VOLUME C NUMBER SIX

THE NATIONAL GEOGRAPHIC MAGAZINE

DECEMBER, 1951

New Map of the World
41 by 26½ Inches, in 10 Colors

Sixty-four Pages of Illustrations in Color

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
WASHINGTON, D. C.

$6.00 A YEAR 60c THE COPY

VOL. C, NO. 6 WASHINGTON DECEMBER, 1951

THE NATIONAL GEOGRAPHIC MAGAZINE

"Around the World in Eighty Days"

By NEWMAN BUMSTEAD

JULES VERNE, the imaginative French novelist, sent Phileas Fogg around the world in 80 hectic days. Resolutely and tirelessly, this fictional traveler pushed onward by steamship, train, elephant back, and prairie ice sled. The year was 1872.

I too went around the world in 80 days, but, unlike Phileas Fogg, I traveled a total of only six days and spent the remaining 74 meeting the people and seeing the sights of 24 lands. The year was 1951; I went by air.

A sheaf of National Geographic Society maps, as faithful and untiring as Fogg's servant Passepartout, identified the wonders of the scene below. They helped plan before I left home and reminisce after I got back (page 713). My mission as a NATIONAL GEOGRAPHIC cartographer was to link The Society's new 10-color World Map with a globe-circling bird's-eye view.

Carrying Tree Seeds to Iceland

At the very outset of my journey, I felt the impact of Air Age geography. In the short hour between New York's International Airport and Boston I met Dr. Sturla Fridriksson, a young Icelandic forester. He was homeward bound with small bags of tree seeds collected in Tierra del Fuego, on South America's southernmost tip.

"Why go so far for tree seeds?" I asked.

"That's simple," he replied. "Tierra del Fuego occupies a position in the Southern Hemisphere similar to Iceland's in the Northern. Both have cold, windy, wet climates. But Tierra del Fuego has forests; Iceland doesn't. With these seeds we are going to try to grow some trees at home."

In Boston our Pan American World Airways Constellation picked up a brave little pair of displaced persons, displaced in reverse because they were bound to, rather than from, Europe. Fred and Martha Ball they were, orphans from Worcester, Massachusetts, flying to Norway to live with their grandmother and aunt.

Fred's 11 years didn't seem to fill his felt hat and military-type topcoat, both of which were stiff with obvious newness. Nine-year-old Martha, or Sister, as Fred called her, clutched a doll in her arm as she came aboard.

From Massachusetts' golden-domed State House, on Beacon Hill, to Cape Ann, Fred sat with me, poring over my map as it pointed out Winthrop, Revere, Lynn, Swampscott, Marblehead, and Gloucester on a rock-bound coast that had lost its sternness in the hazy dusk of New England's spring twilight. Stewardess Eleanor Gabunas and Sister, like women everywhere, suffered no dearth of conversation.

Hours later over Nova Scotia and Newfoundland we saw the single lights of farm dwellings that spoke of loneliness. Like the embers of a dying campfire, the lights of an occasional village shone up at us.

Our first of two North Atlantic stops was Gander, Newfoundland.* Light snow and field attendants who blew into their hands to keep them warm contrasted sharply with the New England springtime.

Smoke Marks Hekla Volcano

Next morning after we had breakfasted and refueled at Iceland's Keflavik Airport, I saw long-familiar place names come to life: Reykjavik, capital city for the little nation's 142,000 citizens; Thingvellir, an almost indistinguishable clump of two or three dwellings at the head of a lake; Hekla, the volcano, marking its position with a banner of smoke; and Vatna Jökull, Iceland's vast glacier,

*See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Newfoundland, Canada's New Province," by Andrew H. Brown, June, 1949; and "Newfoundland, North Atlantic Rampart," by George Whiteley, Jr., July, 1941.

smooth and dazzling-white like new-fallen snow in winter sunshine.

I had come into the upper left-hand corner of The Society's map of Europe and the Near East, on a larger scale than the Top of the World map I had used from Boston.

We passed the Faeroes rising sheer, rocky, brown, and barren from the North Atlantic. Soon we glimpsed Bergen, Norway, and, beyond, the inner reaches of Hardanger Fjord, which came into view just before we landed at Oslo (page 714).

Strange Tongues Cause Embarrassed Silence

From the terminal building ran a little boy, sputtering Norwegian greetings to his American cousins. Only a word or two in English from Fred were required to establish the fact that there was no understanding either way. Exuberant good cheer was quickly displaced by silent awkwardness.

It was in the crowd at customs that I last saw them, Fred with his felt hat and military topcoat and Sister clutching her doll. Beside the grandmother they stood, mute and alone—oh, so alone, I thought.

But I hadn't reckoned with the adaptability of youth that was so evident in Fred's letter, received a few weeks later in Karachi: ". . . . Thanks for the chocolates. Yesterday was May 17th, Norwegian Independence Day. We had a parade, and everybody was yelling 'Hurrah.' Having lots of fun . . . . P. S. When you write your children, give my regards. P. P. S. Give Sister's regards, too. Fred Ball."

Early on a Sunday morning, in mist that bore a tang of the sea, I watched

National Geographic Photographer J. Baylor Roberts

Eleven Feet of Ticket for 31,000 Miles of Flying

Newman Bumstead, who helps make the National Geographic Society's maps, here prepares to fly around the globe. He devoted a solid month to preparation, selecting 30 stops and fitting them into airline schedules. The 10-color World Map accompanying this issue illustrates his trip. The author encountered temperatures ranging from freezing in the North Atlantic to 112° in India. These extremes presented a clothing problem, but he kept his luggage below the 88-pound limit. Pan American's Margaret Russell sells the complete ticket in Washington, D. C. Its cost: $1,943.10.

International News

London's Oily Traffic Lanes Weave a Dark Pattern Around Trafalgar Square

Horatio Nelson's 184-foot monument dominates the scene. Battle lamps that lit his flagship at Trafalgar now burn on the square. The Mall begins at Admiralty Arch (lower right). Left: the National Gallery and, facing it, St. Martin's in the Fields.

Oslo take to the woods and snow of Holmenkollen, where the skiing events of the 1952 Olympics will be held in February. With skis, rucksacks, and bright, shiny faces, quick-stepping young people from seven to seventy funneled into the subway which connects with the hill-climbing Holmenkollen line.

What impressed me was the contrast between Oslo's snowless streets and the holiday crowds dressed in winter sports clothing.

Standing near me at the subway entrance was a friendly young fellow wearing blue knickers and knee-high gum boots. He peered expectantly into approaching faces.

"Where are you going?" I asked him.

"To walk in the forest," he answered in English.

"Alone?"

"No. With a friend."

She appeared in a few minutes, wearing a similar outfit: knitted cap, blue knicker suit, rucksack, and knee-high gum boots.

With a "cheerio" and smiles to me they were off, arm in arm. In 20 minutes they would be in snowclad wilderness.

By subway and electric line (its cars permanently fitted with ski racks) I went from sunless, snowless streets to Frognerseteren, 1,371 feet up. In bright sunshine I watched skiing, hiking, and just plain loafing on beds of fir boughs laid in the snow.

The way to Frognerseteren led through hillside Holmenkollen, an area of fine residences that look out over the city, Oslo Fjord, and the mountains beyond.* I saw homes like

* See "Norway Cracks Her Mountain Shell," by Sydney Clark, NATIONAL GEOGRAPHIC MAGAZINE, August, 1948.

TOH Gilbert Grosvenor

Schools Close and Children Cheer; the 17th of May Is Norway's 4th of July

Norway's Constitution was signed on May 17, 1814. In Oslo thousands of school children celebrate the day by marching to the Royal Palace for review by the King. These young flag wavers, having finished their part in the parade, join the cheering onlookers.

Hänsel and Gretel gingerbread houses, weathered to a soft brown, roofed with sod, and capped with a foot-thick layer of snow.

Next morning I sought democratic, 14-year-old Prince Harald at an Oslo public school where he mixes freely and on equal terms with boys and girls from all walks of life.

"Of course you may see him," said Dr. Bjørje, the principal. "Just stand here. He will be one of the boys who change classes on this floor in a few minutes."

"But which one?" I asked as the students poured from their classes.

"No, I won't tell you that," said Dr. Bjørje with a smile. "The fact that you can't pick him out is proof that he is part of the group, a condition that would cease to exist should we display him to visitors."

Prompted by an interest in the ability of Norwegians to speak English, I suggested observing an English class. Suddenly, to my surprise, I found myself seated on a platform in front of 25 girls, all pretty, all giggling.

And how do they learn English? For an hour they read selections from an American edition of O. Henry's *The Trimmed Lamp* in English, then in Norwegian, followed by a discussion of the plot in English and French.

From Oslo Fjord to Copenhagen

"We fly south to the mouth of Oslo Fjord and then head straight for Copenhagen," said Capt. John Christiansen next day as he penciled his course on my map.

The route lay along Sweden's Kattegat coast to Öre Sund, the three-mile-wide bottleneck between Baltic and North Sea waters through which slipped warships of the German fleet for the invasion of Norway in 1940.

Arriving in Copenhagen (København) late in the morning, I went straight to Amalienborg Palace to see the noontime changing of the royal guard.

Beside me stood a middle-aged man, hatless, wearing a weathered trench coat and carrying a brief case.

709 National Geographic Photographer Maynard Owen Williams

To Win Her Prince, the "Little Mermaid" Sought Human Form and an Undying Soul

Failing in her quest of love, the fairy tale mermaid was changed to a daughter of the air. For 300 years she must diffuse the scent of flowers all around; only then can she gain a soul and the joys of mankind. Copenhagen's bronze statue immortalizes Hans Christian Andersen's princess of the deep.

"Nice morning," I ventured, thinking he might be an English-speaking Dane. He was.

"It's not morning. It's afternoon," he responded.

Seven-and-a-half-hour Conversation

Thus began a conversation with newspaperman Aage Birch that lasted seven and a half hours. It impressed me with the friendliness of the Danes and the pride and love they feel for their capital.

For half an hour we talked while guards wearing big, bushy, bearskin hats clomped on the cobbles of Amalienborg Plaza.

For two hours we talked while we lunched at Tivoli Gardens.

Tivoli has no exact counterpart in the United States, but nevertheless it strongly suggests the American scene. Take a "Boston Pops" concert, a touch of Coney Island, the playground of a well-managed private school, the summer music festival from Tanglewood in the Berkshires, stir thoroughly, sprinkle with sidewalk cafés and friendly, hearty, soft-mannered Danes of all ages and from all walks of life—this isn't the exact Danish recipe, but it may suggest the flavor.*

We talked on the bus back to the hotel.

"You must be tired, but you should see New Harbor," pleaded Birch, his pride in Copenhagen getting the better of his concern for my stamina, which was suffering not at all.

So we talked our way along New Harbor's three blocks, lined almost solidly with pubs. From one came the strains of *Good Night, Irene*.

In the Church of Our Saviour, around whose steeple winds a corkscrewlike staircase, we ceased talking. At the altar Povl Andersen was taking Inge Jensen to be his bride.

"Could you go on for another half hour to

* See, in the National Geographic Magazine: "2,000 Miles Through Europe's Oldest Kingdom," by Isobel Wylie Hutchison, February, 1949; and "Royal Copenhagen, Capital of a Farming Kingdom," by J. R. Hildebrand, February, 1932.

Sled Dogs Pant, Skiers Sun-bathe 11,000 Feet up in Swiss Sunshine

Jungfraujoch, in the Alps, offers year-round snow sports. Europe's highest railroad, tunneling most of its 5.8 miles through solid rock, takes visitors to the scene. Here the author met a scientist in ski costume who was burying cosmic-ray test plates in the snow (page 723). These huskies are descendants of 20 dogs brought from Greenland in 1912 with the help of Roald Amundsen.

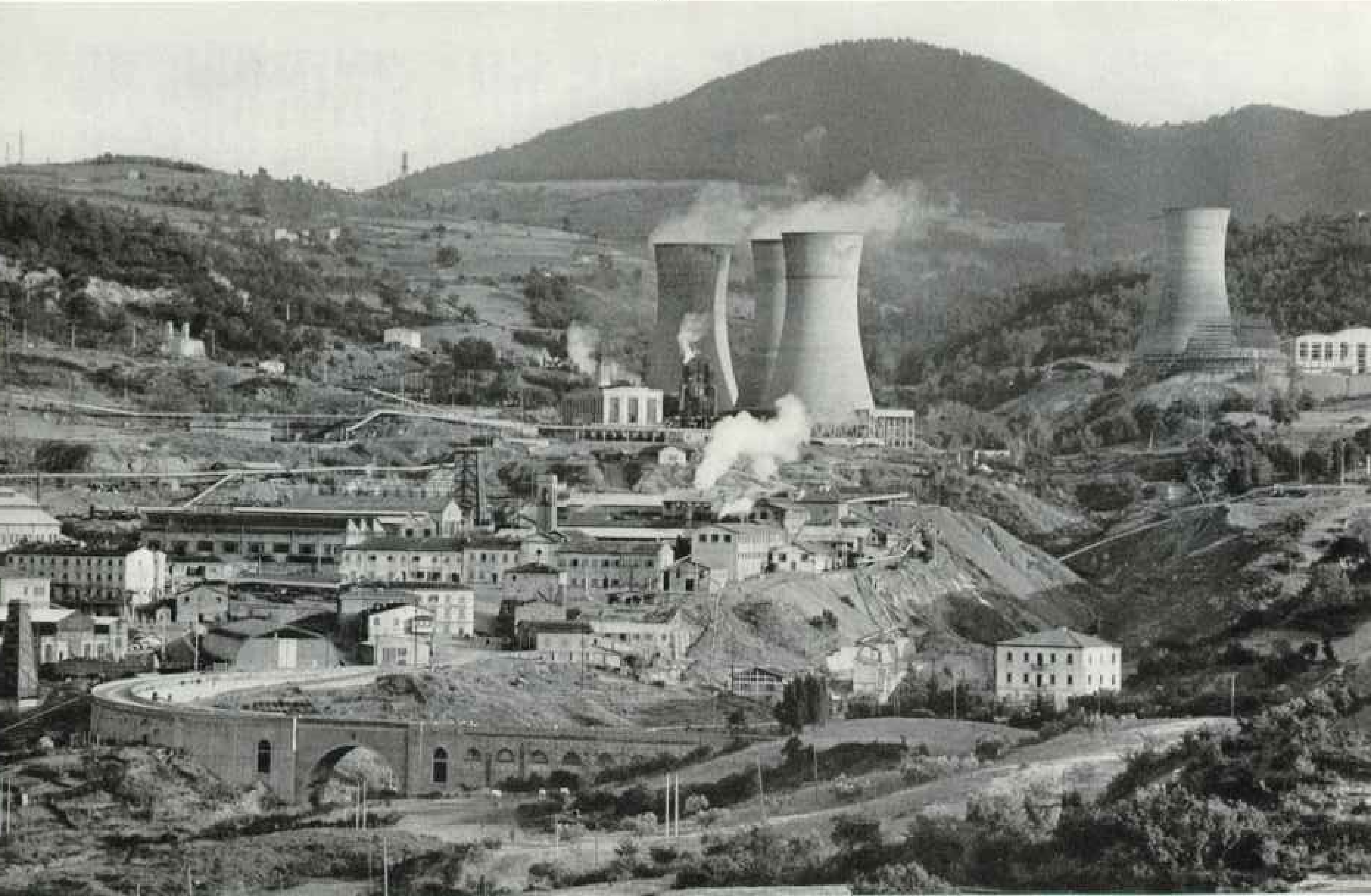
Earth's Steam Makes Electricity in Italy

Volcanic steam jets turn Larderello Valley into a natural power plant. Some of these vents have been capped and harnessed to turbines driving generators.

The author, flying over Pisa, spotted Larderello's spool-shaped concrete towers from a distance of 40 miles (page 727). These huge condensers cool volcanic steam to water. After cleaning, the water is reheated by more volcanic steam. This purified steam drives the generators. In 1950 Larderello collected 10 million pounds of boric acid and borax as by-products from the steam-cleaning.

Italy obtains a twelfth of her power from Larderello. With almost no coal, she depends on water power for 88 percent of her electricity. Drought, a hazard to hydroelectric plants, has no effect on Larderello's steady output.

National Geographic Photographer
Willard R. Culver



see the Round Tower, where Peter the Great is believed to have driven his horses up the spiral stairway?"

So on we went and on we talked as Birch showed me Copenhagen like an art collector displaying his choicest treasures.

Finally, at 7:30, we stopped in front of my hotel. I thanked him profusely, shook hands, and said, "I'll see you again, Mr. Birch."

He paused, gripped my hand, and smiled. "No," he answered, realistically; "no, you won't."

He turned, and the gray, hatless head, the shabby trench coat, and the brief case disappeared in the crowd.

Over Blasted Helgoland

For well-known and easy-to-spot geography, it would be difficult to surpass the 15.2 inches between Copenhagen and London on the National Geographic's map of Western Europe.

First the distinctive forms of Danish islands came into view, matching themselves one by one with their names on the map. For 10 minutes we flew over Schleswig's narrow neck; next came Helgoland.

Here on April 18, 1947, with a Bikinilike blast of 6,700 tons of explosives, the British Navy demolished the German batteries and submarine pens of this tiny island which, during two wars, had been a thorn in its side.

The Frisian Islands' unmistakable shapes flashed beneath us, followed by the 20-mile dike between the fresh water of Zuider Zee (IJsel Meer) and the North Sea's briny deep.

After some 40 miles over the North Sea we sighted the Kent coast, Canterbury, Epsom Downs Race Course, and finally London, sprawling and smoking on the banks of the Thames (page 707).*

I was greeted at the airport by Robert J. Reynolds, of The Society's staff, who had flown the Atlantic nonstop to Ireland a few days earlier. His time between New York and Shannon Airport, 13 hours, reminded me of a prophecy made by Alexander Graham Bell in the NATIONAL GEOGRAPHIC MAGAZINE 38 years ago (June, 1914, page 665).

"Calculation shows that . . . . our best machines should be able to cross the Atlantic in 13 hours," said Dr. Bell.

So visionary did the distinguished inventor regard the prediction that he added, "I hardly dare to say it aloud for publication."

Bob and I visited the Houses of Parliament (page 715), where we heard socialized medicine debated. Amplification is by "soft" speakers instead of the usual "loud" variety. In the backs of the gallery benches amplifiers operate at a very low pitch, which doesn't disturb the M.P.'s on the floor.

Westminster Abbey's hoary interior walls were being cleaned. Although the Stone of Scone had recently been retrieved from Scotland, it was not in evidence, but we were shown its historic resting place under the seat of the Coronation Chair. Here, since the crowning of Edward II, this block of sandstone has figured in six centuries of English coronations. It made its first trip from Scotland in 1297.

At Lloyds in Leadenhall Street we lunched in the Captains' Room. The name stems from the days before wireless, when returning ship captains were wined and dined while they reported directly to their underwriters. In this world-famous institution, insurance has been, and is, written on risks varying from a £100 policy on Napoleon's life to a National Geographic Society stratosphere balloon or San Francisco's cable cars.

One evening we walked to Grosvenor Square to join Sara Revis, of the American Embassy staff. In her tiny English car we drove to Windsor Castle, where on the following day Frederik IX of Denmark was to be made a Knight of the Garter. From the castle's heights we watched the sun go down into the peaceful green countryside, green as only England in the spring can be green, I thought.

Through Eton we drove as boys with blue caps and shin guards were leaving the cricket field. On the Thames at Marlow bridge we dined at the Compleat Angler Inn whose name reflects the popularity of the region with modern Izaak Waltons. Stately white swans, the King's property, swam in the river.

