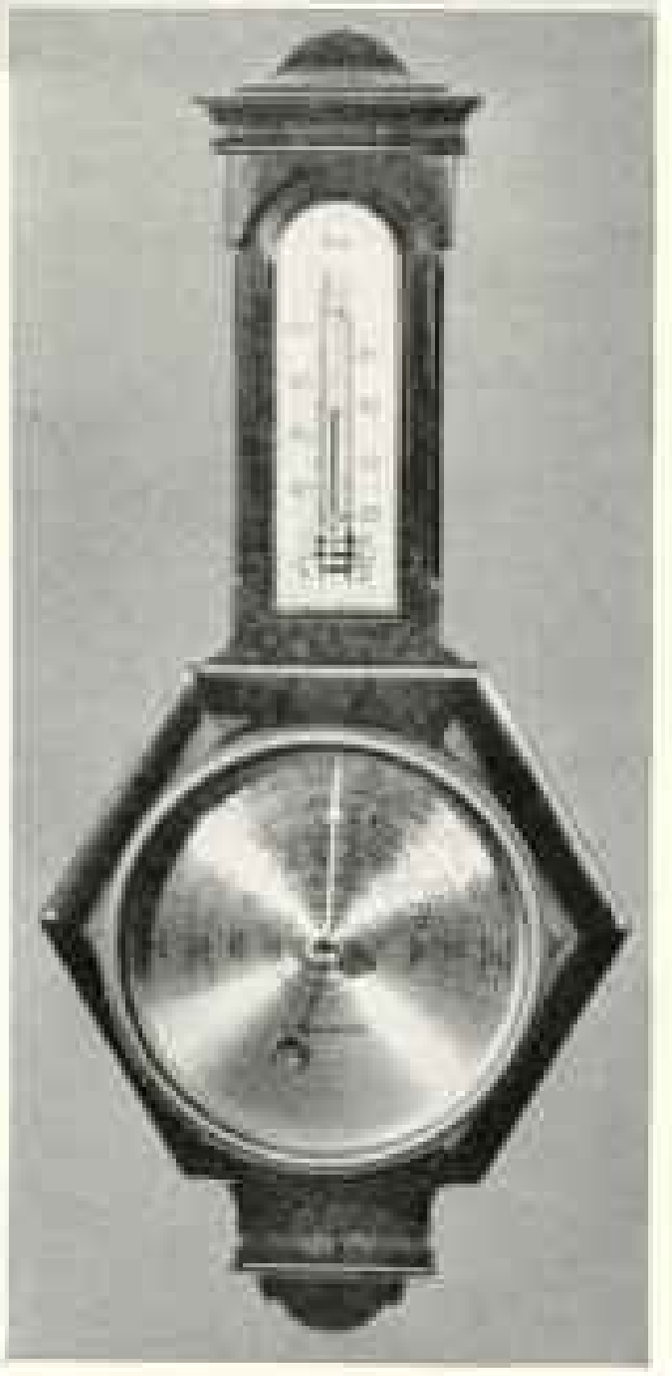
Besides the Stormoguide, the Taylor Instrument Companies make Barometers, Stormographs, Barographs, Recording Thermometers, and many other Taylor Instruments that are recognized the world over for accuracy. They have been making them for more than eighty years. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.




**TAYLOR STORMOGUIDE.** *Fairfax model, a perfect Christmas gift. Tells when it will be clear, cool, stormy, windy, etc. In satin black, aluminum dial and chromatrim. Price, $15.00.*

**TAYLOR PENDANT STORMOGUIDE** *with thermometer. In walnut or mahogany bakelite. Forecasts easy to read. A welcome Christmas gift. Size, 14". Price, $15.00.*





**TYCOS HUMIDIGUIDE** *for measuring relative humidity; with control semi-automatic humidity tables, 6" x 4" Bakelite housing and ivory-finished scales. Price $6.00.*

# Taylor
## INSTRUMENTS

FOR CHRISTMAS GIFTS

*[Prices slightly higher in Canada and west of Mississippi.]*

# BLUE SKIES . . .

## AND THE SPANISH MAIN

St. Thomas (Virgin Islands) Fort de France, St. Pierre (Martinique) Port-of-Spain (Trinidad)
La Guayra, Puerto Cabello (Venezuela) Willemstad (Curaçao) Colon (Canal Zone) Havana (Cuba)

ABOUT Christmas-time, people are getting restless. They're looking longingly southward, to the blue Caribbean, where the sun shines golden in midwinter.

The little French shops of Martinique abound in interesting knickknacks . . . St. Thomas, Trinidad, La Guayra, and Curaçao are full of buccaneering memories and strange exotic sights . . . at Colon: the canal, Old Panama, the Miramar Club . . . and fair Havana delights her visitors.

A West Indies Cruise is an ideal break in dreary Winter . . . and the beautiful, new *Lafayette* will sail there twice this season. There will be a Christmas Cruise, leaving New York December 16th for 19 days. And the second leaves on February 21st.

The *Lafayette* is famous for her delicious cuisine and for the beauty of her salons. She will be a most comfortable, delightful and economical midwinter home.

See your own travel agent. He will gladly help arrange this cruise for you. . . . French Line, 19 State Street, New York City.

**2 WEST INDIES CRUISES**
**DECEMBER 16 AND FEBRUARY 21**
**19 DAYS . . . $217.50 UP**
**M. S. LAFAYETTE**

French Line

NORTH ATLANTIC SAILINGS: PARIS, Nov. 11, Dec. 9 • CHAMPLAIN, Nov. 5 and 26, Dec. 23 • DE GRASSE, Dec. 6, Jan. 3 • ROCHAMBEAU, Nov. 26, Jan. 12