Next day, standing alone on Westminster Bridge over this same Thames, I listened to Big Ben bong out the hour into the gray London morning. Here I sensed the intensity of British tradition.

The Netherlands' Miami Beach

Flying to Amsterdam, I sat with P. R. Moenking, a Dutch carpet merchant. He pointed out the Hook of Holland (Hoek van Holland); the big port of Rotterdam; The Hague ('s Gravenhage), seat of his country's Government; Leiden, the university city; and the North Sea resort of Noordwijk ann Zee.†

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "The British Way," by Sir Evelyn Wrench, April, 1949; "Yanks at Westminster," by Capt. Leonard David Gammans, August, 1946; "London Wins the Battle," by Marquis W. Childs, August, 1945; "As London Toils and Spins," by Frederick Simpich, January, 1937; and "Some Forgotten Corners of London," by Harold Donaldson Eberlein, February, 1932.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE: "Mid-Century Holland Builds Her Future," by Sydney Clark, December, 1950; and "Holland Rises from War and Water," by Thomas R. Henry, February, 1946.

© National Geographic Society 711 Photograph by John E. Fletcher

A Modern Phileas Fogg Maps His 80-day Trip Around the World

Unlike Fogg, Jules Verne's fictional 80-day wonder who circled the globe by ship, train, elephant, and sled in 1872, Newman Bumstead (right) spent only six days in elapsed travel time. By flying, he conserved 74 of his 80 days for sight-seeing in 24 lands and territories.

Mr. Bumstead, National Geographic research cartographer, took with him a set of The Society's 10-color maps. They served him as airborne signboards. Using the recent map of Western Europe, he identified rivers, mountains, and cities with ease. Highlights of history printed on the Classical Lands and the Bible Lands maps illuminated his Mediterranean tour.

Here Mr. Bumstead outlines his global route to James M. Darley, The Society's chief cartographer. Red pins in the World Map represent ground stopovers; yellow pins, refueling stops.

The painting reproduces in oil a photograph of a square-rigged bark. Entitled *Argosy of Geography*, the picture was made in the Caribbean 31 years ago by John Oliver La Gorce, Associate Editor of the National Geographic.

Norway in the Spring: Blooms in the Fjord, Ice on the Mountains

Plum, cherry, and apple trees flower in Hardanger Fjord almost at the feet of glaciers. The valley, not far from Bergen, is as close to the North Pole as Labrador's northern tip. Its climate, milder than snowy peaks suggest, is moderated by warmth piped north by the Gulf Stream.

The author flew over the fjord on his way to Oslo, where he found schoolgirls reading an O. Henry story in English, then discussing it in French and English.

Strollers wear old-time folk costumes usually stored away for festive occasions.

Hardanger people busy themselves with farming, fishing, boatbuilding, wood carving, and the making of Hardanger fiddles. The Hardanger fiddle differs from the conventional violin in that it has four supplementary steel strings which produce a droning undertone to the gut strings. Its music resembles that of the Scottish bagpipe.

Kodachrome by Pat Hill

London's Big Ben Booms the Hours over the Houses of Parliament

→ England's lawmakers have convened here beside the Thames since 1547. The Houses of Parliament, badly damaged by bombs during World War II, are now completely restored; they are officially titled New Palace of Westminster. Resonant tones of the clock are vibrant with British tradition. ↓ Mounted sentry at the Royal Horse Guards headquarters in Whitehall is a member of the Household Cavalry's Life Guards Regiment.

George VI Passes the Courts of Justice on His Way to Open the Festival of Britain

Matched Windsor grays draw the King's carriage. Next comes Princess Elizabeth's conveyance. Royal Horse Guards, or Blues, follow. Foremost troops are Life Guards. The route is sanded for safe footing.

Rothenburg's Big-drink Festival Re-enacts a Gargantuan Gulp

When Gen. Johann Tilly (enacted by man in center) captured the German town in 1631, he ordered its councilmen hanged, but jocularly offered to spare them if any citizen drank three quarts of wine in one draught. A burgomaster accepted the challenge and saved his associates. Right: Author and present burgomaster.

German Girls Display Garments Made from American Donations

These young ladies attend a Darmstadt church adopted by the author's congregation in Washington, D. C. Sale of needlecraft like their aprons helped them rebuild their bombed-out parish house. Here they present to Mr. Bumstead a boutonniere made from an old felt hat, one of many American gifts.

Kodachrome by Luis Marden

Puerta de Alcalá, a Relic of Madrid's Old City Wall, Stands Like a Gate Without a Fence

Once the Spanish capital was surrounded by 20-foot-thick masonry. Three gates survive. One of them is Alcalá, built in 1778.

Bus-going Parisians Ride Standing, the Better to See Their Paris

→ Parisians look to cylindrical billboards, which they call *Colonnes Morris*, for information on the National Lottery, art shows, festivals, Follies, plays, movies, operas, concerts, and new books. A lampshadelike sign at top of this column says the National Lottery will have its next drawing on Wednesday. Lune Rousse (Russian Moon Theater) and 10 Heures (Ten o' Clock Theater) proclaim current attractions. Suze is a light apéritif. Geraniums add daytime beauty to the lamppost. Policemen carry white nightsticks.

↓ Neck-craning bus riders are so eager not to miss some interesting sight that they often stand on the platforms while seats remain vacant. Bio Dop is a toothpaste.

Kodachromes by Justin Locke

Building St. Peter's, Michelangelo Refused Pay, Saying He Worked only for Love of God

In the days of Nero, Christians were martyred on this Roman site, then the Circus of Caligula. Here the original wood-roofed St. Peter's stood for 1,200 years as the world's foremost church. The new St. Peter's, Christianity's largest edifice, was begun in 1506 by Pope Julius II. Construction required 120 years. Michelangelo, one of the principal architects, began his labors at the age of 71.

"Like your Miami Beach—lots of hotels and people spending money. All but the weather," he laughed.

At Amsterdam's Schiphol Airport I saw General Eisenhower's plane, *The Columbine*, and beside it a stiff array of Dutch and American officers waiting to see the General off. He was due to depart in a few minutes.

The few minutes lengthened to 20, to half an hour, to an hour, but still no General. The officials lost their stiffness, even smoked cigarettes.

Suddenly he arrived in a shiny black Ford sedan. From the driver's seat jumped Lance Corporal Gerard Deters, coming smartly to attention. General Eisenhower stepped out the other side. While the high-ranking officers waited (again in proper, stiff array), he walked around the car to speak a few smiling words to the lance corporal.

"That's what we like about him," said the cab driver at my side.

On one of Amsterdam's passenger-carrying canalboats I met Hank Verberkmoes, who took me to Edam. To see cheeses? No, to visit his ceramic studio, where I saw a dinner set destined for a Chicago family.

We spent the afternoon sailing on the Zuider Zee in a *boter* (butter) boat. This stubby fishing craft, unique to the Zuider Zee, is about 40 feet long, nearly a third as wide. As I crouched in its pitching cabin, too small for me to stand erect, my thoughts were of Winken, Blinken, and Nod and their experiences in a wooden shoe.

Bells Chime a Challenge

Back in Amsterdam that evening, I paused on a busy street corner to hear the chimes of the Royal Palace clock. Hank had told me of their song.

"Beware how strong we are," its words warn, referring to the citizens of Bergen op Zoom, in southern Holland, who centuries ago repulsed invading Spaniards.

Near by a tall, well-groomed police officer, wearing both sword and pistol, stood with dignity beside his mount, a bicycle.

"What are the bells playing?" I asked him.

He began to answer me in meager English.

"Isn't it something about 'how strong we are'?" I prompted.

"You know about that, do you?" he exclaimed in surprise, and his face lit up with warm approval of the foreigner who knew this proud bit from his country's past.

Our flight from Amsterdam to Frankfurt led up the Rhine over the smoking, industrial cities of the Ruhr. "Old Flak Alley," said Pan Am copilot George Smith, formerly of the Eighth Air Force.

At Frankfurt I had lunch and an hour of pleasant talk with Frederick G. Vosburgh and Volkmar Wentzel, there on editorial assignment for the NATIONAL GEOGRAPHIC, and departed for Darmstadt with the latter, who was to be my interpreter for a few days.

Visiting an "Adopted" Church

I went to Darmstadt to visit the people of St. John's Parish which was "adopted" in 1948 by my church in Washington, D. C., the Chevy Chase Presbyterian (page 717).

On the night of September 11, 1944, 250,000 incendiary bombs and hundreds of high-explosive bombs were dumped on Darmstadt, important producer of scientific instruments, chemicals, and machinery. Through death and desertion its population shrank from 115,000 to 40,000. The church was gutted.

The welcome given me by St. John's minister, stocky Dr. Hans Orth, was spoken with a sincerity that needed no interpreting.

He showed us the new parish hall, built from rubble, much of which was cleaned and stacked by children. To encourage these young workers, prizes of soap were awarded. Chevy Chase children, on the previous Halloween, had collected this soap for Darmstadt's needy instead of applying it to cars and windows.

As we were finishing dinner in the hotel that evening, Dr. Ludwig Metzger, mayor of Darmstadt for five years following the war, joined us with his wife.

"Tell me about the bombing," I urged. "Were you and your family in the midst of it?"

With some reluctance he began to talk. On that particular night he was away. His wife and one son of 8 years were at home in Darmstadt. The elder son, Gunther, then 11, was visiting on a farm 14 miles from the city.

Awakened by the thunderous noise, the people on the farm watched the terrible scene.

Gunther started running toward the barn.

"Where are you going?" demanded the farmer.

"To get my bicycle. I must go to my mother and brother. They are alone."

He was sent back to bed. But later, unnoticed this time, he slipped away and rode off into the night. By dawn he had reached the smoking ruins. His mother and brother had disappeared. Finally, after searching, he found them unharmed in a near-by village.

Recollecting Dr. Metzger's story, I see not his boy, Gunther, but my own 11-year-old son, John, riding home through the awful night; and war's tragedy becomes real and personal as nothing else has made it.

From Darmstadt Wentzel and I drove through New England-like Bavaria to Rothenburg on the Tauber, a medieval walled

National Geographic Photographer Volkmar Wentzel

Tenor Lauritz Melchior and the Author Met on the Clipper *Good Hope* over Germany

Boarding the Pan American plane at Amsterdam, Mr. Bumstead visited the crew in the cockpit. Seeing the singer there, he forwarded his National Geographic Society card with the scribbled message, "Are you a member?" Mr. Melchior smilingly waved assent. Mrs. Melchior (wide hat) poked her husband in the ribs, and volunteered, "He saves NATIONAL GEOGRAPHICS!" Using The Society's maps, the three spent the rest of the flight picking out German landmarks. Here at Frankfurt am Main after the ride up the Rhine, they part with Capt. E. J. Martin and stewardess Eleanor Gabunas.

town of turrets, gables, and cobbles that must have inspired many a fairy book illustrator.*

In 1631 General Johann Tilly besieged and finally entered Rothenburg. Provoked by their stubborn resistance, Tilly ordered the councilmen hanged. In jest, he promised mercy if any Rothenburger could drink, in one draught, a 3-quart pitcher of wine. One did. Rothenburg re-enacts the historic scene annually (page 717).

The costumed actors in the drama seemed to have walked out of a Rembrandt painting. Hoofs on cobbles, cannon fire mingled with musket shots, and the ringing of the town's bells so completed the realism of the medieval setting that Wentzel and I felt we had gone back to the year 1631, when the first "big drink" took place.

Another admirer of Rothenburg is John J. McCloy, U. S. High Commissioner for Germany, who, as Assistant Secretary of War, spared the town from shelling during World War II. In appreciation, after the war, Rothenburg made McCloy an honorary citizen.

Twice during the 80 days of my trip it was necessary to alter the schedule. Once this resulted in a longer stop, in Pakistan, and the other time in a shorter one.

Paris, of all places, was the short stop. Here, with Paris celebrating her 2,000th birthday, I had time enough only to realize the misfortune that was mine.†

What John Adams Thought of Paris

As I sipped coffee in a sidewalk café on the Champs Élysées, I found myself in full sympathy with John Adams when he wrote his wife Abigail in Boston from Paris in 1799: "I admire the Parisians prodigiously. They are the happiest people in the world, I believe, and they have the best disposition to make others so."

For the most part, I had to content myself with a drive through the Bois de Boulogne, a ride to the top of the Eiffel Tower, a visit to the Arc de Triomphe with its Eternal Flame, and a few other standard attractions (page 719).

* See "Rothenburg, the City Time Forgot," by Charles W. Beck, Jr., NATIONAL GEOGRAPHIC MAGAZINE, February, 1926.

† See "Home Life in Paris Today," by Deena Clark, NATIONAL GEOGRAPHIC MAGAZINE, July, 1950.

A flying trip to Montmartre, still a show place despite its comparative loss of prestige as an art center, was rewarding enough, if only for a visit to Sacré Coeur, which crowns its heights.

I have more reason than the average traveler for wanting to see Paris again.

Next stop was Switzerland. I had been in Geneva just over an hour when I engaged a Swiss driver, big John Pinget, who drove his car with one hand while he talked to me with the other. I asked him his weight.

"About 106 kilograms," he answered.

"And how much would that be in pounds, John?"

"Pounds?" he pondered. "I don't know, but it would be something over sixteen stone."

John was quite as unable to change his weight from kilograms to pounds as the average American is to change his from pounds to kilograms. The 106 kilograms came to 234 pounds—a calculation I did not take time to make on the spot.

While John showed me the United Nations Palace, formerly the League of Nations Palace, and the headquarters of the International Red Cross, I pressed him for some more personal aspects of Switzerland.*

"How about a school?" I asked.

"It's too late now, and tomorrow is Thursday," he replied with puzzling finality.

"What's the matter with Thursday?" I persisted.

John explained that children in Geneva Canton don't go to school on Thursdays and Sundays. This system was devised to give parents who have Saturdays off a vacation from children as well as from work.

$4,000 Pocket Watch

In the showrooms of the Gubelin Watch Company in Geneva I saw a pocket watch which was about to be delivered to President Juan Perón of Argentina. It indicated the second, minute, hour, day of the week, date, month, and phase of the moon, not forgetting to add the 29th of February every four years. It struck the hours, quarter-hours, and minutes. Two stop hands permitted the timing of two horses, selecting and automatically holding the faster time. Price: $4,000.

The rack-and-pinion railway to 11,340-foot-high Jungfraujoch leads up from the village of Lauterbrunnen and a valley of hanging waterfalls. On an afternoon when Jungfrau and its lofty neighbors were hidden in gray clouds, I walked alone in the valley. Like night wind in the pines, the sad sighing of waterfalls was a soft undertone for the cheery tinkling of cowbells.

On the railway angling skyward, I rode up to Jungfraujoch in the eternal Alpine snows (p. 710). Beside me sat young Asoka Gunasekera from Colombo, Ceylon, who, with his father and sister, was visiting Switzerland. No sooner had he heard I was an American than he pressed me with a vital question.

"Do Hopalong Cassidy and Gene Autry ever speak to each other?" he asked.

I tried to set Asoka straight without disillusioning him and wondered, as we talked, just what difference one could actually find between a Ceylonese boy reading comics and his American cousin similarly engaged.

Clouds Veil Jungfrau's Face

Below us sunshine filled the valleys. Above, clouds covered the peaks, and we speculated on the chances of a view (which I have yet to see) from Jungfraujoch.

"You've been skiing?" I asked a young man who wore a jaunty ski outfit.

"Not this trip," he answered. "I am up here in connection with a study on the primary particles of the cosmic ray."

He was Dr. Hans Bichsel, of the Physical Institute of the University of Basel, and explained that he had just buried some sensitized plates in the snow where, for a number of weeks, they would remain to record the cosmic-ray effects desired in the study.

Flying from Geneva to Barcelona, I talked with photographer Dave Pratt of the International Refugee Organization.

"I see a lot of your maps in my travels," he volunteered. "I have photographs of refugees poring over them in our camps."

Again my map of Western Europe identified the scene below. We flew down the Rhône to its westward bend toward Lyon, met it again near Avignon, and finally left it where it meets the blue waters of the Mediterranean between Montpellier and Marseille.

We picked up the Spanish coast at rocky Cape Creus and followed it to Barcelona. Here and there fishing nets spread out on the sand appeared like mammoth nylon stockings laid out to dry.

Building Boom in Madrid

In Barcelona we changed planes. Dave Pratt went to the island of Mallorca for a fortnight's vacation, I to old Madrid.†

In Madrid I found Spain's second skyscraper under construction. The builders plan to have it ready for partial occupancy in 1952. A product of Spanish enterprise, engineers, and materials, the 26-story concrete structure is properly called the España Building.

*See "Switzerland Guards the Roof of Europe," by William H. Nicholas, NATIONAL GEOGRAPHIC MAGAZINE, August, 1950.

†See "Speaking of Spain," by Luis Marden, NATIONAL GEOGRAPHIC MAGAZINE, April, 1950.

Mosque and Motor Ad Proclaim Old and New in Istanbul

Call it Greek Byzantium, Roman Constantinople, or Turkish Istanbul, a powerful city has stood here for 2,600 years. Only Rome, Jerusalem, and Athens influenced Western civilization as much.

When Rome's eclipse ushered in the Dark Ages, the arts continued to flourish here. Greek mosaics' brooding, dark-eyed saints reflect an ancient art style known as Byzantine. Architecture's spreading domes—in Moscow, Venice, and Delhi—follow a pattern perfected here. Turks, in admiration, erected stately domes like that of the Mosque of Suleiman the Magnificent (left).

Ancient Greek colonists founded Byzantium to command traffic between Mediterranean and Black Seas. They named this arm of the Bosporus the Golden Horn.

Constantine the Great moved the seat of Empire and Christendom here from Rome, A. D. 330, and called his new capital Constantinople. He completed the Hippodrome, antiquity's famous chariot-race course. Later emperors raised a ring of walls which repelled tides of barbarians.

Crusaders sacked Constantinople in 1204. Turks broke into the city in 1453, substituted sultan for emperor, and turned churches into mosques. Republican Turkey deposed the sultans and moved the capital inland to Ankara.

Idle water taximen here fish in the Golden Horn. Larger motor lighters carry freight.

Aimé

Baghdad, Straddling the Tigris, Bakes in Desert Heat

During Europe's Dark Ages, Baghdad flourished as a fountainhead of culture. Its scholars helped lay the foundations of algebra and chemistry; they translated Euclid, Aristotle, and Plato from Greek to Arabic. Scientists, philosophers, poets, and musicians flocked here from all Islam. At a time when the art of healing was barely more than superstition in the West, Baghdad employed licensed physicians and pharmacists in its hospital.

A cousin of Mohammed the Prophet here founded a triple-walled city A. D. 762. Mongol armies sacked the place 496 years later, destroyed irrigation canals, and turned Mesopotamia from Garden of Eden into wasteland. As capital of Iraq, Baghdad now directs vast reclamation works.

In its golden era Baghdad was the seat of Harun-al-Rashid, the wise and adventurous caliph celebrated in *The Thousand and One Nights*. Today the city's main street, Al Rashid, commemorates him. Exploring it, the author looked in vain for jinn, rocs, Aladdin's lamps, and magic carpets. Instead he found store signs advertising Lux, Flit, and Coca-Cola.

Most of the modern city lies on the Tigris's east bank (left).

Once bridges of boats were strung from shore to shore; two steel spans replace them. Date-palm groves, here seen as dark patches, line the river 350 miles southward to the Persian Gulf.