*Now* GRACE LINE *Presents . . .*

# 4 NEW "SANTA" LINERS

LARGER · · · FASTER · · · MORE LUXURIOUS

TO CARRY YOU TO OR FROM

# *California or New York*

*visiting . . .* HAVANA · COLOMBIA · PANAMA · COSTA RICA · EL SALVADOR · GUATEMALA · MEXICO *En Route*

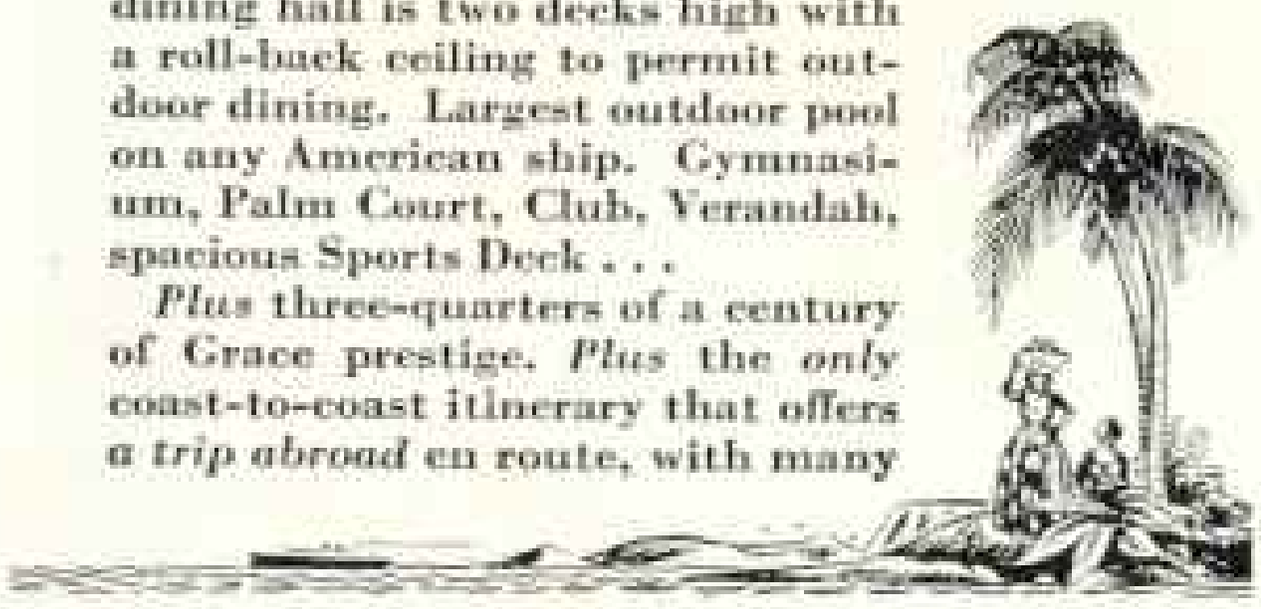
NOW! — Four brilliant new sister liners . . . to speed you coast-to-coast with all the sparkle and supreme comfort of the smartest transatlantic crossing!

The palatial new Santa Rosa, Santa Paula, Santa Lucia and Santa Elena are alike in every superb detail. They offer you: *SPEED* . . . 20 knots or more. *LUXURY* . . . first American ships having all outside staterooms with private baths. Telephone in every room. Double rooms. Single rooms. De luxe suites. Controlled ventilation and temperature. *SIZE* . . . dining hall is two decks high with a roll-back ceiling to permit outdoor dining. Largest outdoor pool on any American ship. Gymnasium, Palm Court, Club, Verandah, spacious Sports Deck . . .

*Plus* three-quarters of a century of Grace prestige. *Plus* the *only* coast-to-coast itinerary that offers a *trip abroad* en route, with many delightful shore visits and optional inland excursions.

Complete rail-water cruise-tour "Round America" for as little as $325: From your home by rail to either coast; Grace Line to the opposite coast — return home by rail.

Fortnightly sailings from New York, San Francisco, Los Angeles. Book for maiden voyage of the Santa Rosa Nov. 26 from New York; Dec. 26 East from San Francisco! This voyage inaugurates Grace Service to Victoria, B. C., and Seattle, Wash. Consult travel agent or Grace Line.



New York: 10 Hanover Sq.; Boston: Little Bldg.; Chicago: 230 N. Michigan Ave.; New Orleans: Queen and Crescent Bldg.; San Francisco: 2 Pine St.; Los Angeles: 548 So. Spring St.; Seattle: Hoge Bldg.

GRACE LINE

10 Hanover Sq., N.Y., or 2 Pine St., San Francisco

Please send me all information about your new liners, New York-Central America-California itinerary, and 'Round America Cruise-Tour.

*Name*_____

*Address*_____

*City*_____ *State*_____

BG-1

# $40 TO California

One way from Chicago in coaches and chair cars. Proportionately low fares from St. Louis, Kansas City, Minneapolis-St. Paul, and many intermediate points. Same fares returning. Other low fares also in effect.


# LOS ANGELES LIMITED

Travel over the smoothest roadbed on earth. Enjoy "meals that appeal" served in air-conditioned dining cars. De luxe appointments. Bath, barber, maid and valet service. The fast and famous San Francisco Overland Limited and other fine trains operate daily between California and the Middle West.

W. S. Basinger, Passenger Traffic Manager
Room 308, Union Pacific System
Omaha, Nebr.

Please send me information about fares to

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Name .....Street.....

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**UNION PACIFIC**

ENIT

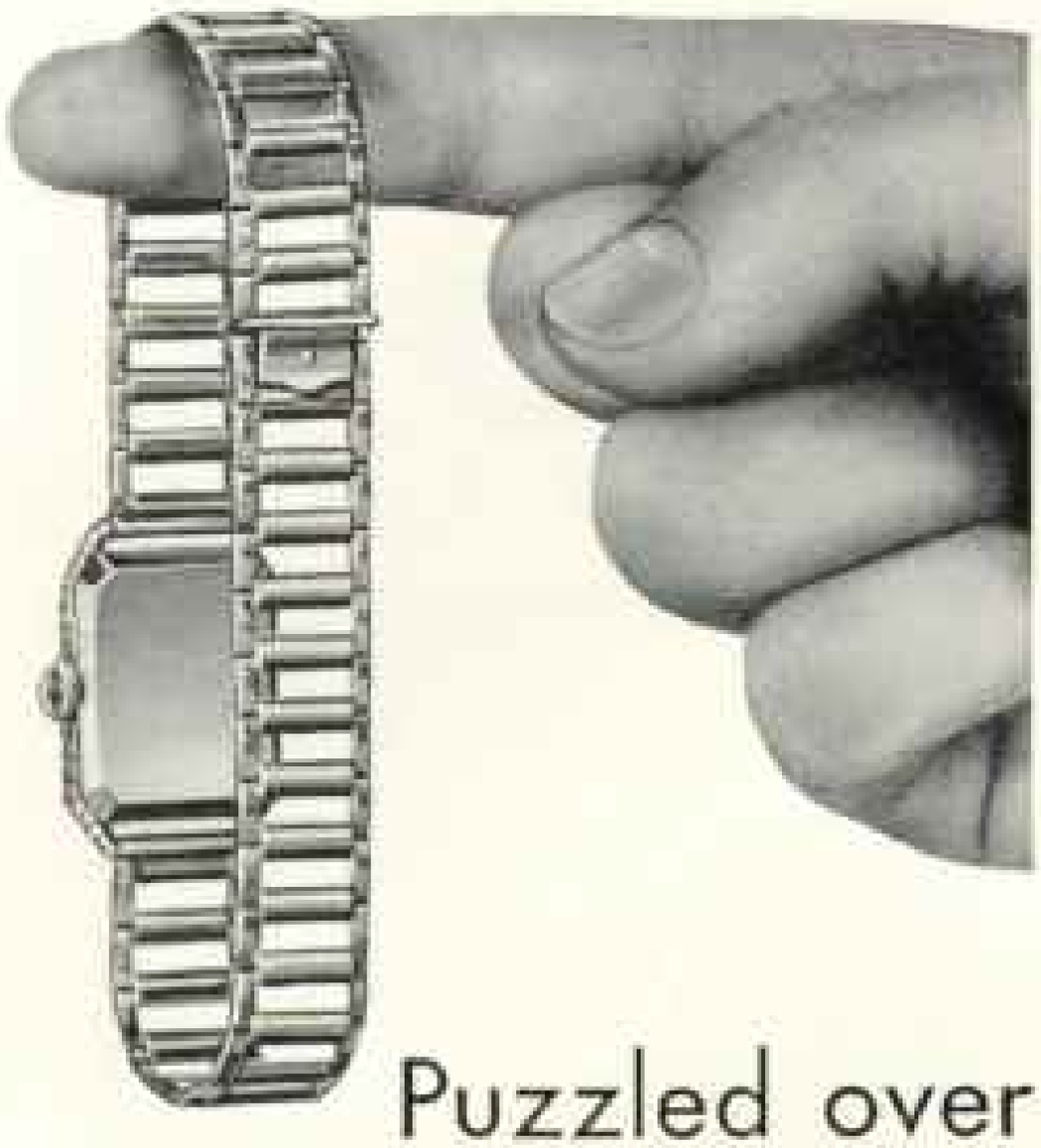
# . . . FOLLOW THE SUN TO ITALY

THIS year, escape the raw early winter—cross on the sunny Southern Route and spend the season in Italy! While most of Europe shivers, Italy picks her olives and oranges . . . ignorant of the chill and damp that beset other lands.