U. S. Air Force, Official

226 National Geographic Photographer J. Baylor Roberts

Both Home and Ferryboat Is This Twelve-foot Craft

Mrs. Leung Tai Hai earns about $10 a month carrying passengers in Hong Kong's Aberdeen Harbor (page 748). Her husband makes somewhat less working on a fishing junk. Their only home is the water taxi. On it they cook, eat, and sleep. When mother gets a fare, Dai Tai, the 6-year-old daughter, sits out of the way under the oar. Speaking of her hand-to-mouth existence, Mrs. Hai said, "We never think of the future."

It will house 400 offices, 200 apartments of from one to four rooms, and a luxury hotel of 600 beds, to be called the Plaza. A sub-basement garage, 32 elevators, air conditioning, and a rooftop swimming pool mark it strictly modern. Standing on the roof of the España Building, we counted 16 large construction jobs, most imposing of which was the new Air Ministry Building. But, despite her building boom, Madrid continues to look skyward with a patchwork of mellow tile roofs in which the new blends with the old (page 718).

In the splendid headquarters of the Spanish Higher Council for Scientific Research, I saw an exhibition of United States Government publications. Two, especially, caught my eye: *Ranger 'Rithmetic for Sixth Grade Teachers*, and *Isotopes . . . A Three-year Summary of U. S. Distribution*. *Ranger 'Rithmetic* is a textbook which combines the teaching of forestry and arithmetic.

At the University of Madrid I spent a noon hour talking with students. Many of them wanted to go to America "because salaries are higher and you work less!"

Youthful Dental Student Serves as Waiter

When the students left for their 1 o'clock classes, a waiter appeared to clear the littered table. His apron, tied close under his armpits, reached almost to the floor. He was Luis Ripoll, 14 years old.

I asked Luis about his job. He was working from 9 to 5 with Sundays off. He received no salary, only tips, "because I am learning." In a good week tips amounted to 70 pesetas (about $1.80).

"What do you want to be when you grow up, Luis?" I asked.

"A dental technician," he replied.

When Luis was 8, he began to work with his father, who was a dental technician. When he was 10, his father died and Luis had to find other work.

"Have you had a chance to do any dental work since then?" I asked.

Proudly he answered, "I made a denture for my aunt last year, and she is still using it."

Luis gives all his weekly earnings to his aunt except five pesetas, which he spends Sunday afternoons to hire a bicycle for an hour.

I backtracked to Switzerland and boarded

TWA's New York-to-Rome flight.

For several minutes we circled over Geneva to gain altitude.

Looping Lofty Mont Blanc

"Just give yourself plenty of room when you fly over those fellows," said Capt. Tom Dyer, looking toward the Alps.

A few minutes later we were safely above and making a loop around Mont Blanc's snow-mantled 15,781-foot summit.

"That little spot you see on Mont Blanc is a weather station," explained the captain.

"You know," he said, reaching for my map, "I studied geography like any schoolboy, but I didn't really become interested in it until I began to read about some of the places I fly over."

An Air View of Pisa's Leaning Tower

He penciled our route on the map. It led from Mont Blanc to Turin in the Po Valley; to Columbus's home port, Genoa; to La Spezia, the naval base, with its threadlike breakwater separating the glassy-smooth harbor from the waves of the Ligurian Sea; and on to Pisa.

"That's it right down there. See it lean?" said the captain, pointing to Pisa's tower.

We looked up from the ancient landmark and, 40 miles to the south, we saw the similarly shaped concrete cooling towers of the Larderello Valley volcano-harnessing project.

Larderello Valley, like Alaska's Valley of Ten Thousand Smokes, is an area of natural volcanic steam jets. Some of them have been capped and piped to steam turbines which drive generators that are now producing one-twelfth of Italy's electric power (page 711).

To our right we saw Elba, near at hand, and Corsica in the hazy distance. Rome was a scant 100 miles ahead, and we were already descending to land.

Below were many mountaintop castles which would be difficult to spot but for the narrow trails or roads that lead to them.

227 National Geographic Photographer J. Baylor Roberts

7,000 Miles to Grandmother's House He Flew!

To visit his grandparents in Amsterdam, 5-year-old Peter Geysen flew unaccompanied from Bangkok. The plane crew could not resist "adopting" him; passengers vied to keep him amused. Peter took his afternoon naps on an improvised bed. On overnight stops he slept with KLM hostess Hens Hamel, who here washes his face. Shy when he left home, the boy returned self-confident. Peter was flying back when the author met him.

"Look for St. Peter's, Victor Emanuel Monument, and the Colosseum. They're all in a row and it's easier to find them together than separately," said affable copilot Charles McMills.*

In Rome I was joined by National Geographic staff photographer J. Baylor Roberts who, with his camera, was to complete the world circuit with me.

Amid the crumbling ruins of the Roman Forum, I listened while 15-year-old Sylvia Tagliacozzo compared her life in Rome with her life in Norton, Massachusetts, where,

* See, in the National Geographic Magazine: "Italy Smiles Again," by Brig. Gen. Edgar Erskine Hume, June, 1949; and "Ancient Rome Brought to Life," by Rhys Carpenter, November, 1946.

two years before, her father was teaching Italian history.

She told me that while it's quite all right for a professor's daughter to baby-sit or work at a soda fountain in Norton, it just isn't done in Rome. In Norton things are better planned for fun; in Rome there is more emphasis on the serious aspects of preparing for a profession.

Early one morning as we flew from Rome on Italy's "shinbone" to Otranto on her "heel," I read history in the terse notes of The Society's map of Classical Lands.

Anzio—Old and New History

Thirty miles south of Rome I spotted Anzio, on a peninsula which resembled a blunt sawtooth. Of this place, whose name Americans find difficult to utter without the word "beachhead," a map note said:

"Birthplace of emperors Caligula and Nero, A.D. 12 and A.D. 37."

Of Vesuvius, basking innocently in the morning sunlight, I read of past "crimes":

"Volcanic ash from Vesuvius sealed houses and preserved their furnishings" (reference to Herculaneum); and "Buried by Vesuvius, A.D. 79" (reference to Pompeii).

I saw tiny villages on Italy's heel which, with their white houses, resembled clusters of salt crystals sprinkled at random on the suede-colored landscape. Finally Otranto, Italy's easternmost city, slipped beneath us, and we were bound southeast toward the narrow neck of water that separates the Peloponnesus from the Greek mainland.

Consisting of the Gulfs of Patraïkós and Korinthiakós, this waterway leads to the canal named for the city of Corinth (Kórinthos) which, according to another map note, was "important commercially by the 8th century B.C."

In the steep-sided canal I saw a freighter saving 600 miles by avoiding the trip southward around the Peloponnesus.

When I had finally accustomed myself to the fact that the big expanse of city extending inland was not Piraiévs alone but Athens and Kallithéa as well, we were about to land. My eager eye glimpsed only the Acropolis and Lycabettus (opposite page).

By royal proclamation, King Paul declared 1951 a year of homecoming for all Greeks living abroad. One such homecomer was Peter Nicholson, a real estate man in Detroit, Michigan.

He left Greece in 1914 at the age of 17 and, after a voyage of 28 days, landed in New York with ". . . about $20 in my pocket, shoes but no stockings, and I couldn't speak a word of English."

Two days after I talked with him, this man was decorated by Prime Minister Venizelos for helping organize, in the United States, groups of Greeks who accepted the King's homecoming invitation. On the following day Peter Nicholson went again to New York —this time in 28 hours by air!

Parthenon? There's One in Nashville!

On the Acropolis I talked with Ensign George Bates of the destroyer *U.S.S. Gainard*, moored in Piraiévs.

"We have one just like it back home in Nashville," said George, referring to the full-sized reproduction of the Parthenon built for the Nashville Centennial Exposition of 1897 and rebuilt permanently in 1922.

From Athens we flew northeast over the Aegean Sea, a bit of Anatolia, and the Sea of Marmara to Istanbul.*

"Is that the Bosporus?" asked Joe Roberts.

My map assured him it was.

"Why, it's no wider than the Mississippi at New Orleans!" he exclaimed.

Joe had no such handy comparison for Istanbul's Blue Mosque, nor had I. Standing in our stocking feet on the richly carpeted floor, we listened as the shrill voices of two boys filled its lofty dome with the words of the Koran. And the words echoed back on themselves from the blue tile walls—the same words, the same blue tile walls that have known each other for more than 300 years.

When at lunch our Turkish driver refused another helping with "Praise Allah, OK," I wondered if perhaps East and West were at least beginning to meet.

From the top of Galata Tower we looked out on the Golden Horn (page 724), busy with shipping; Galata Bridge handling a 5-o'clock rush; and Istanbul's minaret-studded skyline silhouetted against billowing white clouds and the Sea of Marmara.

The men who sleep in hammocks in the top of this 1,400-year-old tower and watch for fires in the city below seemed at first to share our enthusiasm for the view as they offered us field glasses.

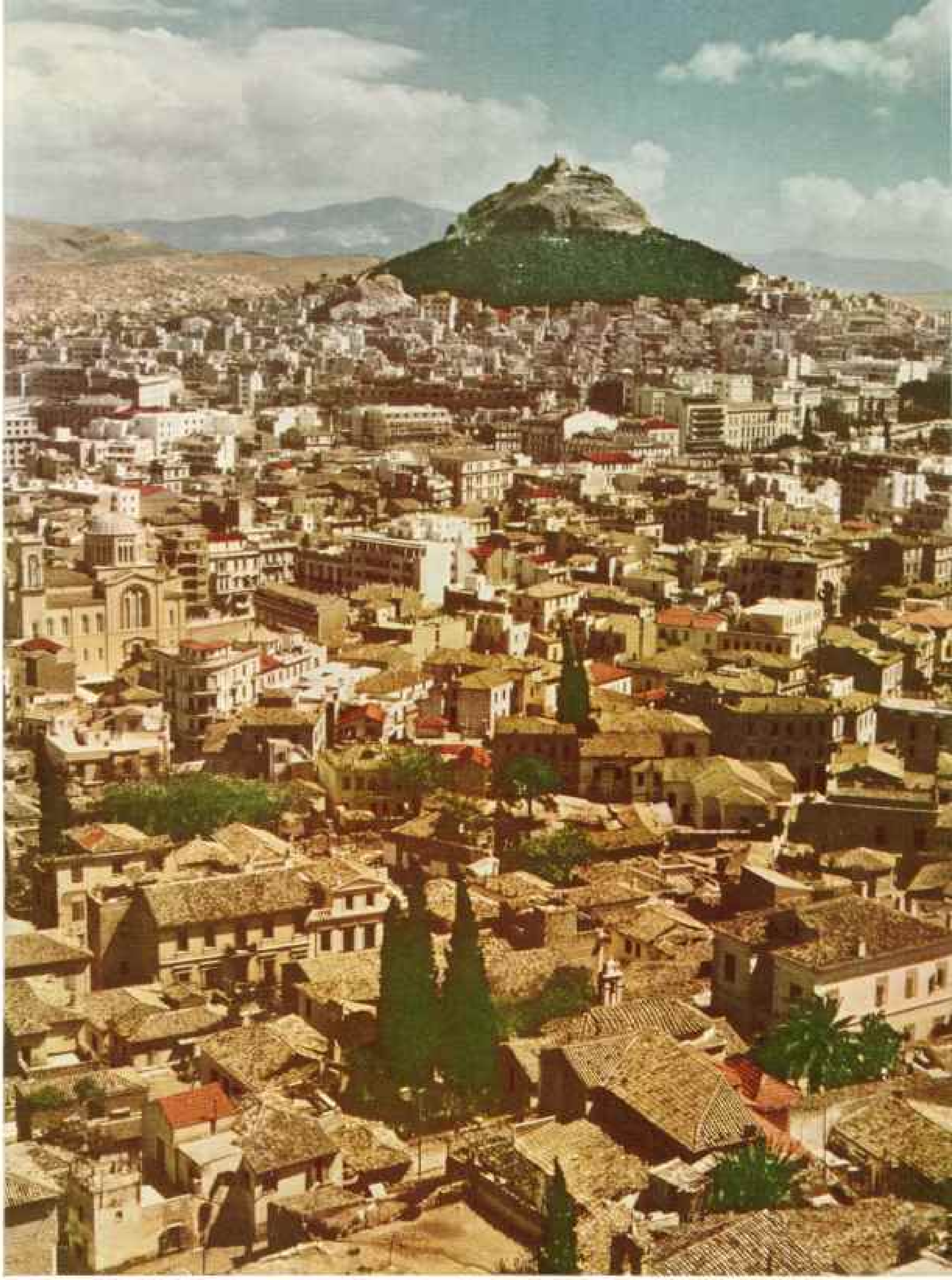
"Look to your hearts' content, but make no pictures," was the substance of their gestures.

Over Classic Lands to Cairo

Flying from Istanbul to Cairo, I again read history, this time from The Society's Bible Lands map.

"Alexander cut the Gordian knot," said the red type, with an arrow pointing to a spot 50 miles southwest of Ankara. Here the world

* See, in the National Geographic Magazine: "Turkey Paves the Path of Progress," by Gilbert Grosvenor and Maynard Owen Williams, August, 1951; and "War-torn Greece Looks Ahead," by Maynard Owen Williams, December, 1949.



Kodachrome by B. Anthony Stewart

Mount Lycabettus, Crown of Athens, Is Larger but Far Less Famed than the Acropolis

Many visitors are surprised to learn there is such a hill. Classic writers largely ignored it; Plato mentioned it but once. Athenians lavished their finest architecture on the Acropolis, whose flat top and easy defenses drew the first settlers. Sharp-peaked Lycabettus had no such attractions. It has supplied stone for many of the city's buildings. The Chapel of St. George gleams on the 909-foot summit, part of a range of hills.

Kodachromes by J. Baylor Roberts

The Society's Asia Map Unfolds in Athens's Temple of the Olympian Zeus

Five French and Italian newspapermen, motor-scooting 6,000 miles from Paris, France, to Gartok, Tibet, here compared routes with the author. When he gave them his map, they laughingly admitted they had been scheming how to get it away from him.

This motor scooter, one of five belonging to the party, carries extra wheel, spare parts, gasoline reserves, and camping equipment.

At the King's palace in Athens, Navy Chief Vern Short of Durango, Colorado, and Yeoman Steve Koslo of Phoenixville, Pennsylvania, talk with Nikolaos Kaliaras, an Evzone of the King's Guard Battalion. Forty yards of material go into the Greek's pleated *fustanella*, or skirt, and 10 yards into his capelike sleeves.

"I get dressed in five minutes," the tall, handsome Evzone said.

". . . and the Earth Is Round Like a Ball"

By coincidence, author and photographer heard these simple words just as they entered this classroom on the grounds of Robert College in Rumeli Hissar, Turkey. The world's shape was described by young David Dingee (standing). He seemed somewhat skeptical about its sphericity until he was confronted by the living proof, two men actually engaged in circling the globe.

This Bosporus-side building was the home of Dr. Edwin A. Grosvenor, Robert College professor of history from 1873 to 1890 and the author of *Constantinople*, a two-volume history of the city now called Istanbul. His son, Dr. Gilbert Grosvenor, Editor of the National Geographic Magazine, was born at this meeting place of continents, ancient trade routes, and history-making armies.

Nancy Beecher, the teacher, is a Wellesley graduate who came to the college in 1948 with her husband, a chemistry professor. She instructs an elementary class of 30 youngsters, most of them from Istanbul's diplomatic colony.

Kodachrome by J. Baylor Roberts

Fairy-talelike St. Hilarion Castle, Legendary Home of Cupid, Mounts Guard over the Enchanted Isle of Cyprus

St. Hilarion, built in 1223, takes its name from a holy man who died here 1,600 years ago. His original burial place is marked by a small chapel. This fortified site was known to Crusader Richard the Lionhearted, who conquered the island in 1191.

The Author's Mount, Called Canada Dry, Heads for the Pyramids

← A camel can turn his head 180 degrees, bare his teeth, and glare menacingly into his rider's eyes, Mr. Bumstead observed with alarm. When the beast trots, posting is more comfortable than sitting, he noted. This Egyptian camel driver, doubtless coached by Americans, encouraged the animal with cries of "Heigh-ho, Silver!"

↓ Nile Valley guides must be linguists, for they entertain visitors from all parts of the world. Swedes outnumber other nationalities in this group photographed with the Sphinx.

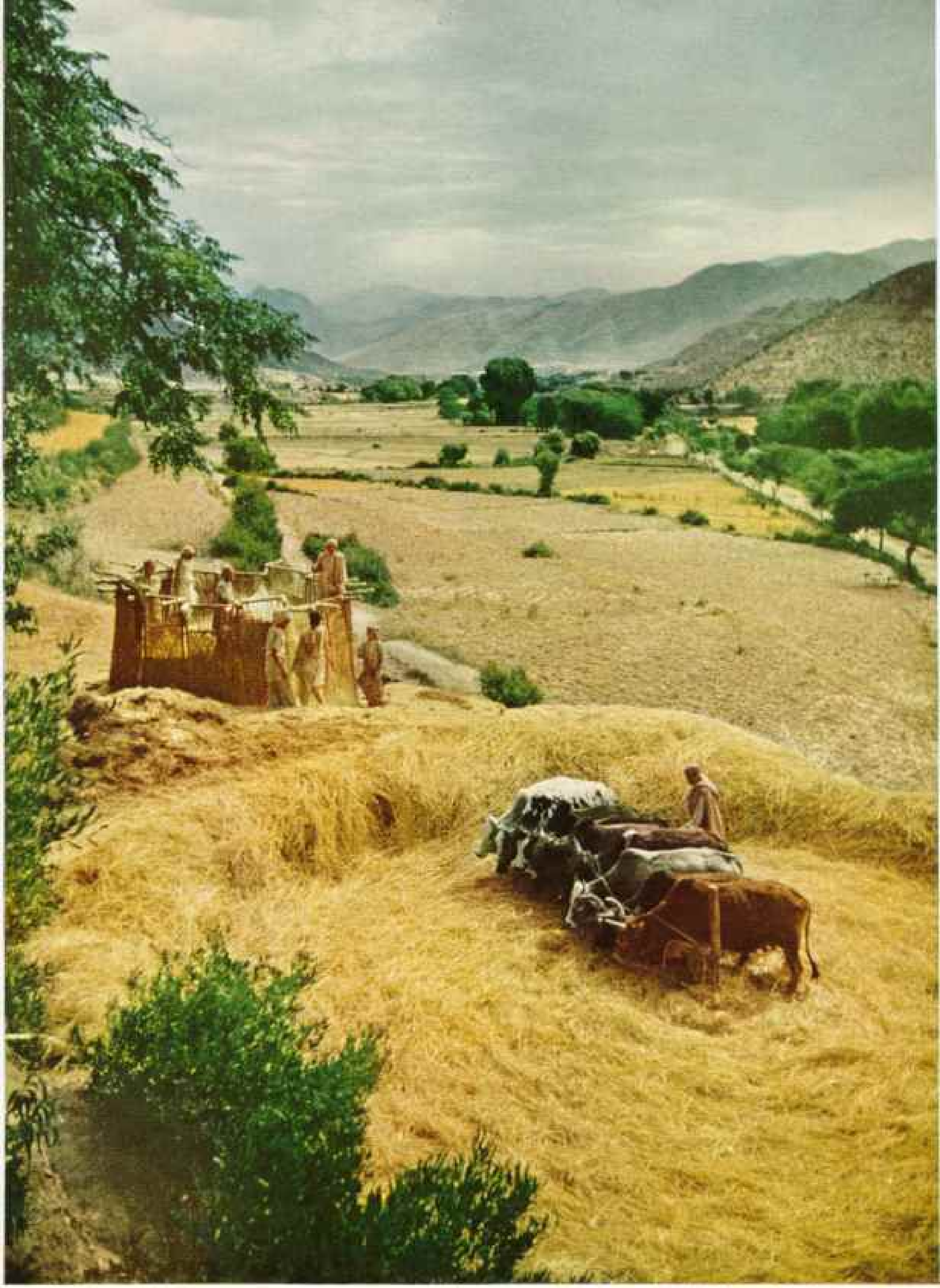
Kodachromes by J. Baylor Roberts

A Truckful of Afghan Hides Moves into Pakistan at Khyber Pass

When the camera was aimed, the Afghan guard hid beside his sentry box; he peeps through a window. Photographer and author here accepted the hospitality of Pakistan officials, who refused food because it was Ramadan, Moslem month of dawn-to-sunset fasting.

Women's Heads Bear Tons of Salt to Lighters in Karachi Harbor

Ten women spend half a day loading the barge. Then, moved to the ship's side, it is emptied in a few minutes by suction pipes. Busy Karachi, capital of Pakistan, has grown from 300,000 to 1,500,000 in four years. Its housing shortage can be imagined.



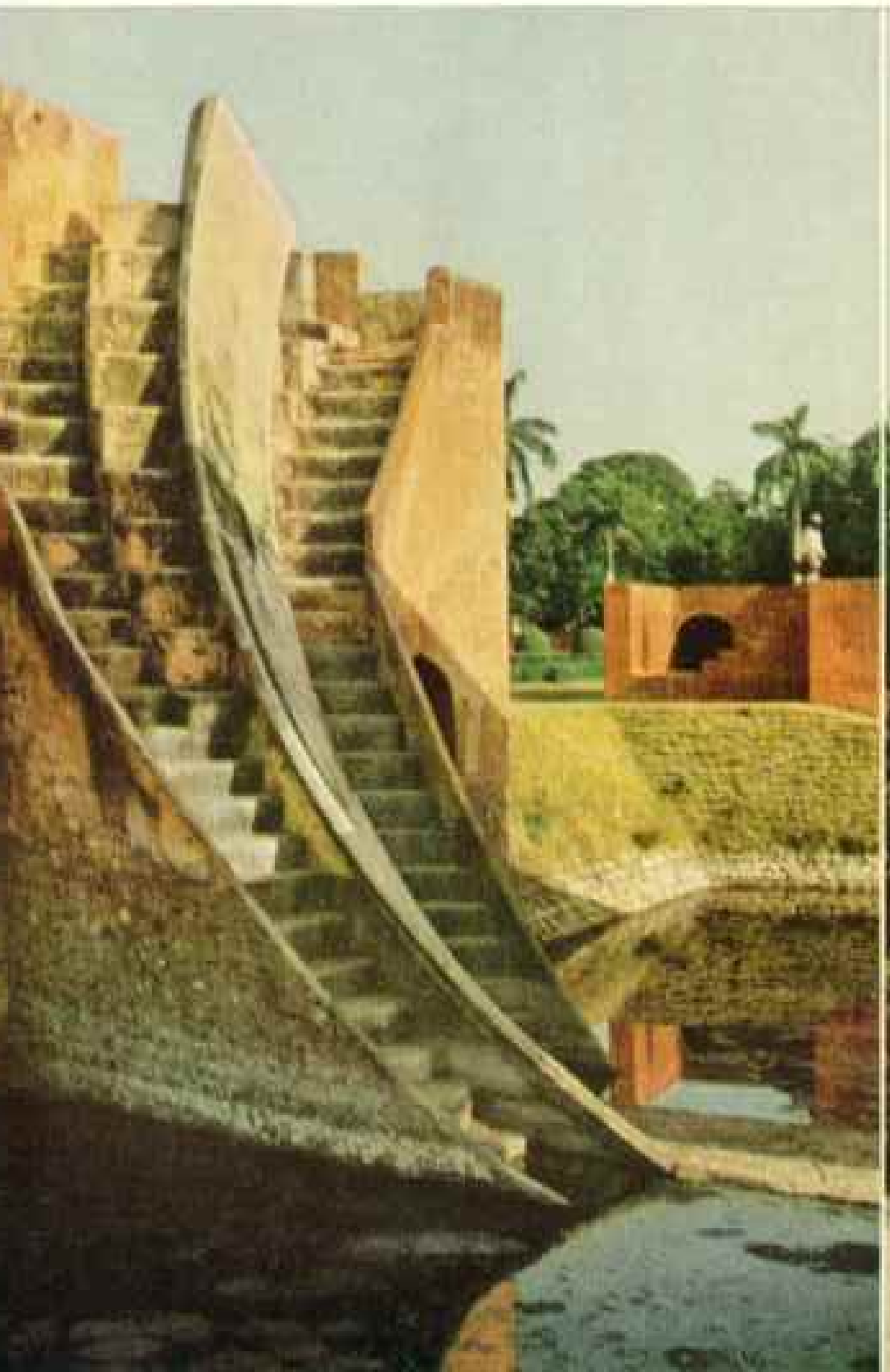
Kodachrome by J. Baylor Roberts

In Swat, Oxen Thresh the Wheat by Hoof, Men Tamp the Straw by Foot

Swat is a princely State in Pakistan. Its ruler, entertaining the National Geographic men, proudly announced he was a member of their Society. Native beds, lashed together (left), form a bin for stacking straw.

↑ When Clouds Blotted Out a Moonlight Study of Agra's Taj Mahal, the Photographer Slept on the Grounds Awaiting This Sunrise View

↓ Delhi's giant astronomical instruments, built of stone and coated with plaster, were built early in the 18th century by Maharaja Jai Singh II of Jaipur. By making them extremely large, he believed he would reduce inaccuracies in his measurements of the sun's shadow. Left: The curved surface between the steps is a sundial quadrant. Right: This bizarre structure was called the Mixed Instrument because it contained four different devices for making astronomical observations.



Kodachrome by J. Baylor Roberts

Salvaged Chains, Abandoned by Ships Unable to Raise Silt-embedded Anchors, Cover the Bank of Calcutta's Hooghly River

Calcutta's Port Authority rents the chains to shipmasters in need of additional moorings to hold their craft against stiff tidal bores. These waves, moving upstream, may suddenly raise the water level as much as six feet. Here a boat with crude square sail ferries workers out to a ship.

Early Morning's Market Clogs a Bangkok Canal with Produce Boats

Joining a flotilla of sampans, the author watched housewives "go to market" merely by leaning over the steps of their canalside homes. Floating merchants offered fruits, vegetables, and soft drinks. Customers bargained for dry goods, kitchenware, and babies' palm-leaf toys.

A bulb-type automobile horn announced the arrival of a sampan "breakfast counter" vending fresh bread and hot coffee. The tinkling of a small bell identified the ice-cream sampan.

Families bathed in the brown water and, standing waist-deep, finished with vigorous tooth brushing.

➔ Siamese dancers beneath templelike headdresses perform a classical ballet in Bangkok.

↑ Chinese Refugees, Awake, but Eyes Shut, Play Possum at Noon Nap

These lads, uniformed by charitable organizations, are sons of Chinese Nationalist families who, fleeing the Communist-held mainland, take refuge at Hong Kong's Rennie's Mill Camp. Each boy keeps washcloth and mug on the shelf. The children's teacher, serving without pay, left her home in Hunan because "China has changed its color," she said.

→ Japanese men often leave their wives at home and engage geishas to enliven business parties. This girl began her training at the age of 7. A licensed entertainer, she is skilled in singing and dancing.

← Hong Kong Junks Dry Huge Fanlike Sails

Businessmen, financing the fishermen who sail these ships, risk thousands of dollars with no down payment or written contract. But when a junk returns with its catch, the promoter is on hand to collect his share. Sometimes he sends his own boat out to the fishing grounds to receive payment while the fish are being caught. Entire families spend their lives aboard the junks. When the wind fails, men, women, and children move the craft with huge oars.

Kodachrome by J. Baylor Roberts

On a Rare Day When Waikiki's Combers Fail to Roll, Outrigger Canoes and Surfboard Riders Lie Idle in the Sun

Opposite page: Wives of yachtsmen and crew members arrive to see the finish of the annual Los Angeles-to-Honolulu race. Hawaiians, famed for their welcomes, receive them with alohas, leis, hulas, and guitar music.


AIRWAYS
PAN AMERICAN
WORLD AIRWAYS

Kodachromes by J. Baylor Roberts

Hawaiian Swimmers Decked with Leis Cut a Cake High in the Air

Flying at 15,000 feet above the Pacific, the teammates assembled in the lounge to eat a cake baked by their host, Pan American World Airways. Later, in Detroit, they competed in an AAU meet, placing third. They gave hula shows to raise funds for the trip.

Day Breaks over the Pacific: Pilot Talks with the Mainland

Author aboard, the plane heads for San Francisco. From that port Mr. Rumstead ended his 31,000-mile trip in three cross-country hops. In Chicago, two and one-half hours from New York, he missed plane connections the first and only time in 30 flights.

conqueror, with one stroke of his sword, cut the strangely entwined knot which others had tried vainly to untie, and gave the world a phrase synonymous with boldness.

We passed Konya, home of St. Thecla, who was "taught by the Apostle Paul," as another note recorded.

Just beyond Konya is the site of Lystra where, I read, "Paul stoned and left for dead (Acts 14: 8-19)."

On Anatolia's southern coast rose the Taurus Mountains. The rounded ridges and smooth-bottomed valleys of their northern slopes reminded me of the soft folds of skin on the neck of a brown cow.

Port Said and the Suez Canal

As we approached Egypt's coast, shades of dusk made it easy to imagine that the lights of Port Said were the sparkling facets of a precious stone which dangled at the end of a jeweled string.

The string was the Suez Canal and its jewels the lights of ships following one another through the continent-splitting ditch as closely as safety permitted. At the string's far end was the faint glow of Ismailia.

Our sojourn in Cairo included a camel-back visit to the Pyramids of Giza and their reticent neighbor, the Sphinx (page 733).

From Cairo we flew across the southeastern corner of the Mediterranean toward ancient Tyre and Sidon. Anchored off Sidon were tankers nursing on oil piped overland 1,000 miles from Bahrein Island in the Persian Gulf.

Beyond Damascus, possibly the world's oldest continuously inhabited city, followed 450 barren and empty miles. We glimpsed a lonely car, tagged by a plume of dust, on the roadless route that leads across Syria to Iraq.

Into view came the clump of small buildings that constitute pumping station H-2 (H for Haifa) on the pipe line that brings oil from the Kirkuk fields of northern Iraq to Israel's Mediterranean coast at Haifa. Then we reached Baghdad (page 725).

Flavor of Anytown, U. S. A.

Searching the city, we at length found a strong flavor of the *Arabian Nights* in the golden domes and minarets of the Mosque of Al Kadhimain. But no searching was necessary to find a stronger flavor of Main Street, Anytown, U.S.A.

In a 20-minute stroll along Baghdad's Al Rashid Street, I saw the following store-front signs: Kaiser-Frazer, Kelvinator, Westinghouse, Esso Flit, Lux, U. S. Tires, Frigidaire, Mobiloil, Goodyear, Chevrolet, Buick, General Motors, Allis-Chalmers, Federal Tires, Oldsmobile, Pontiac, Plymouth, Chrysler, Dodge, Studebaker, Philco Radio, Exide, De Soto, Lee Tires, Singer, Cadillac, White, Hudson, B. F. Goodrich, Fiske Tires, Seiberling Tires, Kelly Springfield, Coca-Cola, Pepsi-Cola, and International Harvester.

That night, at the Roxy Theater on Al Rashid Street, we saw Esther Williams and Van Johnson in *Duchess of Idaho*.

At Baghdad's airport we watched "Operation Magic Carpet," the airlift which, when we were there, had moved 116,000 Iraqi Jews to Israel. Twenty thousand more would be flown out, an official told me.

The morning we left for Karachi, 88 of these expatriated Jews were boarding a Curtis Commando plane. They varied in age from nursing babies to an old man who carried an even older woman pickaback to the plane.

On its 9,000-mile way from Amsterdam to Java, a KLM Flying Dutchman picked us up in Baghdad and set us down 10 hours later in Karachi.

En route, we looked down through a dust storm on Babylonia, Basra, and Abadan, renowned for history, dates, and oil refineries, respectively.

Iran's Persian Gulf coast, steep and in places 7,000 feet high, appeared newly eroded like a pile of builder's sand after a summer shower.

Karachi Looks to the Future

In Karachi, the capital of four-year-old Moslem Pakistan, we talked with Government officials who displayed earnestness, determination, and proud optimism of the type associated with the founders of the United States Government.

I talked with some of the Moslem refugees from Hindu India who have swelled Karachi's population from 300,000, when British India was partitioned in 1947, to 1,500,000 in 1951.

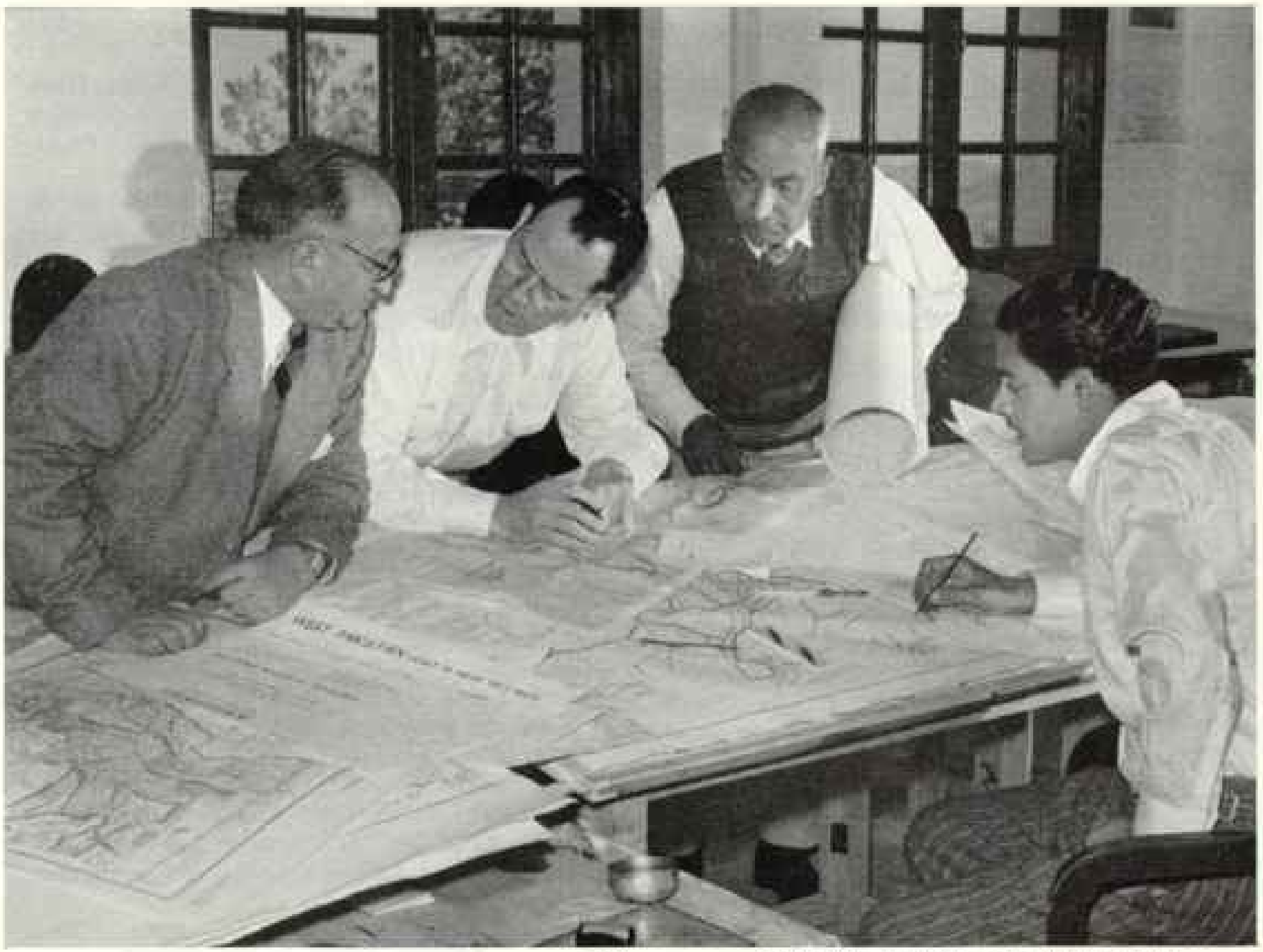
Thousands of them were living in rude shelters built along the city's sidewalks. And on the same sidewalks they were busy at many trades, repairing shoes, building furniture, dyeing cloth, and selling food cooked on small dung-fired grilles.

"How's business?" we asked harbor official Rassul Subra.

"Karachi port is very busy. We receive 80 to 90 ships a month, and most of them come here to load," said Mr. Subra, explaining an important reason for Pakistan's favorable trade balance (page 734).

We flew to Peshawar in Pakistan's North-West Frontier Province, and then drove to the historically sinister Khyber Pass (page 734). Here I stopped a 13-year-old tribesman, Jandali, and asked him, through my interpreter, what he would be when he grew up.

"Surely, for the sake of the State, destiny



Map Talk, an International Language, Makes Brothers of U. S. and Pakistani Cartographers

Coming from hot, sea-level Washington, D. C., Mr. Bumstead envied these men their cool 7,500-foot headquarters in Murree, a Pakistan summer resort. He found them making brand-new maps of their new nation. Deputy director C. M. Aslam (left) and chief map examiner Badruddin Hydar were keenly interested in duplicating the National Geographic Society map department's photo-lettering process. Draftsman Qureishi (right) was working on his country's first highway map.

must have planned some job for me," he answered.

At the border, beyond the pass, we looked across into Afghanistan and later were served tea by friendly and hospitable Mohammed Ozman, the Pakistan passport officer.

I talked to gun-packing tribesmen who caused the British to stud Khyber with fortified pillboxes, and who, as if to keep in trim, feuded among themselves when not harassing the British.

Said one, concerning tribal ethics: "If, when I am entertaining you and am away from my house, my blood enemy should come to get me and find you, he will entertain you. The enmity will go on forever, but the guest will remain a guest."

We were guests of Chief Akbar Shahkhan at his "gun factory" in near-by Kohat Pass (opposite). Here in mud huts with primitive, homemade equipment, tribesmen make exact copies of British and American arms.

No detail of the original is omitted in the copy. Proof marks, manufacturers' numbers, patent numbers, and dates are given as much attention as sights and triggers.

After inspection and a lavish tea, the chief took Joe and me across the road to try out a new model. In front of what looked to be the entire male population of the village, we fired the rifle at a stone 100 yards distant. Our shots were close, but we scored no hits.

Smiling, the chief approached the firing line with his favorite rifle and showed us how, scoring a hit with every shot.

In Kashmir at the cease-fire line between Pakistani and Indian forces, we drank tea with Maj. Zia-ul-Latif, of the Pakistan Army. In his account of the early Kashmir fighting, he referred to the exploits of the North-West Frontier Province tribesmen and their homemade rifles.