Enjoy Rome—when Romans enjoy it most! Then is the time to explore the Forum, search out the fountains, climb the seven hills—and on the seventh, peer at St. Peter's dome through the keyhole in a famous garden! Discover the Bay of Naples . . . Sorrento, Capri and the golden city itself. Stop off in Sicily, fly to Tripoli, or make your way to mediæval Rhodes!

Anywhere in Italy or her colonies you'll live more cheaply than at home—with hotels, restaurants and railway fares drastically reduced, visas and other fees abolished. Let us help you plan your trip in cooperation with your tourist agent. This office is operated for that purpose by the Royal Italian Government on a non-commercial basis—helping the traveler cut expenses, see more and enjoy the best the country offers, with no charge for its services. Write for large illustrated book on Italy, sent free.

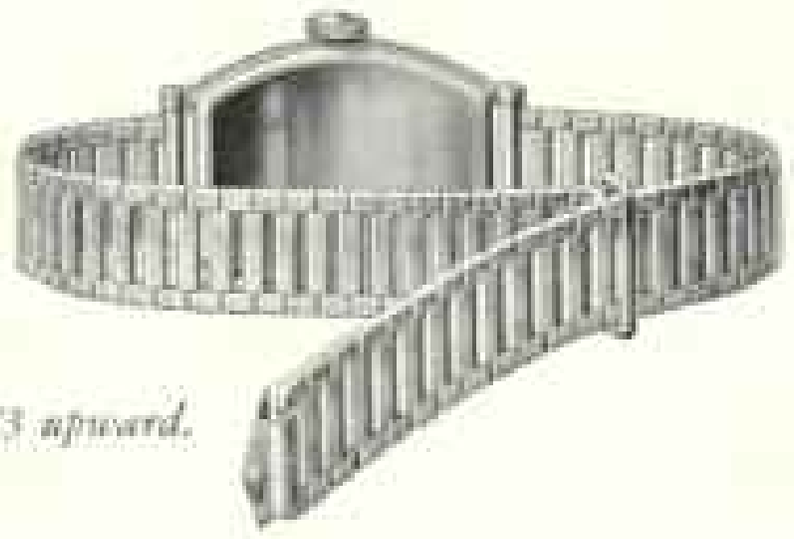
ITALIAN TOURIST INFORMATION OFFICE
Squibb Bldg., 745 Fifth Ave., N. Y. C.



## Puzzled over what to give HIM?

Why not a Krementz *Self-Adjustable* Wrist Watch Band? This *smart, up-to-date* watch band is easily adjusted to fit any wrist without danger of dropping one's watch. See it at your jeweler's. Also, Krementz Dress Sets, Collar Pins and Tie Holders—the kind of jewelry the best dressed men buy for themselves. Write for illustrated gift booklet with correct dress chart for men.

KREMENTZ & CO., Newark, N. J.
*Makers of Fine Jewelry since 1856*



*Priced from $3 upward.*

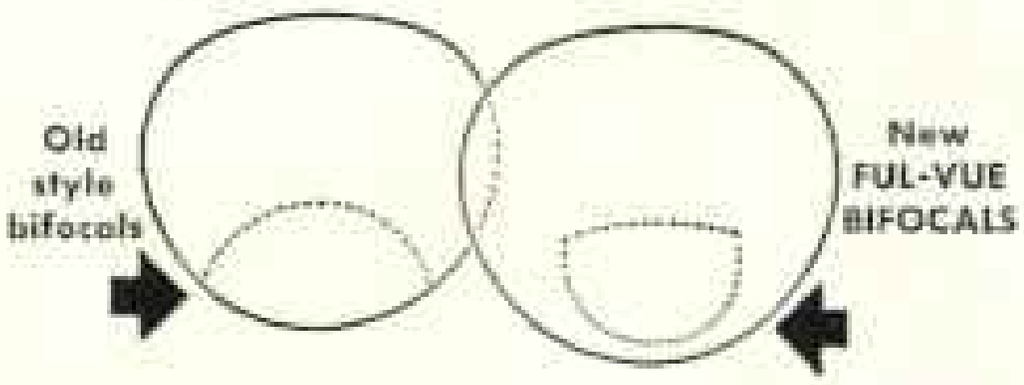
# KREMENTZ
*Self-Adjustable*
# WATCH BAND

## Do Phone Numbers BLUR THROUGH YOUR BIFOCALS?

## FUL-VUE Bifocals will stop that annoyance

PERHAPS you've noticed a blurred streak across the page. It's present with most bifocals—the dividing line seems to "split" the type. Ful-Vue Bifocals are free from this annoyance and they're so much easier to get used to.

### See the difference!




Eyes are priceless and deserve the best professional service in your community. Inadequate examination and hasty fitting are in the end more costly, and are harmful both to good eyesight and good looks. Don't skimp on eyesight.

Our booklet, "What You Should Know About Your Glasses," will be sent without charge if you will mail us the coupon.

AMERICAN OPTICAL COMPANY, *Southbridge, Mass.*

AMERICAN OPTICAL CO., Dept. NG8, Southbridge, Mass.
Without charge or obligation, please send me the booklet, "What You Should Know About Your Glasses."

Name_____

Address_____

City_____ State_____

The name of the man who fits my glasses is

_____

# A Happy Climax to

# Thanksgiving Day

Once upon a time . . . but why relate the plot when only the climax is important . . . the thrilling moment when Wife, Mother or Sweetheart tells you that your lovely gift of flowers has made her day a truly thankful and happy one. Don't forget to take home flowers Thanksgiving Day . . . the most beautiful token of love and devotion you can give.

**Send FLOWERS by WIRE** . . . Even though separated from loved ones, make your presence felt by a gift of beautiful flowers. They can be wired anywhere, instantly, at moderate cost, through any member of the FLORISTS TELEGRAPH DELIVERY ASS'N.