Sleeping on the Taj Mahal Grounds

After reaching Delhi, India, we drove 125 sweltering hot, nocturnal miles to Agra to photograph the Taj Mahal by moonlight,

747 National Geographic Photographer J. Baylor Roberts

Pakistan's Rifle Imitators, Who Copy Famous Firearms, Make Feuding Inexpensive

Fighting Afridi tribesmen, like old-time Western cattlemen, feel undressed without a rifle; some have committed murder to get one. In Kohat Pass's rude arsenal they make their own, imitating the best Western models. Bearded blacksmiths heat gun barrels in primitive forges; boys drill the rifle bores on machines using wagon wheels as flywheels; woodworkers whittle gunstocks held between toes. Chief Akbar Shahkhan (seated, right) fondles a homemade Lee-Enfield. Using it, he bested the author in a shooting match.

arriving at 2:30 a.m. (page 736).* But the cloud-filtered moonlight was too weak for Joe's camera. I stretched out on the hard stone pavement and thought of its builder, Emperor Shah Jahan, who, with his beloved wife Mumtaz-i-Mahal, lies beneath its dome in eternal sleep. And soon I too slept.

Sitting out a Siamese Revolution

Taking to the air again, we flew to Bangkok and were met by a friendly and efficient Pan American official, Lambeth Renstrom. On the way to town he lamented the fact that, six months before, his bride of two weeks and all other company wives had been ordered back to the States as a precaution, because of uncertain political conditions.

"But obviously there was no need of it," said Renstrom. "Nothing has happened!"

A few minutes later, Renstrom stopped in his office and came out excitedly announcing that Premier Pibul had been kidnaped and a revolution had broken out.

"Why, they've even thrown up a road block between here and the airport! We'd have seen it if we had looked behind us," he exclaimed.

"But don't worry," continued Renstrom, "there will be a little harmless shooting tonight, and tomorrow morning when you wake up it will be all over."

That evening we heard only that the contest was between Thailand's Army and Navy. The shooting was sporadic and seemingly not near enough our hotel to be alarming.

At 3 a.m. the shooting could no longer pass for sporadic. By 7 a.m. Thailand's Army Air Force was dive-bombing and strafing the naval barracks across the river, and our hotel seemed to be a check point for the bomb run.

Soon the planes scored a hit on the Navy's oil depot. Flames and billowing black smoke filled the sky.

Just then there was an ear-splitting *ka whom* in the river some 30 yards from the

* See "Delhi, Capital of a New Dominion," by Phillips Talbot, National Geographic Magazine, November, 1947.

balcony on which we stood, and the guests of the hotel suddenly, and as a group, were seeking shelter in the cellar. But when we found there was no cellar, we went out on the open terrace and had breakfast.

Throughout the day, Bangkok rocked with artillery fire, rifles banged back and forth, and Army planes continued their zooming attacks on the Navy's ships in the river and its barracks beyond.

Peace Descends on Bangkok

Things looked better next morning. Premier Pibul, who had been held captive on a warship, had swum ashore to safety when the vessel was hit and set afire. Casualties on both sides rose to 68 killed and 1,100 wounded, but the Premier was again in control of the Government and Bangkok was once more its friendly, peaceful self. Quiet settled over its temples with their gracefully curving roofs of tile and gilt.*

In a sampan traffic jam in one of Bangkok's floating markets, we watched paddling merchants tempt canal-side housewives (page 739). I saw sampans loaded with fresh bread and hot coffee; with pots and pans; with ice cream; with toys; with cloth and sundries; with betel nuts; with pineapples; with the morning's mail; and even with bright-eyed, slate-carrying school children.

Using The Society's map of Southeast Asia, BOAC Capt. Steve Gordon showed me how our course to Hong Kong would be bent to avoid flying over Red China's Hainan Island.

"Going to stop in Hong Kong?" began a young man, seating himself across the aisle from me.

I nodded, and he quickly produced a copy of the March, 1950, NATIONAL GEOGRAPHIC.

"Better read this, then," he advised, pointing to "Trawling the China Seas," an article on the Hong Kong junk fleet by J. Charles Thompson.

Aloft, I watched our progress on the map. First came the Mekong River, telling me we were leaving Thailand and entering Laos, Indochina. A ridge of mountains passed below, indicating, approximately, the Laos-Viet Nam frontier.†

During a two-and-one-half-hour flight over the South China Sea, we skirted, at a good 20 miles, Red China's Hainan Island.

Border Guards of Hong Kong

Our Hong Kong stop included a visit to Aberdeen's junk fleet (pages 726 and 740), a look in on the 16,000 Chinese Nationalist refugees who exist at Rennie's Mill Camp (page 741), and a trip north to the barbed-wire frontier between British territory and Communist China.

At the frontier we met Inspector Thomas MacKenzie, in charge of the British border guard.

"That's China on the other side of the fence," he said. "The fence stretches for 12 miles, and we keep searchlights on it at night."

As we approached a small bridge guarded on our end by British soldiers and on the other by Communists, the Inspector warned us not to do anything to upset the harmony of the situation (opposite page).

"We don't talk to them, and they don't talk to us. We have good silent cooperation," said he.

"If we don't want to admit a person from Red China," he continued, "we just stop him on our end of the bridge, and, after a few minutes, they come over and take him back. We do the same for them."

On the flight to Tokyo, our route was again bent to avoid an island. This time it was Formosa, stronghold of Nationalist China's forces. We paused for gasoline and Coca-Colas at Naha, Okinawa.

In the air again, Joe and I busied ourselves matching the islands of the Nansei chain with their names on The Society's map of Japan and Adjacent Regions of Asia and the Pacific Ocean.

A fellow passenger was Paul Schwarz, a young Dutch trader. In the same southeastern Asia where spices lured his ancestors in their tiny sailing vessels, Paul was traveling by air and selling food flavors.

Tokyo—Rebuilt or Rebuilding

In Tokyo we saw very little to remind us that more than 55 square miles of the city were leveled by the bombing and ensuing fires of World War II.

With few exceptions, where it wasn't rebuilt, Tokyo was rebuilding. From my hotel window I looked out on the steel framework of a new office building.

At Tokyo Onsen (hot springs), four modern stories of hot baths, chess and mah-jongg parlors, a billiard room, a restaurant, and a cabaret, I found tired businessmen bathing and relaxing while their wearing apparel was pressed, laundered, and polished.

In the well-equipped studios of the Broadcasting Corporation of Japan I saw a program schedule listing basic English, Fountain of Knowledge (like Information Please), American Folk Songs, Twenty Gates (like Twenty Questions), Early Bird, My Book Shelf, and Quick-wit Classroom (like It Pays to Be Ignorant).

* See "Scintillating Siam," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, February, 1947.

† See "Strife-torn Indochina," by W. Robert Moore, NATIONAL GEOGRAPHIC MAGAZINE, October, 1950.

149 National Geographic Photographer J. Baylor Roberts

British and Red Chinese Practice "Silent Cooperation" at a Hong Kong Border Bridge

Even as Britons and Chinese fought battles in Korea, they maintained a live-and-let-live truce at this international bridge. Inspector Thomas MacKenzie (with binoculars) heads the British border guard. Chinese at the Communist end of the bridge passed these food-bearing porters into the city (opposite page).

At the Imperial Theater I saw the musical comedy *Madame Sada-Yacco Goes to America.* Dancing, music, slapstick, and costumes (and the absence of costumes) were in the Broadway tradition.

But Tokyo still has its purely Japanese aspects, such as ceremonial tea and geisha girls.

In a picture-book garden of centuries-old trees, winding paths that lead across arched bridges, and carp-filled pools, we removed our shoes and stooped low to enter the three-foot-high door of a ceremonial teahouse.

Seated on the floor with my stiff-jointed legs painfully bent under me, I paid strict attention to my companions so that, when I was served, I should know what to do.

Finally the cup was set before me. I placed my hands, knuckles down, on the floor and bowed. Picking up the handleless cup and placing it on the upturned fingers of my left hand, I gave it three clockwise quarter turns with my right.

Then I sipped the fragrant brew once, remarked its excellent flavor, finished the contents with no more than three draughts, and remembered to make a loud sucking noise with the final, cup-emptying draught.

Five Courses of Eels for Dinner

Bolstered with a pillow or two, I sat on a satiny-smooth floor to an eel dinner that night. The first item, which I surprised my newspaper friends by eating, was fried eels' livers on a toothpick. Then followed courses of eel soup, boiled eel, fricasseed eel, and pickled eel.

During the meal, by the arrangement of my friends, a geisha girl and her one-piece string "orchestra" appeared (page 741).

This girl's ability to entertain by dancing, by singing, and by simply looking pleasant through slitlike eyes that almost closed when she smiled—these attributes were not just luck, but, like the ceremonial tea, resulted from age-old tradition and years of training.

The following night I went to bed on one of Pan American's big two-deck Boeing Stratocruisers and woke up next morning just

The World.

ATION GUARANTEED GREATER THAN THAT OF ANY TWO OTHER AMERICAN NEWSPAPERS COMBINED.

CIRCULATION BOOKS OPEN TO ALL.

CIRCULATION PER DAY DURING THE MONTH OF DECEMBER, 1889. - - 340,113 COPIE

CE FIVE CENTS. NEW YORK, SUNDAY, JANUARY 26, 1890. PRICE FIVE

SHE'S BROKEN EVERY RECORD!

A Little Pardonable Consternation Among the Globe-Circlers at the Remarkable Achievement of "The World's" Traveller.

Verne Followed Every Step of the Journey on His Globes.

THE WORLD correspondent then asked

FATHER TIME OUTDONE!

than ninety days, and now look as lively as

I called on Jules Simon, announced the

ALL EUROPE ENTHUSIASTIC.

Congratulations from Geographers, Scientists and Friends.

VERNE

Even In the

HER TI

Thous

WELCOME

The Wh

NELLIE

750

Nellie Bly Circled the World in 72 Days, Clipped a Week Off Jules Verne's Fictional Record

One dress, two caps, an ulster, and several changes of underwear made up the 22-year-old reporter's wardrobe. She got ready in a day. Storm-slowed in the Pacific, she said, "I would rather go (home) successful and dead than alive and behind time." Her triumphant homecoming was spread across the *World*'s front page. Its readers, estimating her time, submitted 927,433 guesses; 116 came within 15 seconds. Ferdinand de Lesseps jokingly claimed a share of Nellie's glory because his Suez Canal shortened her distance. Paris quickly sold out 10 new printings of Verne's 18-year-old *Around the World in 80 Days*.

in time to dress before we landed for fuel and breakfast on Wake Island.

During the day's flight we crossed the International Date Line and gained the day we had lost piecemeal during the preceding two months of eastward flying. We had left Tokyo on Thursday evening, July 12; we landed in Honolulu Thursday evening, July 12, some 24 hours later (page 742).

After two days at Waikiki Beach, which encompassed sun-bathing, outrigger canoeing, and sailing a speedy, twin-hulled catamaran in a 20-knot wind off Diamond Head, Joe concluded, "Next time we go around the world, let's do it right here."

My first glimpse of the United States mainland was the peaks of California's mountains, rising like islands above a shimmering white sea of clouds.

After brief stops in San Francisco and Los Angeles, I flew east. In Chicago, two and a half hours from home, and after 31,000 miles of flying, I missed a plane connection for the first and only time.

My journey's end in New York was not marked by the counting of seconds that attended Phileas Fogg's return to the Reform Club in London. I had easily equaled his 80-day time. Nor were the cannon at the Battery and Fort Greene fired as for Nellie Bly, famous New York *World* reporter, when in 1890 she finished her earth-girdling trip in eight days less than the fictional Fogg and I had taken.

But in Nellie's words, "I took off my cap and wanted to yell . . ., not because I had gone around the world . . . but because I was home again."

Our Narrowing World

The Story of the New National Geographic Map

TO MEET the need for an up-to-date picture of global geography, the National Geographic Society presents with this issue of its Magazine the best map of the world it has yet produced. It reflects new geographic knowledge obtained by explorers, airborne cameras, and patient oceanographers since previous maps were made.

The map's 5,488 place names conform to latest official spellings. Scores of them are new: Israel, Jordan, Indonesia, and Pakistan, for example; Formosa for Taiwan, Djakarta for Batavia, Krung Thep for Bangkok; and Levant States are now Syria and Lebanon.

By looking at a clock and the World Map inset showing time zones, one can tell in a moment what time it is anywhere in the world.

After painstaking preparation of the master map by National Geographic cartographers, more than 2,100,000 copies in ten colors have whirled from a battery of big lithographic presses for distribution to members in 160 countries, to schools, libraries, and government agencies.*

World View Vital for Survival

On the World Map the United States looks small—less than six inches wide compared to 39 inches for the earth as a whole. Yet, measured by the time it takes to travel around it, the whole "wide world" today is less wide than was the North American Continent a short lifetime ago.

At the beginning of this century of ever-increasing speed, it took at least four and a half days to cross the United States from New York to San Francisco by the fastest possible means, the railroad train.

Now a United States Air Force B-50 bomber, refueled four times in the air, has circled the world nonstop in 3 days, 22 hours, and one minute. Any man or woman with the necessary fare, passports, and taste for haste can make the circuit by scheduled airliners in a week or less (page 705). Jets, rockets, and atomic power promise—or threaten—to shrink the world still more.

Ignorance of the geography of nations was perhaps excusable a generation ago, but today knowing and understanding the many diverse countries of the world has become urgent and vital for our national survival.

What happens in Moscow or Peiping today, or in Korea or divided Berlin, can affect the lives and fortunes of Americans more quickly than the firing on Fort Sumter in South Carolina did 90 years ago.

Formosa, Yugoslavia, Iran—datelines from such distant places turn up in a single day's grist of important news. Only a world map will show where they are in relation to the United States and its friends in far parts of the earth.

The National Geographic Society map gives the background of the global struggle between Soviet Communist expansionism and members of the United Nations carrying out their charter obligation to prevent aggression. For world travel in fancy or fact, or for international business planning, the map will be equally useful.

One-piece Panorama of the Earth

Beginning in 1905, The Society has issued nine world maps. On these, and on the many National Geographic maps of the continents, the geographer and historian can note the changes in boundaries, the changes in sovereignty, and the growth and disappearance of states during the past half century.

The world maps have been among the most popular ever issued. Like three of its predecessors, this one shows the earth in a panorama uninterrupted except by the borders of the map.

In 1943, when The Society last published a world map, it was divided along the meridian 80 degrees east of Greenwich to keep the Pacific theater of war intact, for at that time Japanese naval forces were active in the Bay of Bengal.

Today, with Japan removed as a threat and United Nations forces alert to maintain peace in the Pacific, Chief Cartographer James M. Darley divided this National Geographic map along the 90-degree meridian east of Greenwich to keep the Indian peninsula intact.

Ancient Greeks, Alexandrians, and Romans centered their maps on the Mediterranean, around which, as Plato quoted Socrates, they lived "like ants or frogs about a marsh." Early Christian cartographers made Jerusalem the center of their maps. Today's World Map is centered on the Americas, source of so much of the leadership and aid, so many of the men, machines, and raw materials needed for the preservation of freedom in older lands.

Abreast of current history, this December, 1951, World Map carries an inset showing

* Members may obtain additional copies of the new World Map (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices in United States and Possessions, 50¢ each on paper; $1 on linen; Index, 25¢. Elsewhere, 75¢ on paper; $1.25 on linen; Index, 50¢. All remittances payable in U. S. funds. Postpaid.

the 60 United Nations, the Atlantic Pact countries, and the territories in the Soviet grip. On it one can trace the "Iron Curtain," Communism's 2,000-mile-long barrier against free information, travel—and escape.

The Iron Curtain, marking the western limit of Soviet occupation or control, runs through Europe from the Baltic to the Black Sea, splitting Germany and walling off Soviet satellites from contact with the western world. Although eastern Austria is Soviet-occupied, the country is administered as a whole by a unified non-Communist federal government. Little Albania, on the other hand, is a Russian satellite outside the curtain.

Russia, the Union of Soviet Socialist Republics, is the world's largest single country in area, though far surpassed in size and population by the British Commonwealth and in industrial and educational resources by the United States. The free association of states linked to the British Crown still numbers more than one fourth of all the people of the world, despite the postwar loss of Burma, now sailing its ship of state alone in stormy Asia. Both India and Pakistan, when granted independence, elected to remain as members of the British Commonwealth.

The following figures show the stature of the world's giants:

	Square Miles	*Population*
British Commonwealth	12,950,000	598,000,000
U. S. S. R.	8,599,000	193,000,000
French Union	4,815,000	120,000,000
Canada (incl. in Br. Commonwealth)	3,845,000	14,000,000
China	3,760,000	(Est.) 464,000,000
United States & Territories	3,622,000	159,000,000
Brazil	3,288,000	53,000,000
Australia (incl. in Br. Commonwealth)	3,158,000	9,500,000

The Soviet Union and its satellites—Albania, Bulgaria, China (excluding Formosa), Czechoslovakia, Germany (Soviet Zone), Hungary, Mongolian Republic, Poland, and Romania—together total 741,600,000 people and 13,363,700 square miles.

Polar Regions Mapped Separately

Since the earth is not flat but a big ball, or spheroid, no flat map of the world can give an exactly true picture of its surface. The National Geographic map is planned to minimize the inevitable distortion and variation in scale.

For this map, as well as three previous world maps, The Society's cartographers chose a projection, or system of intersection of meridians and parallels, that gives perhaps the best over-all picture of the round earth on flat paper. Called the Van der Grinten Projection, it was invented nearly 48 years ago by the late Alphons Van der Grinten but was little used until National Geographic map makers saw its possibilities for their world map of 1922.*

This design shunts most of the distortion and scale change into the polar regions. Accordingly these areas have been omitted from the world panorama and mapped separately in twin insets which give accurate pole-centered pictures of the earth's top and bottom. The North Polar inset shows, for example, how short is the route between Russia and the United States by the Arctic back door.

The map records many changes in territorial and political alignment since The Society's last large World Map was issued eight years ago. Newfoundland has become the tenth Province of the Dominion of Canada. Iceland has severed all ties with the Kingdom of Denmark. Ireland has given up dominion status within the British Commonwealth. Ceylon has become a Dominion and the Republic of Israel a reality.

Poland Pushed Bodily Westward

Europe's greatest territorial changes involve Russia, Poland, and Germany. Today's Poland is a new state which has been pushed west some 50 miles, losing land in the east to Russia and taking from Germany in the west.

Other annexations include Germany's East Prussia by Russia and Poland, Romania's Moldavia and Czechoslovakia's Carpatho-Ukraine by Russia, and Soviet seizure of Latvia, Estonia, and Lithuania.

Some of these changes have not been internationally approved. The map merely shows the de facto situation.