Whose anniversary is in

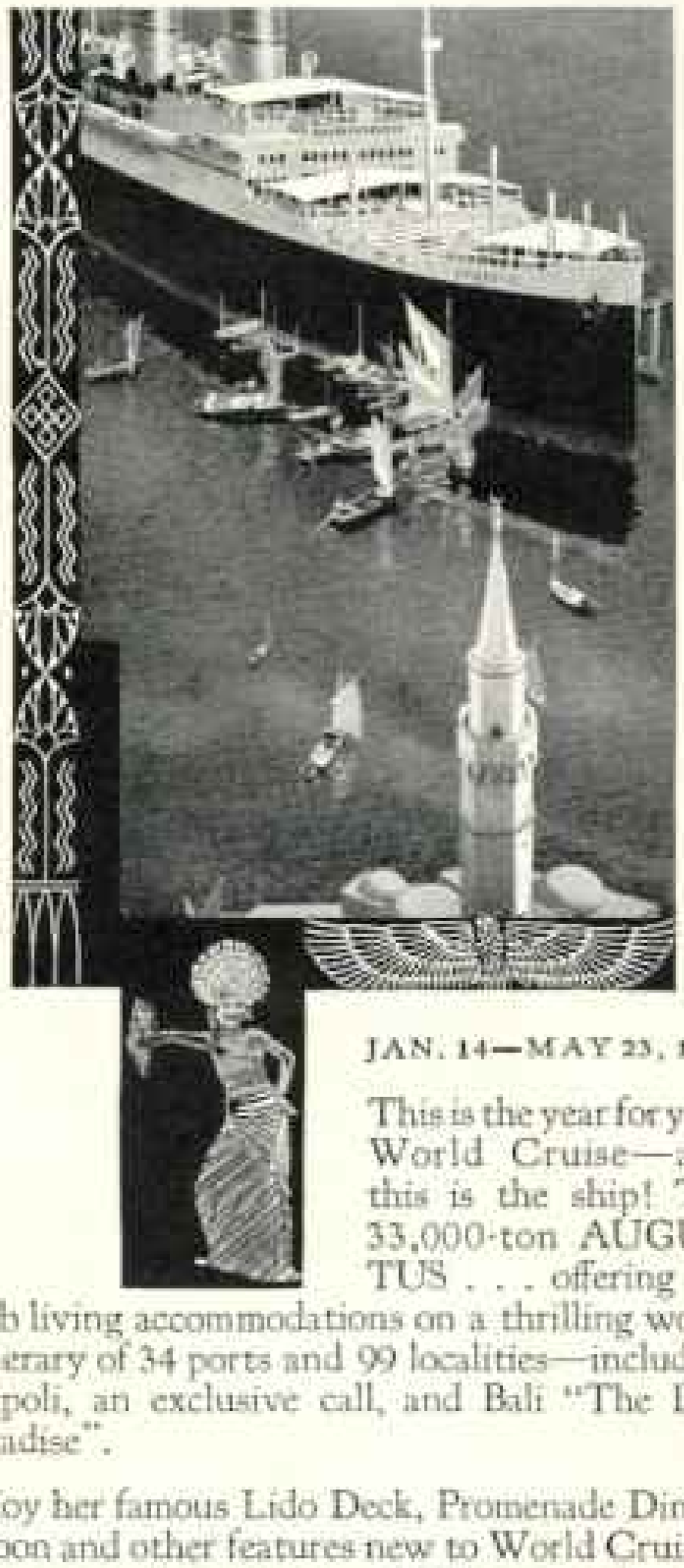



*Lido all the way*

# AUGUSTUS

[LARGEST MOTOR SHIP IN THE WORLD]

# WORLD CRUISE



JAN. 14—MAY 23, 1933

This is the year for your World Cruise—and this is the ship! The 33,000-ton AUGUSTUS . . . offering superb living accommodations on a thrilling world itinerary of 34 ports and 99 localities—including Tripoli, an exclusive call, and Bali "The Last Paradise".

Enjoy her famous Lido Deck, Promenade Dining Saloon and other features new to World Cruises! Rates are extremely low—$2100 up including 70 complete shore excursions directed by American Express. Write for complete literature.

Apply local agent or 1 State St., New York; 1601 Walnut St., Philadelphia; 86 Arlington St., Boston; 944 Arcade, Union Trust Bldg., Cleveland; 333 N. Michigan Ave., Chicago; 386 Post St., San Francisco; 129 Decatur St., New Orleans.

# ITALIAN LINE

In Cooperation with THE AMERICAN EXPRESS CO.

# The "Accident" Alibi

"IT was an accident" is a poor alibi for injuries which could have been prevented.

Ask yourself what caused the latest injury to one of your own family or to a friend. Was it a *true* accident which could not have been prevented or was it the result of carelessness? Most accidents are of the preventable kind.

Could any member of your family suffer a serious injury in your home because of hazards you have not removed? Could you walk safely in any part of the house, day or night, without fear of falling over some temporary or permanent obstruction?

Last year in the United States there were almost as many deaths from accidents in homes as there were from automobile accidents. Many cripplings which happened in homes could have been averted.

Scaldings from boiling liquids, burnings from fire and hot surfaces, could have been prevented by greater thoughtfulness. Most of the injuries from sharp tools and instruments could have been prevented by carefulness. Investigating gas or gasoline leaks with a lighted match is a direct invitation to a disastrous explosion.

There were about 17,000 fatal injuries in industry last year in the United States and 29,000 in homes. Well managed industries have learned how to reduce the number of accidents during working hours through regular inspection and protective measures.

Why not inspect and protect your own home? Look around now—carefully—to see what can be done to make your home safer.

Send for and use the Metropolitan "Home Inspection Chart" which lists many of the places where dangers may lurk in your home. Your copy of the Chart and also a booklet, "Accident Prevention in the Home" will be mailed free. Address Booklet Dept. 1132-N.

### *Are there unsuspected or unheeded dangers in your home?*

**Brooms, pails, boxes, toys or other objects placed where someone might trip over them?**

**Unlighted stairways?**

**Rickety steps, loose banisters or hand-rails?**

**Unsecured rugs, slippery or highly polished floors?**

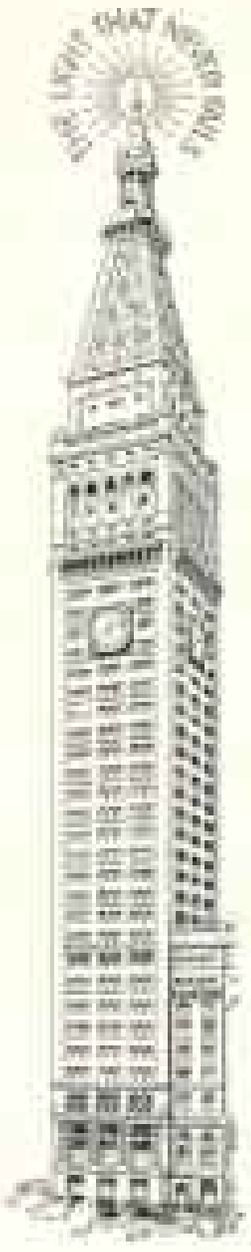
**Wabbly ladders?**

**Leaky connections in gas heater, range, furnace or lighting fixture?**

**Defective electric wiring or appliances?**

**Matches within reach of children?**

**Unlabeled poisons?**



METROPOLITAN LIFE INSURANCE COMPANY

FREDERICK H. ECKER, PRESIDENT — ONE MADISON AVE., NEW YORK, N. Y.

# "They must have added more pieces to that orchestra"

BUT not a single piece had been added!

The new PHILCO, the only radio scientifically designed as a musical instrument, had brought new notes—both high ones and low ones—into the home.

The orchestra the family had listened to so often and liked so well had been transformed. Through the magic of PHILCO'S reproduction, it now seemed a larger, infinitely superior musical organization.

No note is broadcast that PHILCO will not reproduce truly—as softly as you may desire or with tremendous volume. No sound on the air is too subtle for PHILCO—the only radio scientifically designed as a musical instrument.

See PHILCO. Note the beauty of its cabinet-work, the hand-rubbed finish that makes it truly an outstanding example of the furniture craftsman's art. Hear PHILCO. Then you will appreciate the richness of its tone. Buy PHILCO. The most economical means of entertainment and enjoyment available. Enjoy PHILCO. Every waking hour!

A nearby PHILCO dealer will be ready and happy to demonstrate this musical instrument of quality and versatility—truly all instruments in one!

**$36.50 to $295.**

Tax Paid

PHILCO MODEL 15X, shown above, $150 Tax Paid—PATENTED—Contains every worthwhile radio improvement—many exclusively PHILCO. Musicians, especially, appreciate the following scientific points of superiority:—1. The PHILCO Inclined Sounding Board throws all sound up into field of listener, making all high notes heard for the first time. 2. Large area of sounding board insures full reproduction of low notes. 3. Echo Absorbing Screen at the back prevents echo and blur, the first radio to deliver sound only from front of speaker. 4. Open sounding board instead of sound chamber affords clear unbound tone.

*Philco-Transitone Radio (superheterodyne) for motor cars and boats, average price complete, installed and tax paid on cars equipped with aerial, $69.50. ALL ELECTRIC (no dry batteries) $79.50.*


PHILCO · PHILADELPHIA · TORONTO · LONDON

# PHILCO

*A musical instrument of quality*

PHILCO REPLACEMENT TUBES IMPROVE THE PERFORMANCE OF *ANY* SET

# Your appetite asks for it—often!

When a soup has such a glowing and unforgettable flavor that you instinctively come back to it in your appetite's memory—crave it—insist upon having it—then that soup must have a special and individual goodness all its own. If you could ask the people of the United States and Canada what soup they like best and serve most often, the combined and enthusiastic answer would be: "Campbell's Tomato Soup!" If you serve it whenever it will appeal to the family, it will be on your table *regularly!*

*See full list of*
*21 Campbell's Soups*
*printed on the label*


LOOK FOR THE RED-AND-WHITE LABEL

# National Geographic Magazine

WASHINGTON, D. C.

## A Message to the Readers of The National Geographic Magazine on the Return of the Public Sense of True Values

THE gradual return of a public sense of true merchandise value is one of the most encouraging signs on the business horizon.

As this public tendency to insist upon sound quality rather than low prices for inferior products grows, everyone will benefit. Consumers will get more genuine value and lasting satisfaction from their expenditures. Dealers and manufacturers can make normal profits. Their employees, in turn, will have more work and continuous wages.

Despite recent trends, your Magazine has, as always, insisted that its pages be used only by advertisers whose products and services assure its readers of that sound value and lasting satisfaction.

By patronizing the advertisers using The Geographic you are making certain of full and fair returns from your expenditures. You are also assisting in the return of public confidence in true values; a vital psychological step in the determination to reestablish normal prosperity throughout the nation.

Sincerely yours,

L. W. Gillett

Director of Advertising

# *He is calling You!*

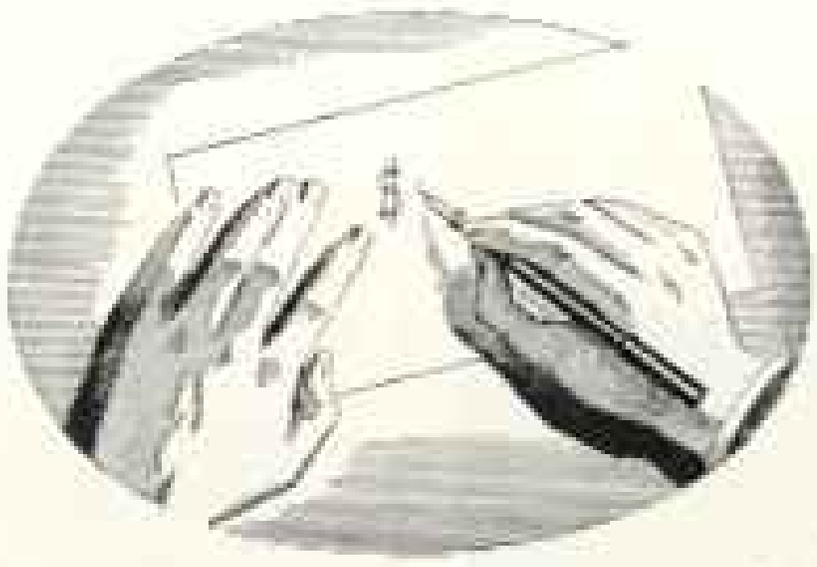
You are likely to think of the telephone from your individual point of view, as a convenience, as a necessity, as a means of transmitting to others your own thoughts and desires.

But your telephone is of equal importance to those who wish to get in touch with you. Right now as you are reading, someone, somewhere, may be calling you. It may be merely a friendly greeting . . . or news of importance to change the course of your life.

"Have dinner with us tomorrow." . . . The greater part of social goings and comings are maintained by telephone. "Come quickly! You are needed." . . . In crises and emergencies the telephone is indispensable. "That contract is entirely satisfactory." . . . Wheels of industry move in direct response to messages received by telephone.

In a moment your telephone may ring. It may be a call from across the street, across the continent, across the sea. As you receive this message, of vital importance or mere daily detail, you share in the benefits of the great chain of communication which links up the activities of the world.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY



# Write your own income

## *The Equitable will guarantee it!*

If you want to retire on a guaranteed income of $100, $150, $200 or more every month as long as you live, just write the amount you desire on the coupon below and The Equitable will show you a simple, practical way to secure it.

Some men say, "I *wish* I could retire" but they never *do anything* to accumulate the necessary cash reserve. The Equitable's plan makes it easy for you to *do something* that will accumulate the necessary amount.

Make *your* wish a reality. Fill out the coupon below for interesting booklet of retirement income facts.

Remember this one important thing: An Equitable Retirement Annuity will guarantee you a check every month as long as you live, beginning at the age you designate. Remember also that this check will represent a *larger* yearly return on your cash accumulation than you could get from any other equally safe program. You are invited to fill out the coupon, now.