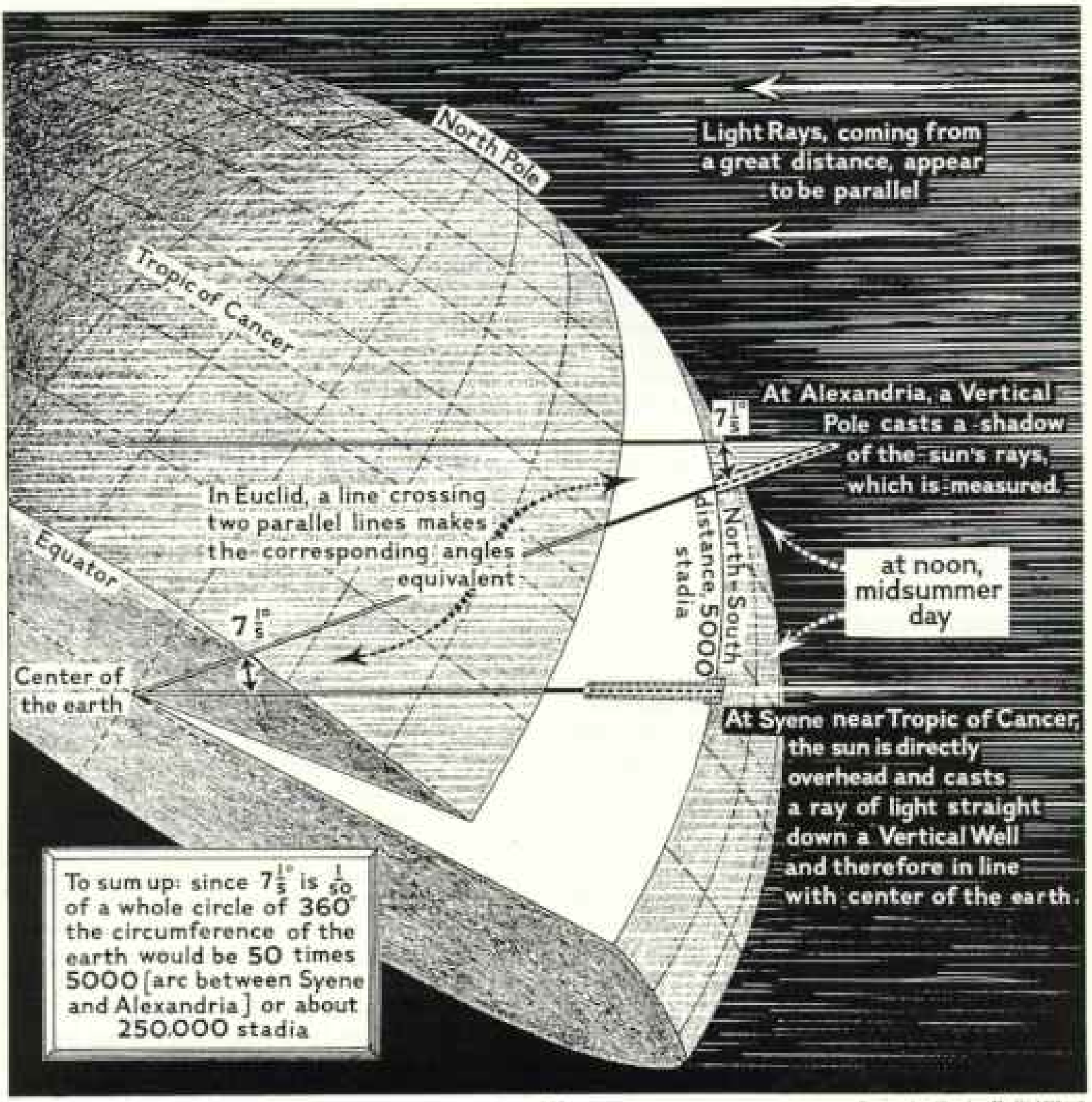
In Africa former Italian lands are going separate ways. Libya is on the road to independence. Eritrea is to be annexed to Ethiopia next year. Italy administers Somalia, the erstwhile Italian Somaliland, under a UN trusteeship designed to prepare the country for independence within 10 years.

In Asia, seething with hot and cold war, a hopeful note is the new Japan. Forty-eight free nations stood firmly together at San Francisco to give Japan a new start under a statesmanlike peace treaty.

Aerial camera explorations by the United States and Canadian Air Forces have greatly altered the mapped outlines of lands in the Arctic since the war. In fact, one new island in the Foxe Basin has been appropriately christened Air Force Island by Canada.

Although little larger than an opened news-

* Members can get a fascinating explanation of map projections used by cartographers in "The Round Earth on Flat Paper," by National Geographic Society Research Cartographer Wellman Chamberlin, with 107 illustrations from photographs and drawings by Charles E. Riddiford, by writing to the National Geographic Society, Washington 6, D. C. Price 75¢.



753 Drawn by Charles E. Hodgdon

Thus Eratosthenes Made the First Measurement of the Earth

This cutaway drawing shows the logic and facts used by the Alexandrian Greek mathematical philosopher in determining the earth's circumference in the third century B. C. (see below and page 754). Any man, woman, boy, or girl can repeat the Greek's experiment today and get an echo of his thrill.

paper, the 41-by-26½-inch map compresses shelves of geographic knowledge. It represents the ripe fruit of some 23 centuries of restless man's investigation of his earth.

"My conviction is that the earth is a round body in the center of the heavens . . ."

How revolutionary was that vague surmise, attributed to Socrates by Plato 2,350 years ago! The words appear in Plato's *Phaedo* and form the earliest known written statement of the idea that the world is round.

Aristotle confirmed the theory by noting that the earth's shadow on the moon in a lunar eclipse is round.

A little more than a century later, another great Greek, Eratosthenes, succeeded in measuring the earth to establish an orderly basis for mapping. He did it with nothing but shrewd reasoning, a knowledge of geometry, a measuring rod, a deep well, and a pole.

The scene of the exploit was Alexandria, Egypt, where Eratosthenes was serving as librarian, and Syene, 520 miles to the south. Syene is shown on the new map under its present name of Aswan. Leaving it off a world map would be like leaving Yorktown off a map of the United States, for it represents a triumph of mind as great as any victory of arms.

At Syene was a deep well, and the observant Eratosthenes had noted that at noon on one day of the year—June 21, the summer solstice—the whole pit was illuminated. The sun was squarely overhead and shone directly down into the well.

A light as bright as those solar rays dawned

in the librarian-philosopher's mathematical mind. At Alexandria he put up a pole, as perfectly erect as he could make it. Then at noon on June 21 he measured the angle of the pole's shadow. It was $7\frac{1}{5}$ degrees.

Knowing geometry, Eratosthenes was aware that if the pole and the well were extended to the center of the earth they would meet at the same angle, $7\frac{1}{5}$ degrees (diagram, page 753). Since there are 360 degrees in a circle, this $7\frac{1}{5}$-degree angle was $\frac{1}{50}$th of the whole circle. So the distance between Syene and Alexandria must be $\frac{1}{50}$th of the circumference of the earth.

Thus, to find out how far it was around the earth, all Eratosthenes had to do was to multiply the Syene-Alexandria distance by 50. This he did in the unit of measurement called the stadium, probably equal to about ten feet. Syene was 5,000 stadia away, so the distance around the earth must be 250,000 stadia.

Even a coldly mathematical heart must have leaped with the joy of pure discovery. Standing on one little corner of the vast, mysterious, unexplored earth, one man—by the power of mind—had thrown a tape measure around the globe.

Actually the measurement was not exact. If we substitute the now-known number of miles for Eratosthenes' 5,000 stadia, we get 520 miles times 50, or 26,000 miles. Today we know that the girth of the earth is 24,901.96 miles. But Eratosthenes' result is remarkably close when considered in the light of the crudity of his instruments and data.

Despite the much earlier work of Eratosthenes in the same city, Ptolemy of Alexandria, in the 2nd century after Christ, conceived of the world as much smaller than it is. Believing in a Ptolemaic-sized world, Columbus thought he had reached India when he had sailed no farther than the West Indies.

One Day Mysteriously Missing

In those days the world, instead of getting smaller, was growing larger as mariners discovered its extent. First to sail entirely around it was not Magellan—he was killed on the way—but members of his crew, including the highly articulate Antonio Pigafetta.

Nearing home with his gossipy round-the-world diary, Pigafetta was puzzled to find it was Wednesday, July 9, 1522, aboard, but ashore in the Cape Verde Islands it was Thursday, July 10!

"We could not persuade ourselves that we were mistaken," he wrote after the worm-eaten, storm-battered *Victoria* reached Spain just 12 days short of three years after the start. "I was more surprised than the others, since I had every day, without intermission, written down the day that was current.

"But we were afterwards advised that there was no error on our part, since as we had always sailed toward the west, following the course of the sun, and had returned to the same place, we must have gained 24 hours!" *

Sailing with the sun slows its apparent speed and thus lengthens each day. Pigafetta's calendar was a day behind because he failed to record these slight daily gains.

New Knowledge of "Rivers in Sea"

These pioneering circumnavigators would have made their voyage in less time had they possessed our modern knowledge of the world-wide, interlocking system of ocean currents, shown by brown arrows on this map.

Prevailing winds, rotation of the earth, topography of the ocean floor, discharge from large rivers, melting of icebergs, heating and cooling of large bodies of water, evaporation, rain and snow, all play a part in maintaining the oceans' vast, ceaseless circulation system.

Surface currents range in speed from hardly perceptible drifts to five miles per hour in the Gulf Stream, swift enough so that in 1513 Ponce de León's ships could not stem it.

Within the past year oil tankers surveying the Gulf Stream for the United States Navy in this same area found that ships can save 3 to 10 hours' steaming time between Cape Hatteras and Key West by staying close to the eastern edge of the Gulf Stream southbound, and that the strongest currents on the northbound route are well inshore.

This American-born stream in the sea brings its warmth to Britain and Europe. It keeps Russia's Arctic port of Murmansk ice-free all year and makes far-north Spitsbergen a summer resort for Norwegians.

The Gulf Stream's course is not always constant. Often it meanders like a river, turning up far from its supposed location, but whether these shifts affect weather in Europe has not been definitely proved.

A two-way, "two-story" current through the Strait of Gibraltar completely changes the water in the Mediterranean Sea every 75 years. Salt tends to concentrate in the Mediterranean, since it loses more water by evaporation than it gains from rainfall and rivers. The heavy salt water sinks and flows out below the surface, while fresher water from the Atlantic moves in above.

All the great "rivers in the ocean" are mapped in the light of the latest knowledge on this new portrait of our world, 71 percent of which consists of the tidal, tossing salt water of Mother Sea.

* See "Greatest Voyage in the Annals of the Sea," by J. R. Hildebrand, NATIONAL GEOGRAPHIC MAGAZINE, December, 1932.

Uncle Sam's House of 1,000 Wonders

All Americans Benefit from the National Bureau of Standards, Where Science Has Served the Citizen for 50 Years

By Lyman J. Briggs * and F. Barrows Colton

LATE one night in Washington, D. C., a startled motorist suddenly saw a fire blazing up in a patch of woods just off busy Connecticut Avenue. Speeding to the nearest alarm box, he put in a hurry call for the engines.

When the firemen reached the scene, they found a group of men calmly watching the blaze roar through the interior of a small brick structure, but making no effort to check the flames. Instead, they were reading instruments attached to wires that led inside the burning building.

"We're burning it on purpose to test some new 'fireproof' construction materials," they explained to the amazed fire fighters. "These wires lead to thermocouples that show how hot it is inside. We're from the National Bureau of Standards."

Dividends for the Taxpayer

Testing and setting standards for just about everything under the sun is the regular job of this great research center run by Uncle Sam, though usually it isn't done in quite so spectacular a way.

Few Federal Government agencies pay bigger dividends on the taxpayer's dollar than the National Bureau of Standards. Here science is constantly being put to work to make life easier, safer, simpler, and cheaper for the American public in a thousand different ways.†

Here one can get a preview of an amazing new world of tomorrow that is already being born in the Bureau's versatile laboratories.

In this new world we will not measure length and time with yardsticks and clocks, but with vibrations coming from inside atoms, having an accuracy undreamed of until now.

Much tedious routine office work will be done by almost-human computing machines that can add up figures in 50 one-millionths of a second. People may carry individual radios that fit in the vest pocket. And clothing moths will die of starvation because a new treatment for wool will give them indigestion!

Already the National Bureau of Standards has the know-how for all these things, and many more (pages 772-773).

Interests of the 1,600 NBS scientists cover the universe. They regularly listen for faint radio "broadcasts" from distant stars that interfere with earthly radio communication. They have weighed the earth, but also can measure how much a steel bar is bent when a fly alights on one end!

Almost everyone living in the United States today has benefited somehow from work done at the Bureau, an important part of the U. S. Department of Commerce. Look at a few examples:

Safer Airplanes and Elevators

Bureau men have made airplane travel safer by finding hidden causes of wrecks; found shades of red and green for traffic lights that won't deceive drivers who are partially color-blind; tested elevator door interlocks 5,000 times to make sure people can't open the door and fall down the shaft when the car is not there.

Their coldly scientific tests have forced off the market some really harmful automobile antifreeze compounds, dangerous "gas-saving" attachments for stoves, and children's inflammable Indian suits. They've tracked down criminals with scientific detective work; invented gadgets to help doctors save lives; and have saved millions of dollars for Uncle Sam by testing nearly everything he buys, from carpets for Congress to cement for the Panama Canal.

This year the Bureau is celebrating its first 50 years of service to the American public. In that time its scientists have played a major role in the vast changes that have taken place in everyday life since 1901.

What the Bureau Does

As one Bureau official puts it:

"The National Bureau of Standards provides, with improved techniques, the basis of precise measurement on which all progress in science and industry ultimately depends.

"This is by no means a cut-and-dried task. For example, with the expanded use of microwaves in radar a whole new field of electrical measurements had to be explored.

"With the increasing development of jet-propelled aircraft, we must have exact methods of measuring engine temperatures so that they can be operated at maximum efficiency."

The NBS has three main jobs. As its name

* Dr. Briggs is Director Emeritus of the National Bureau of Standards, a Trustee of the National Geographic Society, and chairman of its Research Committee.

† See "Washington—Storehouse of Knowledge," by Albert W. Atwood, National Geographic Magazine, March, 1942.

National Geographic Photographer John E. Fletcher

Memorial Sundial Honors Dr. Briggs and Bureau of Standards' Two Previous Directors

Co-author of this article, Lyman J. Briggs is now Director Emeritus; he still carries on research at the Bureau. Here he explains the operation of the sundial commemorating the services of Dr. Samuel W. Stratton, Dr. George K. Burgess, and himself. Dr. Briggs is noted for his studies in aerodynamics of aircraft and projectiles. He is a Trustee of the National Geographic Society and chairman of its Research Committee.

implies, it sets the Nation's standards of measurement, essential in today's world of precision machines—the length of an inch and the weight of a pound. It fixes temperature standards ranging from nearly the "coldest cold," 459.6° below zero Fahrenheit, to 6,000° or above, where even rocks will melt. It sets the standards for accurate measurement of the amount of electric current in one ampere and of voltage, resistance, and power, which provide the firm foundation upon which our great electrical industry is built.

Secondly, it tests the quality and performance of all kinds of products, from typewriter ribbons to steel girders, procured by the Federal Government, which is the world's largest individual purchaser (page 771).

And it carries on research and development in countless fields, from harnessing the atom for peaceful work to learning just how soap gets things clean.

Special work for the Atomic Energy Commission will be done by the NBS at a new laboratory in Boulder, Colorado.

Today also, as always when war clouds gather, the Bureau is shifting into high gear to help develop new scientific weapons, many of them top-secret. New types of guided missiles are being developed for the Navy at a new NBS Laboratory at Corona, California.

Congress established the National Bureau of Standards in 1901, because scientists and businessmen were clamoring for some central agency in this country to fix standards for all kinds of things. Until the Bureau was founded, many scientific instruments had to be sent all the way to Germany for calibration to establish their accuracy.

To ensure that Uncle Sam gets his money's worth, the Bureau cooperates with other Federal agencies in setting up many of the specifications for the things the Government buys. The NBS has helped to establish many of the industrial standards set up for private business by the American Standards Association and the American Society for Testing Materials. Consumers' groups utilize its testing methods and reports.

America's Most Cherished Documents Are Preserved by Bureau Scientists' Skill

Glass "sandwiches" protect the Declaration of Independence and the Constitution, both on exhibition at the Library of Congress. Special glass filters absorb harmful violet and ultraviolet light. Within the cases, inert helium replaces atmospheric oxygen and other gases, time's slow deteriorating agents. Here a tube for detecting helium leaks is soldered into place.

Working in the Bureau's laboratories are 62 research associates who are paid by 13 different industrial and trade associations but whose work is for the public benefit.

This article cannot begin to describe all the things the Bureau does, but a few examples will help show the amazing scope of its service to the citizen.

Weights and Measures Once Differed

In medieval times a foot was the length of a man's foot, a fathom the span of his outstretched arms. They varied from person to person.

Even as late as the 1820's a bushel of wheat in South Carolina contained 68 cubic inches more than a bushel in New York City. A pound of potatoes in Massachusetts weighed less than a pound in Maine. Because customhouses in different cities used varying weights and measures, the Government lost large revenues from import duties.

But today, without precision standards of length, weight, time, temperature, electric power, radio wavelengths, and atomic radiation, our technical civilization would collapse in chaos.

America uses more than 4 billion dollars' worth of electric power annually. If electric meters were consistently inaccurate by even one percent, either the power companies or their customers would lose $40 million a year. This does not happen, because meters now are calibrated by comparison with the Bureau's master meters.

If a radio or television station's assigned frequency gets a little out of line, it interferes with other programs. All stations set their wavelengths by the Bureau's standards of frequency, which it broadcasts 24 hours a day on a world-wide scale.

These standard frequencies do not vary by more than two parts in 100,000,000. They are controlled by crystal-operated clocks kept at an unvarying temperature and pressure.

When a doctor takes a "blood count" to see if your health is up to par, he counts the number of red and white cells in the blood

National Geographic Photographer John E. Fletcher

"Automatic Redcap" Lifts Luggage until the Handles Snap

To set quality standards for manufacturers, this machine picks up and sets down brick-weighted suitcases at the Bureau of Standards. A strong handle, it has been determined, should survive 25,000 pickups (page 774).

sample. Unless he can be sure his sampling pipette contains a known amount of blood, the count is meaningless. Accuracy of such pipettes is tested by the Bureau.

Bending Steel Bridge Girders

Is a concrete slab six inches thick strong enough for a main highway? Will a steel bridge girder carry the load for which it is designed? The Bureau squeezes them in its giant testing machines as easily as you can break a graham cracker or bend a tin can, and gets the answers engineers need. These machines can crush brick and glass block walls, stretch steel cables, and pull apart ship bulkheads, to find weak spots.

Though in the United States we commonly measure lengths in feet and weights in pounds, you will find no standard foot or pound at the National Bureau of Standards. Instead, it carefully preserves a standard *meter* and a standard *kilogram*, which are precisely calibrated against the international standard meter and kilogram kept in Paris. Our foot is slightly over three-tenths (.3048) of a meter, and a pound is 45.36 percent of a kilogram.

The Bureau's standard meter and kilogram are guarded in a securely locked vault. The kilogram is never touched by human hands, for a spot of perspiration could alter its weight.

When the kilogram is taken out, it is carried by two men, so that if one should faint or stumble the other would keep it from falling to the floor. When it is placed on scales, for checking other weights against it, the operator works by remote control 10 feet away, lest the heat of his body affect the test (page 783).

Though no one ever has seen electricity or even knows just what it is,* the Bureau "weighs" it regularly to get the value of an ampere of current. A small electric coil hung from one end of a delicate balance is placed between two larger coils. When current is

* See "The Fire of Heaven," by Albert W. Atwood, National Geographic Magazine, November, 1948.

National Geographic Photographer John E. Fletcher

"Why Did My Shoes Wear Out Fast, Daddy?" He Cuts Them Open to Find the Reason

Bureau of Standards distributes shoes for testing to youngsters in orphanages and to children of staff members, who wear them for about two months or until they are worn out. Later the shoes are returned to the Bureau for examination. This scientist inspects footgear worn by his daughter and other children. In World War II the Bureau developed a waterproofing compound desperately needed for Army boots.

run through all three, the small coil is deflected slightly up or down.

Weights are then added to (or taken from) the scale pan to restore the beam exactly to its original position. From the change in weight and the dimensions and position of the three coils, the strength of the current is measured in absolute amperes.

Length of a Second Is Crucial

Even the length of a second of time can be crucial in today's world. Radar sets, detecting hostile bombing fleets, and echo-sounding devices showing the depth of water under a ship's keel, depend for usefulness on knowing how far a radio pulse or sound wave travels in one second, and also just how long a second is.