**THE EQUITABLE**

FAIR—JUST

**LIFE ASSURANCE**

SECURITY—PEACE OF MIND

**SOCIETY**

MUTUAL—COOPERATIVE

**OF THE U.S.**

NATION-WIDE SERVICE

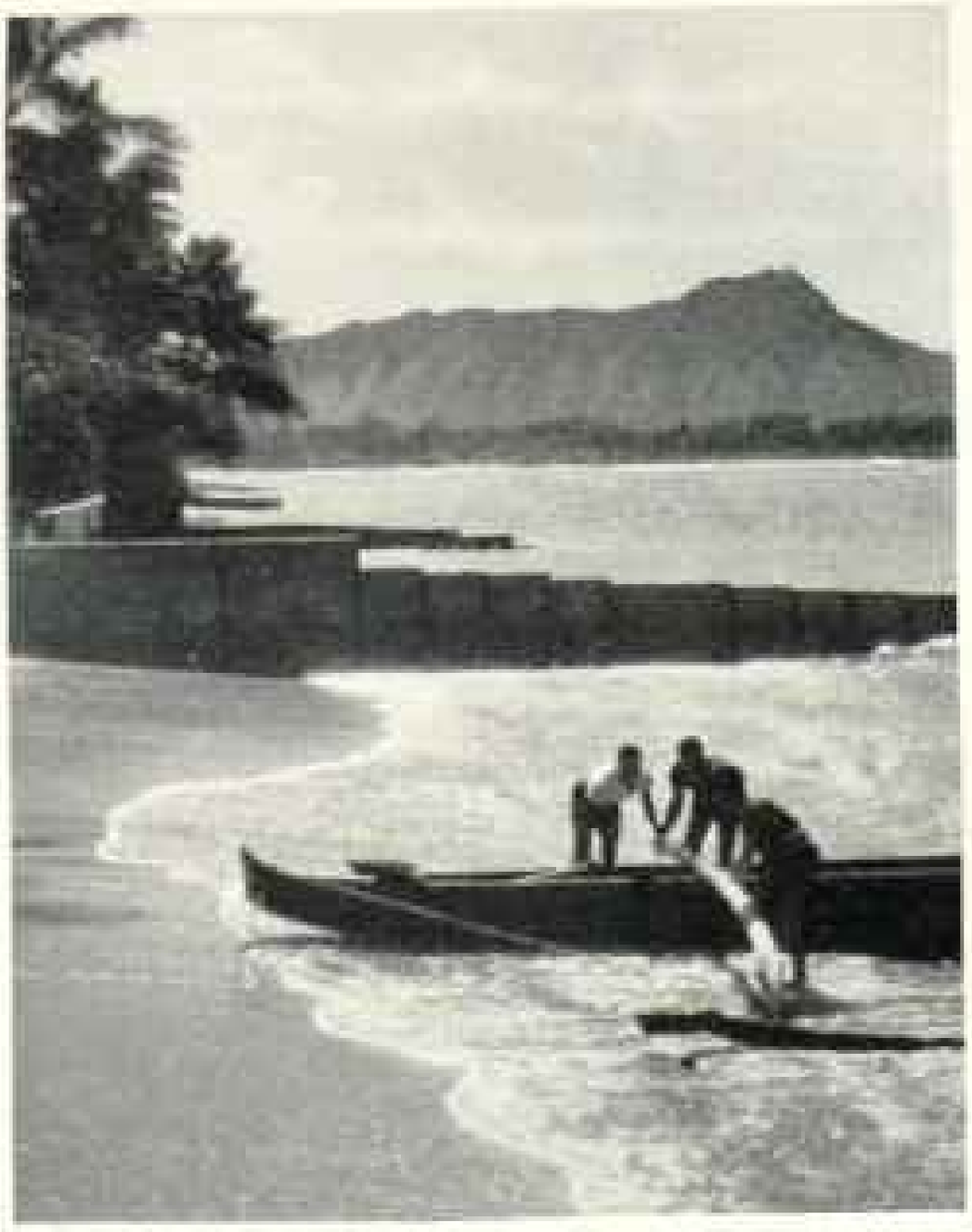
The Retirement Annuity is but one of the many forms of Self-Income and Life Insurance service available through The Equitable.

The EQUITABLE Life Assurance Society of the U. S., Thomas I. Parkinson, *President*
393 Seventh Avenue, New York, N. Y. 30 G

Please send me information about a Retirement Annuity for $_____ a month.

NAME _____ AGE _____

ADDRESS _____



# 21 Glorious Days for Less than $300

For all those who have known Hawaii's caress—its unhurried peace and joyful contentment—Mark Twain wrote:

"... No alien land in all the world has any deep, strong, charm for me but that one; no other land could so longingly and beseechingly haunt me, sleeping and waking, through more than half a lifetime, as that one has done.

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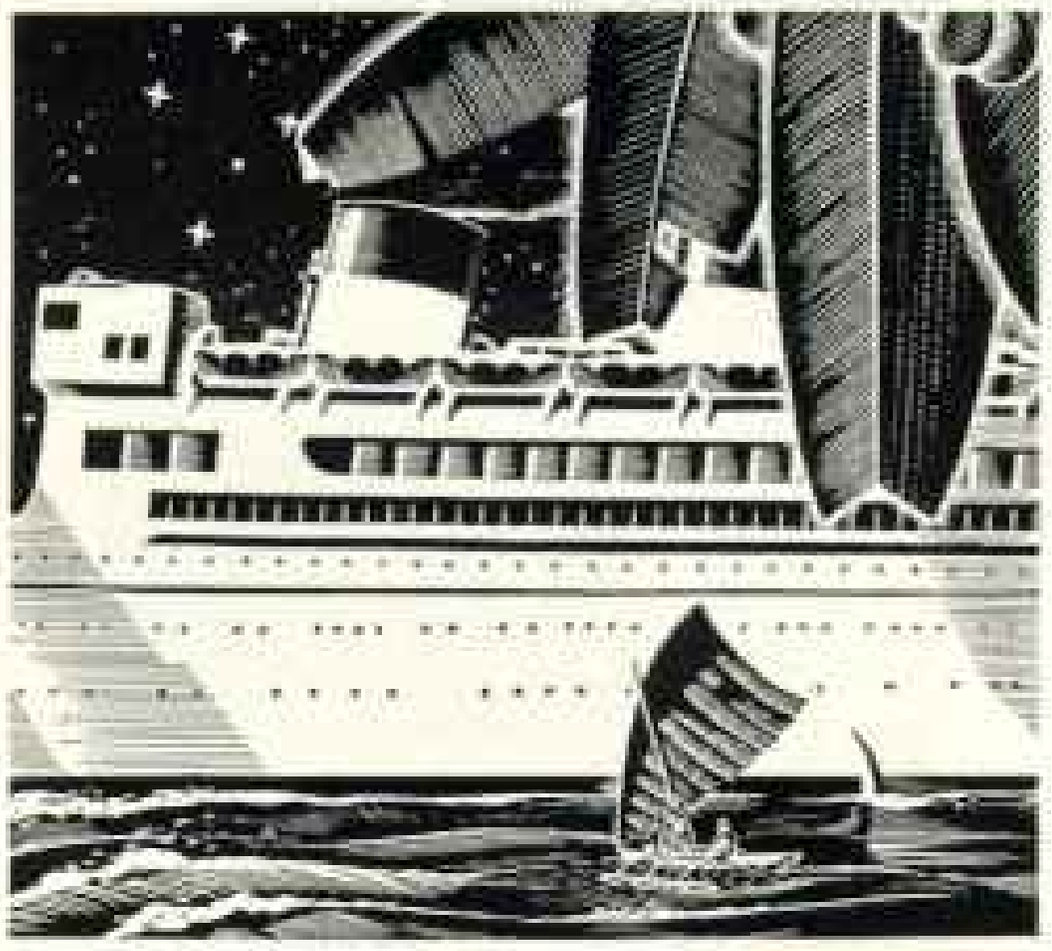