To fill the need for super-accurate measures of time, NBS broadcasts around the clock the Nation's "standard second," a continuous "tick-tick-tick," 24 hours a day. The interval between two ticks is one second, accurate to one part in a million.

Length of this standard second is based on the time of the earth's rotation, as determined by the Naval Observatory, which varies only minutely from exactly 24 hours.

But over the centuries the length of the second is changing, because friction of the tides in shallow seas is gradually slowing down the earth's rotation. Even the standard platinum-iridium meter-bar might conceivably slowly vary in length, although measurements over a 50-year period show no detectable change. Many hard steels, however, "grow" or shrink with age.

Modern scientific gadgets and processes need even more precise standards of length and time, such as in measuring accurately the speed of light, used as a yardstick in exploring the universe. By harnessing atoms, NBS scientists have found a new standard of length potentially accurate to one part in a billion, and a way of measuring time which does not vary at all.

New "Atomic Yardstick"

The new atomic standard of length is the wavelength of green light emitted by atoms of a new kind of man-made mercury. Its chemical name is mercury 198. All light moves in waves, like waves in water, and wavelength is the distance between the crests of two waves. The wavelength of the green light of mercury 198 has been measured to one part

in a hundred million. One meter is equal to 1,831,249.21 wavelengths of this green light.

Mercury 198 was not available before the atomic age. It forms a part of ordinary mercury, but cannot be separated from it by any known method.

But now it is possible to *make* mercury 198 by reversing the dream of the alchemists of old, who tried to turn mercury into gold. Instead, modern alchemists turn gold into mercury 198 by bombarding the gold with neutrons in atomic piles or ovens, which were first developed for making atomic bombs. The Bureau now is making mercury 198 "yardsticks" for other scientific laboratories (page 762).

Vibrating atoms, instead of swinging pendulums, regulate the Bureau's new atomic clocks, which never run fast or slow. Molecules of ammonia control one clock. A nitrogen atom in this molecule vibrates 24 billion times a second, and this rate never changes. Another clock, even more accurate, is run by atoms of cesium, vibrating within themselves 9,200 million times a second, and this rate also does not vary.

Already plans are under way to have these atomic yardsticks and clocks adopted as the world's new standards of length and time. Bureau men also are considering atomic standards of weight, or mass.

The coming of the atomic age has vastly increased the use of radioactivity in all kinds of tasks, from treating disease to learning how farm crops use fertilizer. But, like dynamite, though useful, it is deadly dangerous if not carefully handled.

Taming Radioactivity

Bureau men have the crucial job of taming the insidious menace of radioactivity and standardizing its strength so that it can be harnessed for useful work.

Atoms of ordinary things like iron or phosphorus can be made radioactive, like radium, by bombarding them with neutrons in atomic piles. Scientists call them radioisotopes.

If properly handled, these isotopes can work scientific wonders inside the human body.

Just as ferrets can hunt down and kill rats in holes where men can't get at them, these isotopes can seek out and sometimes relieve internal ills otherwise beyond a doctor's reach.

For example, if you eat a little iodine, as you do in fish, it travels straight to your thyroid gland. If you have an overactive thyroid, operating on it may be undesirable for some reason.

Instead, the doctor may give you some radioactive iodine. When it gets to the thyroid, its rays in some cases may help the overactive condition. Radioactive phosphorus helps ameliorate some blood troubles because it travels to the body's blood-producing centers, the bone marrow, spleen, and lymph glands.

If little Johnny swallows a watch, its progress down inside him might be followed by listening for the ticking. Likewise, to find how iron is used in the body, a patient may be given some radioactive iron to swallow. The rays this iron gives out cause clicks in a Geiger counter. As the counter is moved over the body, its clicking shows where the iron has gone—to the brain, the biceps, or maybe the big toe!

With this "tracer" technique doctors are learning many things about how the body uses food and vitamins. Such information is useful in diagnosing and treating disease.

But these same rays that treat disease and show where tracer atoms go can be dangerous inside the body if they last too long or are too powerful. National Bureau of Standards tests are helping to show what doses are safe, yet strong enough to be useful.

Safe Handling of "Hot" Isotopes

Radioisotopes must be carefully handled outside the body as well. Unseen and unfelt, their rays can injure, cripple, or even kill.

To guard against this menace, the Bureau shows atomic scientists how to play safe. If the hands, cigarettes, lipstick, or food become contaminated with radioactive atoms, they can carry them into the mouth.

Radioactive materials can lurk in cracks in the floor or woodwork, on laboratory shelves or the tops of lamps where dust accumulates, or they may be spilled on workbenches or clothing.

Workers guard against all this by carefully cleaning their workrooms, wearing special clothing and even masks at times, and making frequent tests to find lurking traces of radioactivity.

Many of the Geiger counters and other instruments used by the Atomic Energy Commission, the armed services, civil defense personnel, and scientific laboratories are carefully calibrated in NBS laboratories so they will show correctly how much radiation exists where they are used.

Making X-rays safe to use and setting safety standards for X-ray equipment also are Bureau tasks.

Though X-rays as used on physicians' patients are normally harmless, some doctors and technicians have acquired severe burns or even leukemia from overexposure to the rays scattered in their workrooms.

When a dentist X-rays a tooth, he usually has the patient hold the film inside his own

Kodachrome by Willard R. Culver

Raw Optical Glass Made at the Bureau of Standards Gleams Like Uncut Diamond

From this 970-pound lump will come finished pieces like the round window of a wind tunnel. Patterns of air flow will be photographed through the glass. Bureau research constantly improves optical glass.

Kodachrome by Robert F. Sisson

Standard Screw Threads Make the World Run More Smoothly

Britain, Canada, and the United States are making nut and bolt threads interchangeable so that machines and military equipment produced in one country can be more easily repaired in another. These gauges for accurate threading of oil-well casings are calibrated at the Bureau.

Kodachrome by Willard R. Culver

Light of Man-made Mercury Is a Super-accurate Yardstick

Wavelength of light of mercury 198, in the tiny tube, is measurable to one part in 100 million, forming the world's most precise standard of length. Precision measurement of the wavelength is achieved with the aid of the targetlike interference pattern, the product of mercury light reflected back and forth between two metal-coated parallel glass plates.

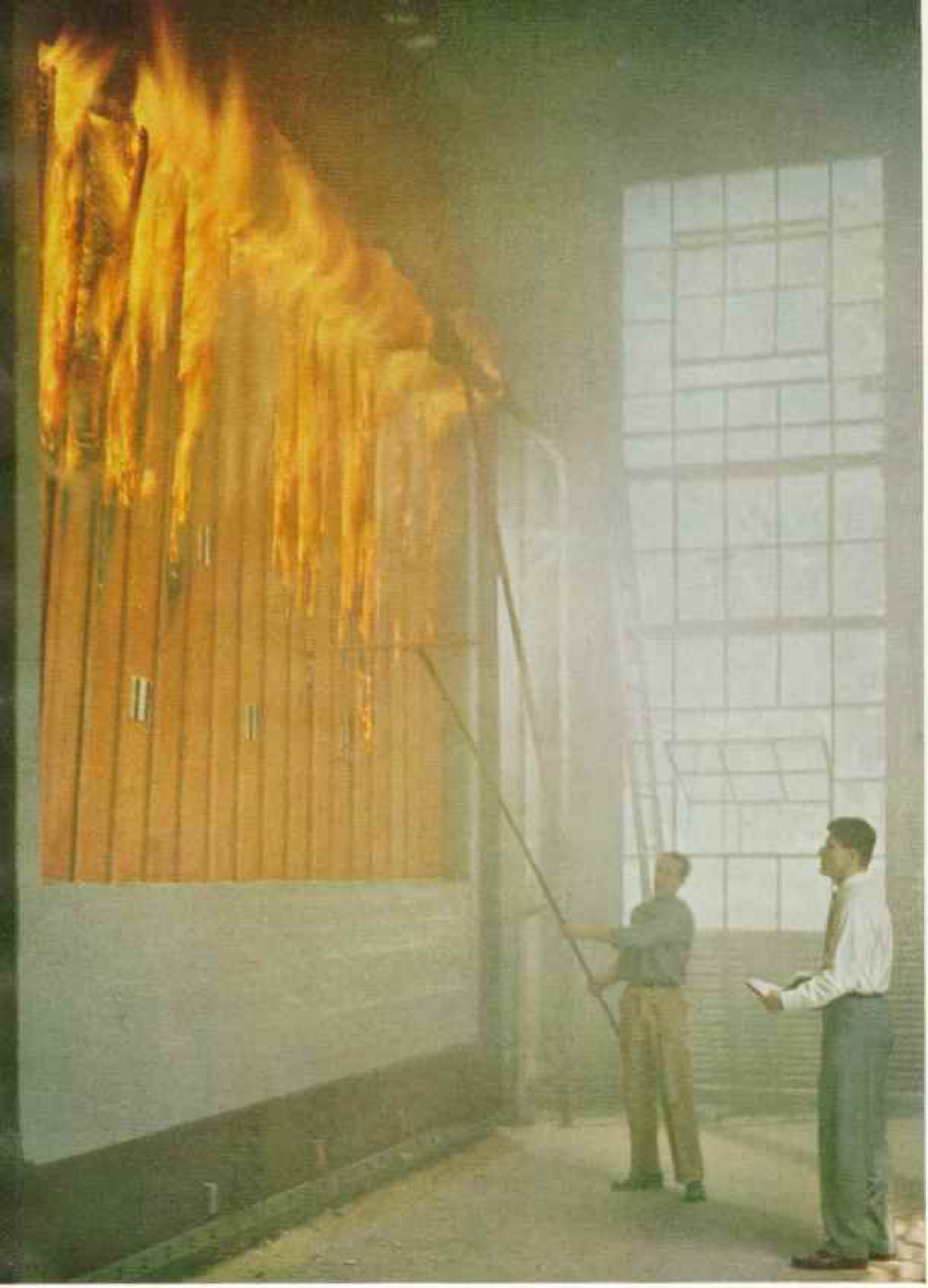
Huge Metal Ears Catch Radio Signals Coming from the Sun

Bureau of Standards uses these 25-foot radiotelescopes to study ultra-short-wave radio "noise" from outer space. The reflectors automatically follow the sun across the sky. Incoming signals are picked up by curved wire mesh, focused onto a central antenna, and carried to a recording device.

Radio "broadcasts" from the sun are more powerful when sunspots are numerous. The Bureau forecasts disturbances of radio transmission resulting from sunspots, flare-ups of gas, and other activities on the sun. Such predictions permit radio transmitters to be switched to other frequencies to keep communications open.

These units, weighing about 12 tons apiece, are set up near Sterling, Virginia.

Photograph by Willard R. Culver



  Photograph by Willard R. Culver

How Long Will a House Wall Resist Fire? Flames Solve the Problem

Fire took 27 minutes to break through this sample wall of Douglas fir after gas flames were directed against the rear side. Instrument on pole measures wall's bulge. Bureau tests set fire-resistance ratings for building materials.

Photograph by Willard R. Culver

A Huge Hollow Sphere Tests the Brilliance of Ordinary Electric Lights

When the sphere is closed, light from the sample lamp inside is diffused equally over the interior. Light coming from one small hole gives an accurate measure of the lamp's total output and helps set electric light standards.

Ektachromes by Willard R. Culver

Invisible Electrons Are "Weighed" to Measure Units of Electricity

To measure the faraday, a basic unit of electrical quantity, a scientist prepares to determine the mass, or weight, of atomic particles by whirling them on a spiral path in the omegatron. Standards for the volt, ampere, ohm, and watt are also set by the Bureau.

Plastic Headgear Tests the Efficiency of Earphones

With this device the Bureau determines how well earphones work on ears. Sound from the earphone is picked up inside the ear cavity by a microphone and the amplitude recorded. Hearing aids and hearing tests are improved on the basis of such experiments.

Kodachrome by Willard R. Culver

Strips of Metallic Paint Protect Plywood Aircraft from Lightning Damage

A ribbon of brass and graphite pigment 1/100 of an inch thick deflects the man-made bolt striking the glider rudder. Zigzag path shows the sharp corners turned by the flash. Lightning does no serious harm to metal planes.

Photograph by Willard R. Culver

A 150-ton Load Deflects Steel Proving Rings Only 5/100 of an Inch

These rings are calibrated to check the force exerted by powerful machines used to measure the strength of heavy girders, brick walls, and airplane parts. One machine at the Bureau of Standards can exert a 10,000,000-pound force.

mouth. This brief exposure does no harm, but some dentists who have held the film themselves in the mouths of hundreds of patients for many years have lost the use of their fingers from gradual X-ray damage.

To prevent such accidents, the Bureau makes tests to see how much X-ray dosage is safe and how much lead or concrete is needed around X-ray machines to prevent the escape of the powerful rays.

X-ray beams of tremendous power, such as those used for treating deep-seated cancers within the body and for finding hidden flaws in metal castings, are being produced by two huge instruments in the Bureau's high-voltage laboratory, a 1½-million-volt X-ray machine and a 50-million-volt betatron.

X-rays coming from such machines, except in the narrow, controlled beams used in treatment, are highly dangerous. Using huge slabs and blocks of concrete, NBS physicists build experimental walls to find how great a thickness is needed to seal in the rays.

Walls to Protect Atom Bomb Workers

Workers in atomic bomb plants are protected by lead and concrete walls of the type tested for safety by the Bureau, and the same data will be used where atomic energy is harnessed for running power plants, ships, and planes.

Years ago, some women putting radium paint on luminous watch dials wet their brushes with their lips. Unknowingly, several doomed themselves to slow death by radium poisoning.

Today, that cannot happen, because the National Bureau of Standards checks people doing such work to see if too much radium is getting into their bodies. From time to time the workers blow air from their lungs into small balloons, from which it is transferred to evacuated flasks and sent to the Bureau for analysis (page 780). Air in workrooms is also sampled.

Radium gives off radioactive radon gas. If there is any radon in the samples of breath or room air, it sets off clicks on an automatic counter that measures how much is present. If too much radon gas is inhaled, or too much radium is deposited in the body, there may be a fatal breakdown of the red blood cells. If the Bureau test shows a worker is getting too large a dose, he is given leave with pay or even transferred to other work.

Tucked away in two small buildings, one on the Bureau grounds in Washington, D. C., and the other at a branch laboratory in California, are two strange-looking machines that may eventually revolutionize civilization.

These machines can solve, in half an hour, mathematical problems which would take a man two months to do with a desk calculator. They can add or subtract 11-digit numbers (such as 87,956,953,719) 1,100 times per second, and multiply or divide them 330 times per second!

This includes time taken by the machine to search its "memory" for the numbers fed into it, do the calculation, and give out the result. It can do addition or subtraction alone in only 50 one-millionths of a second, and multiplication or division in only a little longer time, 250 one-millionths.

"Solving the Unsolvable"

This means that scientists and engineers can now solve mathematical problems previously unsolvable, because it would have taken scores or hundreds of people working months or even years to get the answers by older methods.

Electrical impulses, flashing through a maze of electron tubes and wires, do the calculating work. Problems are fed in by code, in the form of holes punched in paper tape or as pulses on magnetic tape. Answers click out on a teletype machine, as if typed by an invisible hand.

"Though these machines are fast and accurate, seemingly almost human, the operator has to do the thinking for them," a Bureau mathematician explained. "They are like a group of reliable but simple-minded clerks, working under an expert boss. The boss breaks down a complicated problem into simple operations the clerks can perform by following a pattern that he sets.

"We know the machines give correct answers because we check them from time to time by feeding in problems whose answers we already know."

Already the Washington machine is working out, in periods of a few days, problems of long-range planning, supply, and budgeting for the U. S. Air Force that formerly would have taken months to solve. It was financed by the Air Force partly for this very purpose.

"Just as our ships are now propelled by steam turbines instead of galley slaves," says an expert, "I can see a time in the not too distant future when much office work in banks, government offices, insurance companies, and the like will be done by machines like these, instead of by clerks tied to routine office jobs."

In the fighting and winning of World War II, the brains and know-how of Bureau of Standards scientists were helpful to Uncle Sam in countless ways.

When word reached President Roosevelt that Germany had split the atom, he instructed the senior author of this article, then Director of the Bureau, to organize re-

search along the same lines. Dr. E. U. Condon, who was appointed Director in 1945, and resigned at the end of September, 1951, did important research on atomic fission. Bureau chemists produced the first pure uranium and graphite, essential for making atomic bombs, and helped lay the foundations of atomic bomb work later put on a production basis by the Army's Manhattan District.

Proximity Fuse Helped Win War

Development of the famous proximity fuse, a tiny radio "brain" which vastly increases the deadliness of bombs, rockets, and artillery shells, and helped win crucial actions in World War II, was shared by NBS and Johns Hopkins University scientists.

The fuse is really a tiny radio set that sends out waves ahead of the bomb or shell. Bouncing back from the target, the waves set off the explosion as the missile comes near.

Equipped with this fuse, antiaircraft shells or rockets need not actually hit hostile bombers to destroy them. The fuse explodes the projectiles when they come anywhere within destructive range of the planes. Bombs and shells exploding at ground level do little harm to troops in near-by foxholes; but, equipped with the proximity fuse, they can be set to explode in the air just before they hit, showering deadly fragments downward, so that foxholes are of little protection.

Bombs and rockets equipped with the fuse enabled Allied bombers to knock out hostile antiaircraft gun crews so that bombing missions were more effective. British gun crews used the fuse to knock down Hitler's buzz bombs before they hit London. Army bombers used proximity fuses with deadly execution against the Japanese in foxholes on Iwo Jima.

Bombs or shells equipped with the fuse must not be "armed" (*i.e.*, safety catch released) until they are well on their way. NBS men devised the method of arming missiles that do not rotate in flight, such as bombs, rockets, and mortar shells; Johns Hopkins researchers developed another type for shells fired from ground or antiaircraft artillery, which do rotate.

Proximity fuses have brought nearer the day when we all may carry our own individual radios, small enough to fit in the pocket or handbag.

Pocket Radios on the Way

Each fuse has a miniature radio in it, no bigger than a man's fist. In that small space there is no room for the large tubes and copper wiring circuits used in ordinary radios. Bureau men developed tubes scarcely bigger than a pencil eraser and circuits made of lines of silver ink, printed on pieces of plastic, ceramic, or other insulating materials, just as the letters are printed on this page. These metallic ink lines conduct electricity the same as copper wire and take up far less space.

Individual pocket radios will use such miniature tubes and "printed circuits." Most modern hearing aids, much smaller than the older types, already use them. Valuable weight and space are saved in airplanes by using these new small parts in radio and airborne radar sets.

In the future, when trouble develops, repairmen will not need to spend valuable time tediously searching through a maze of wires. They will simply pull out the entire circuit, throw it away, and insert a new one costing but a few cents.

Back in the depression days of the early thirties, some Bureau scientists were discharged under the Government's economy program. One of them was in the midst of studying how various kinds of rubber refract, or scatter, light waves. He found an outside clerking job so that he could eat, and worked on at the Bureau without pay for three months to finish his project. When this country desperately needed a method of controlling the proportions of various ingredients in synthetic rubbers in World War II, this man's unselfish work of 10 years before proved to be the answer.

Production of planes was imperiled at times in World War II because much of our bauxite clay for making aluminum had to be brought from abroad over submarine-infested seas.

That cannot happen again because Bureau men have found how to make aluminum from our own domestic clays. Though too expensive for peacetime use, the process is an invaluable "ace in the hole" if needed.

Standardizing Screw Threads

Operations in World War II were often dangerously delayed because America and Great Britain used slightly different kinds of threads on bolts and screws. For years American screw threads had been cut at an angle of 60 degrees, British threads at 55. American nuts would not fit British bolts.