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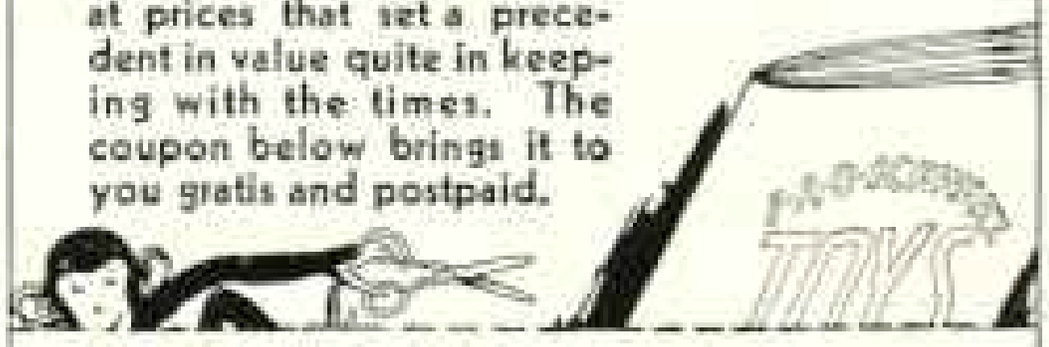


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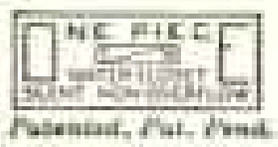


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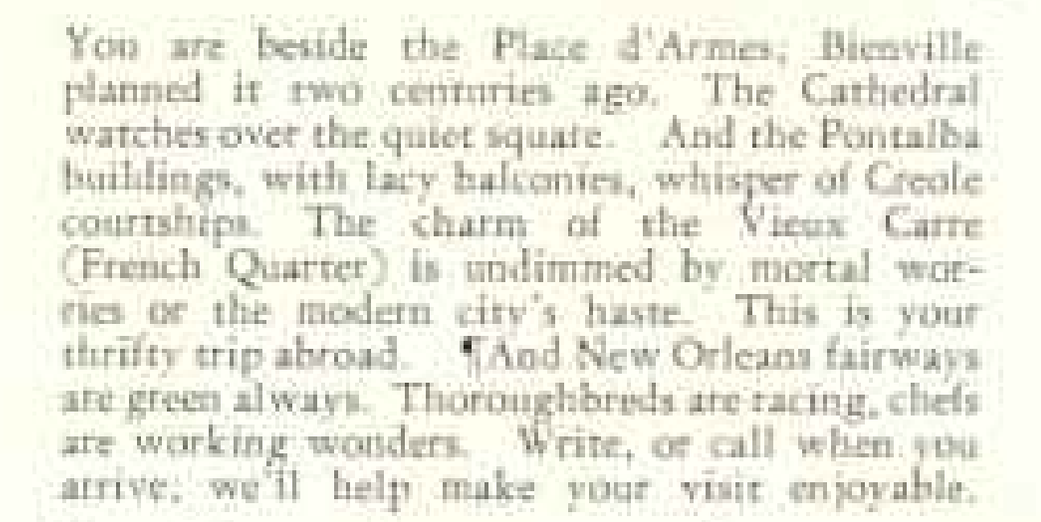

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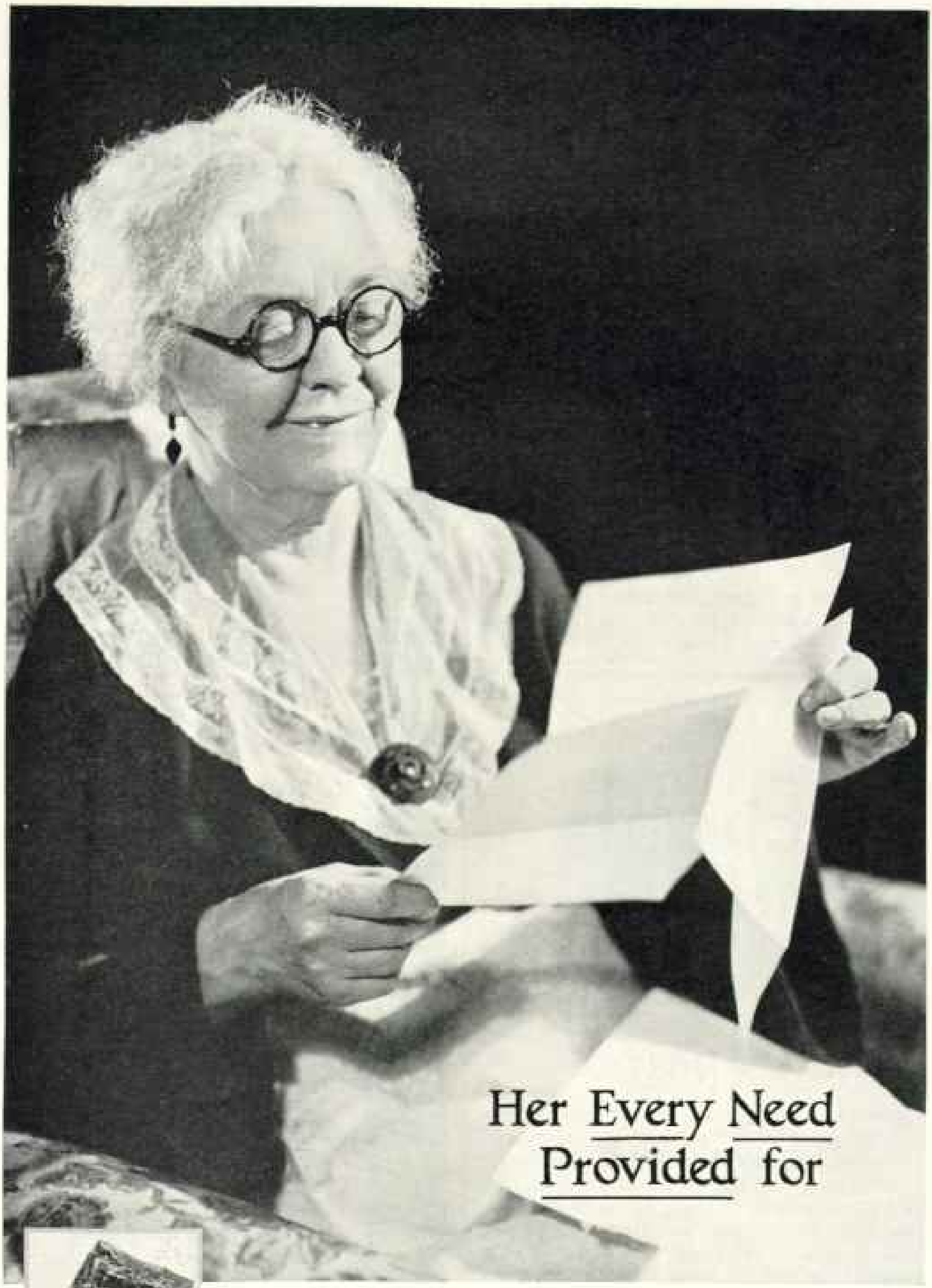


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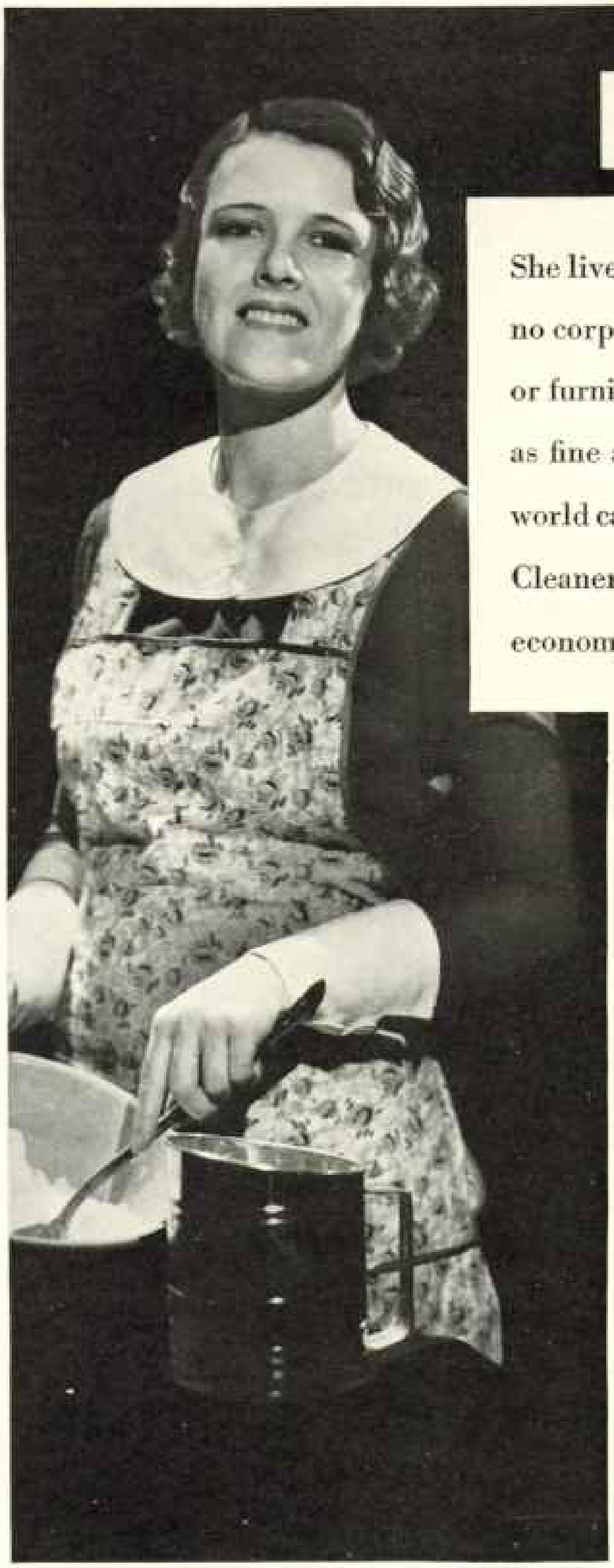

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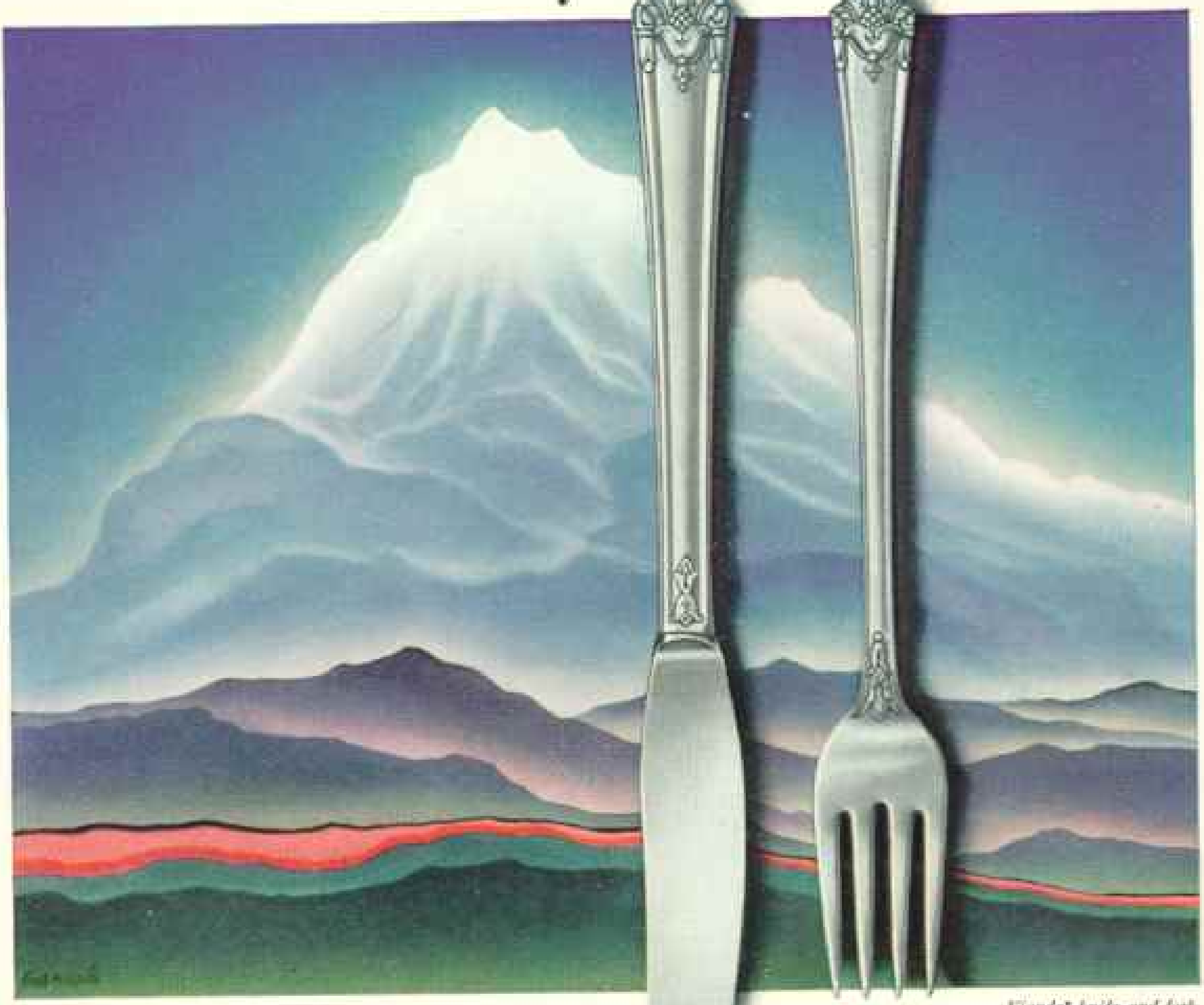

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