Britain had to scrap the outlets on 100,000 oxygen cylinders made in America and manufacture new ones because the American type would not fit British plane attachments. British warship repairs were delayed in American yards because our screw threads were different from theirs.

Now America, Great Britain, and Canada, aided by the National Bureau of Standards, have agreed to standardize the threads on their nuts and bolts, largely adopting the American style. This will have vast peace-

Electric Bulbs, Burning until They Fail, Measure Their Life Span Accurately

Samples of all the millions of lamps purchased annually by the Federal Government are checked by the Bureau. Bulbs of 40 and 60 watts have an average life of 1,000 hours; 100-watters, about 750. Fluorescent lamps burn approximately 7,500 hours. Such tests benefit the public, since most manufacturers make their lamps to meet Government standards (page 765).

time benefits, too, for almost everything made today, from fine watches to locomotives, is put together with nuts, bolts, and screws. Henceforth it will be far easier for mechanics in one country to find spare parts and make repairs for a machine manufactured in another (page 762).

Forecasting "Radio Weather"

NBS radio scientists keep a constant and wary eye on the sun because things that happen there interfere directly with life on earth, especially with radio.

Ultraviolet light speeding in from the sun electrifies, or ionizes, layers of air 50 to 250 miles aloft, creating what we call the ionosphere. Shortwave radio travels around the earth in big bounces between the ground and these layers, making long-distance radio communication possible.*

But the ionosphere is temperamental. Radio messages sent on a certain wavelength may bounce merrily along between earth and sky to their destination in the morning, then suddenly shoot right off through the ionosphere into outer space in the afternoon. On another wavelength this may not happen, and by shifting to it a station may still get its messages through.

Worst trouble comes when spots form on the sun and streams of atomic particles shoot out from them toward the earth, badly disrupting the ionosphere. Then radio messages may have to be rerouted over new paths half a world away.

Predicting these radio troubles is part of the job of the Bureau's radio men. They call it forecasting "radio weather." They regularly predict, three months ahead, what is the best wavelength to use between any two points on earth at any time of day or night, in order to get a message through instead of having it lost in space. They also forecast, a few weeks or days in advance, the day-to-day changes in radio weather.

Airlines, steamship lines, radio communication companies, press wireless services, and broadcasters all use these predictions.

Sunspots cooperated with our armed forces

* See "New Frontier in the Sky," by F. Barrows Colton, NATIONAL GEOGRAPHIC MAGAZINE, September, 1946.

in World War II. Because there were comparatively few sunspots during the war years, long-range radio messages could be sent to our distant fighting fronts without too much interference.

Forecasts of radio weather were used in planning bombing raids for times when there would be no interference with radio signals guiding aircraft home; also in timing fleet actions in the broad reaches of the Pacific where clear radio reception over vast distances was essential.

Tooth Fillings Last Longer

Next time you have a tooth filled with amalgam, you'll notice that the dentist probably handles the filling material in a soft rubber container, not touching it with his hands. Thereby hangs a tale.

Formerly many people who had teeth filled suffered severe pain in them a few days later. Bureau scientists found the reason. Dentists often had mixed their amalgam by rolling it in the palms of their hands, not realizing that a little moisture thus got into the filling. Inside the tooth this moisture released hydrogen gas, which expanded and caused pain.

Amalgam fillings often failed, because little was known about this filling material and how to insert it properly. Today 90 percent of dental amalgams meet standards of quality set by the Bureau, and fillings last much longer.

Bureau tests have helped develop new materials, both for false teeth and for denture bases, that won't shrink, break, or dissolve in mouth fluids, as many once did.

Experimental fillings and dentures are tried out on Bureau scientists, who act as guinea pigs. Dentists and dental schools get lists of materials tested by the Bureau and approved by the American Dental Association. Much of the work is done by research associates from the Association and the armed services, who work in NBS laboratories (page 775).

Bones Are Elastic

Breaking human bones, to find how much punishment they can take, is an NBS-Navy project. This knowledge helps in designing airplanes and safety devices for them so that crews and passengers will have a better chance of surviving crashes.

Modern jet fighter planes are so fast that pilots cannot bail out against the force of the air stream. Instead, they have to blast themselves out with an explosive charge under the seat. Too great a shock might break a pilot's back or injure him internally. Engineers want to know how much of a shock human bones can absorb and how much they may transmit to vital organs.

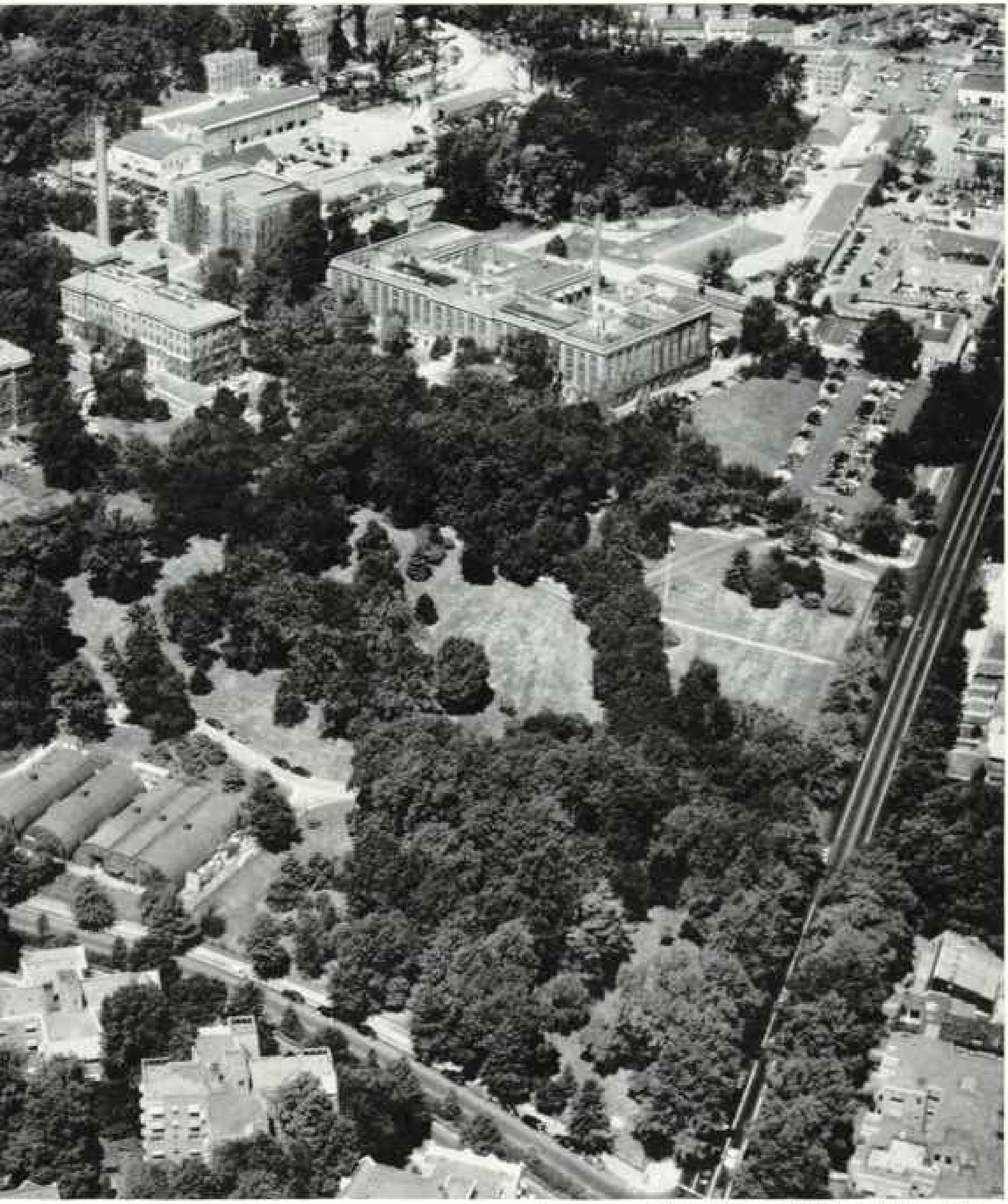
Long bones of the human body, those in the arms and legs, average twice as strong as a

122

Where Science Works for the Citizen:

piece of hickory the same size. Bones are elastic in all directions, and will bend and spring back considerably without breaking, the Bureau found, though of course they grow more brittle with age.

One day in Washington a woman was found murdered. The noses of the two bullets that killed her had been filed down to make them fit the chamber of the gun. One suspect had



774 National Geographic Photographer Willard R. Culver

National Bureau of Standards Laboratories Have Made Life Better in Countless Ways

a nail file in his pocket, on which were traces of lead.

Examined with a Bureau spectrograph, which reveals unerringly the exact composition of any material, the lead on the file proved to be identical with that in the bullets. Because he neglected to throw away his incriminating nail file, the murderer went to the electric chair.

A post office burglar, going out a window, left a piece of his pants behind on a nail. The microscope showed that fibers recovered from the nail must have come from a certain suspect's torn pants.

Analysis of handwriting by a Bureau expert helped stop the kidnaping racket. Characteristic variations of German script, found in the handwriting of Bruno Richard Hauptmann,

If Properly Repaired, Watches Should Keep Good Time in Five Positions

This Bureau expert checks the accuracy of timepieces overhauled by student watchmakers seeking proficiency certificates from the Horological Institute of America. He tests the watches face up, face down, stem up, and with stem turned left and right, for two days in each position, at temperatures from 41° to 90° F. Master watches used on railroads and in industry are similarly checked by the Bureau.

proved he wrote the ransom notes for the Lindbergh baby.

A forger was tracked down when his handwriting revealed that he had learned to write in Italy, then had had his style modified by going to school later in this country.

Why Male Audiences Hear Better

Sound and its behavior, from the inaudible noises made by bats to the operation of hearing aids, is another Bureau specialty. When ROTC cadets started drilling in the University of Maryland's new armory, they could not hear the commands. Paint had filled up the pores in the cinder-block walls and had ruined the acoustics. Bureau experts recommended a sound-absorbing material to be applied to the walls to remedy the trouble.

Incidentally, a speaker in a noisy auditorium can be heard better if his audience consists of men, because their heavier garments absorb more sound than women's lighter clothing.

When the new U. S. Supreme Court chamber was first used, comments by the judges sometimes were hard to hear. Bureau men suggested installation of amplifiers that carry the Justices' words clearly through the courtroom, but at the same time do not transmit what they say among themselves, which is not always complimentary to attorneys conducting trials!

A pamphlet, *Selection of Hearing Aids*, written by a Bureau expert, has circulated all over the world. It is obtainable from the Government Printing Office for 15 cents.

How strong should a suitcase be? Rail, bus, and airline officials and manufacturers asked the Bureau to find out, because luggage damage on trains, buses, and airplanes was averaging $1,250,000 a year.

The Bureau sent sample suitcases on 12,000-mile trips all over the country, devised a machine that dropped them and picked them up by the handle thousands of times, and piled heavy weights on them (page 758).

A good suitcase, they found, should be able to hold a 150-pound man standing on the top, sides, and ends for five minutes. One should be able to pick it up 25,000 times with-

775 National Geographic Photographer Willard R. Culver

Hot Coffee and Ice Cream Test a Tooth Filling's Reaction to Heat and Cold

If heat expands a filling too much, pain or breakage may result. If contracted by cold, the restoration may loosen and fall out. Research by the Bureau has improved both filling and denture materials (page 772). The wire entering this girl's mouth leads to a thermocouple imbedded in an experimental filling to measure temperature changes caused by hot and cold foods.

out breaking the handle, and drop it five feet 50 times on all the faces, edges, and corners.

Not long ago the Bureau invited some master plumbers to witness a unique kind of motion picture. As it unreeled, the audience grew more and more excited. They were seeing, for the first time, what actually happens inside the plumbing system of a house.

Most plumbers thought they knew, but didn't all agree. American cities had more than 1,500 different plumbing codes. Bureau men built a complete plumbing system out of transparent plastic pipe, ran water through it, and took movies.

These showed that many pipes were unnecessarily large, and systems often had more traps than were needed, adding to the cost. Today local plumbing codes are gradually adopting these findings, saving money for the home builder.

Brick manufacturers didn't like it at first when the Bureau reported that an 8-inch wall was just as safe for the average house as the 12-inch ones used for many years. But they soon found this enabled more people to afford to build brick houses, resulting in greater sales of brick.

Care and Repair of the House, a book written by Bureau men, sold nearly 140,000 copies this past year. It gives expert advice on everything from fireproof shingles to leaky basements and can be bought from the Government Printing Office for 50 cents.

Rebuilding the White House

Decision to rebuild the inside of the White House, while preserving its original outer shell, was based on Bureau tests. Gauges put on interior cracks showed these were growing, while borings into the sandstone walls revealed no damage either from the fire during the War of 1812 or from the passage of time.

Years ago confusion reigned on American railroads in the checking of carload weights. A load that weighed 100,000 pounds on one road's scale might weigh only 80,000 on another's.

Today, in cooperation with the Association of American Railroads, two National Bureau of Standards test cars, equipped with stand-

ard weights, are constantly on tour, checking the accuracy of 19 master track scales. These scales don't vary now by more than three or four pounds in 80,000. Against these scales in turn are checked the 6,500 commercial track scales operated by railroads to fix freight charges and by manufacturers to check on production and transport costs.

Paper Money Made Tougher

Today you seldom see a torn dollar bill because Bureau paper experts have learned to make currency paper many times as strong as it once was. Sample bills must survive being folded and unfolded thousands of times in a testing machine. Even so, a dollar bill's average life is only eight months!

Asked to make Army map paper tough enough for hard field usage, Bureau men produced some samples bonded with a synthetic resin. To test them, soldiers cleaned rifles with the maps, used them for towels, and drove over them with jeeps on muddy roads. Washed off, the maps were as good as before!

With the dwindling of the Nation's supply of soft pulpwood used in making paper, the Bureau used the same resin to strengthen the shorter fibers of hardwood so that they could be mixed with softwoods. Many American paper mills use this process today.

Paper used in the NATIONAL GEOGRAPHIC MAGAZINE and maps, and in the wrappers for mailing, was selected as the strongest and most durable obtainable for GEOGRAPHIC requirements on the basis of Bureau tests.

Once, when a building burned, valuable Government records were reduced to a pile of charred sheets. Bureau experts carefully placed them on photographic negatives and exposed them for several weeks. Gradually the all-but-obliterated writing was thus photographed in legible form and salvaged.

Airplanes hardly could operate today without the pioneering work of Bureau men. They could not follow radio beacons or get weather reports and landing instructions radioed from the ground without an NBS development that cuts out interference by shielding the engine ignition system.

Blind flying, instrument landing systems for use when airports are "souped in," radio range beacons and direction finders all were pioneered largely by Bureau engineers. They invented the radiosonde device that is carried aloft by small balloons, radioing back to earth automatically the temperature, pressure, and wind direction in the upper air, for use in weather forecasts. They developed automatic weather stations which, unattended, report weather by radio from remote locations.

How air flows over airplane wings at speeds approaching that of sound, a guide to making them the right shape, was first discovered in tests in Bureau wind tunnels. In one of the tunnels Dr. Alexander Graham Bell, the world-acclaimed inventor, tried out a model of his hydrodrome, a motorboat driven by two airplane propellers, which in 1920 traveled 70.86 miles per hour. At high speed its hull rose clear of the water, and it ran only on small steel vanes set beneath, which offered slight resistance.

Tumbling over each other in a turning barrel, experimental dishes in the Bureau's ceramics laboratory get the equivalent of five years' washing and handling in 48 hours. In the barrel they are sprayed at intervals with hot water, soapsuds, and food mixtures. These tests, made in cooperation with the Vitrified China Association, have shown chinaware makers ways to make dishes less breakable, such as putting a slight bulge on a plate's bottom.

Two mysterious cases of lead poisoning once were traced by Bureau men to teacups decorated with colored glazes containing lead. Tannic acid in the tea which the victims had been drinking had dissolved some of the lead. Lemon juice, and vinegar used in salads, also could dissolve lead from such glazes, the Bureau's chemists found. Today these glazes are no longer used, and in glassware the colors are put only on the bottoms of plates and outsides of cups.

If one of your enamel-lined pots boils dry on the stove, don't pour in cold water while it's still hot. This causes the enamel to contract so rapidly, the Bureau found, that it may crack and absorb water. When the pot is heated again, this water turns to steam, resulting in further cracking and flaking.

Are Baseballs Livelier?

Even sports sometimes come under the Bureau's all-seeing eye. When big league baseball teams start hitting more home runs than they did the year before, sports writers and others sometimes suggest it's because the balls are livelier. The Bureau settles these arguments with its baseball batting machine, which hits every ball with exactly the same force. Every test so far has shown that the balls aren't livelier. The batsmen are just better!

One problem the Bureau has never solved and probably never will is perpetual motion. Yet every year so many Americans think they have found the secret that the Bureau has a tactfully worded form letter explaining why their ideas won't work.

When one inventor received this letter, he wrote direct to the White House:

"Dear Mr. President: I want you to fire that darn fool at the Bureau of Standards who says perpetual motion is impossible"!

Photographing the Shape of Jet Flame Helps Design Better Engines

The Bureau uses such pictures in fundamental research on improving the performance of jet power plants. It is also developing ceramic materials to withstand jet-engine temperatures, which range up to 4,000° Fahrenheit. Most metals melt in such heat.

"Mud" Becomes Solid and Strong under the Touch of Magnetism

Magnetic fluid, a mixture of oil and iron particles invented at the Bureau, is used to operate a new type of clutch for large machines. Here two thin gray layers of the material tightly hold the yellow strip supporting the 50-pound weight. Right: Magnet solidifies fluid.

Flowers Beautify Bureau of Standards' 78-acre "Campus"

Centering around a hill-top quadrangle in Washington, D. C., the Bureau laboratories wear the mellow air of college buildings.

Varied research activities long ago outgrew the Bureau's main grounds, and six laboratories are now scattered through the suburbs. Several others have been set up in western States.

In addition, the Bureau operates nine stations and sponsors five others for forecasting radio-transmission conditions. Some 50 other institutions here and abroad cooperate with the Bureau.

In spring, the Bureau's "campus" is beautified by azaleas (foreground), tulips, and other flowers.

Fundamental measurements of electrical units have been carried out in the ivy-mantled East Building.

Testing the Breath for Radioactive Gas Safeguards Health of Radium Workers

People who paint luminous dials and do other work with radium may inhale harmful radon, a gas given off by radium.

Industry and the Bureau cooperate in periodically testing samples of breath and workroom air to determine the amount of radon. If the tests reveal that a worker has inhaled an overdose, he is transferred to another job.

Workers blow up balloons (right). Sample air is emptied into vacuum flasks (left) and shipped to the Bureau, where instruments measure the radioactivity.

Safety standards for handling of other radioactive materials and X-rays are likewise set up by the Bureau.

Photograph by Willard R. Culver

How Salt Sea Water Flows under Fresh Is Tested with Dye in a River Model

Ocean water sometimes travels far enough upstream to contaminate city water drawn from a river. Again, it may enter artesian wells, ruining them for irrigation purposes.

This transparent plastic model enables scientists to study laws governing the movement of sea water into a river channel. Heavy red liquid represents salt water moving "upstream" beneath lighter fresh water.

The Bureau's Hydraulic Laboratory has made many studies of water flow in rivers, canals, and harbors. Using transparent pipe, it has taken movies of water movements inside plumbing systems.

Ektachrome by Willard R. Culver

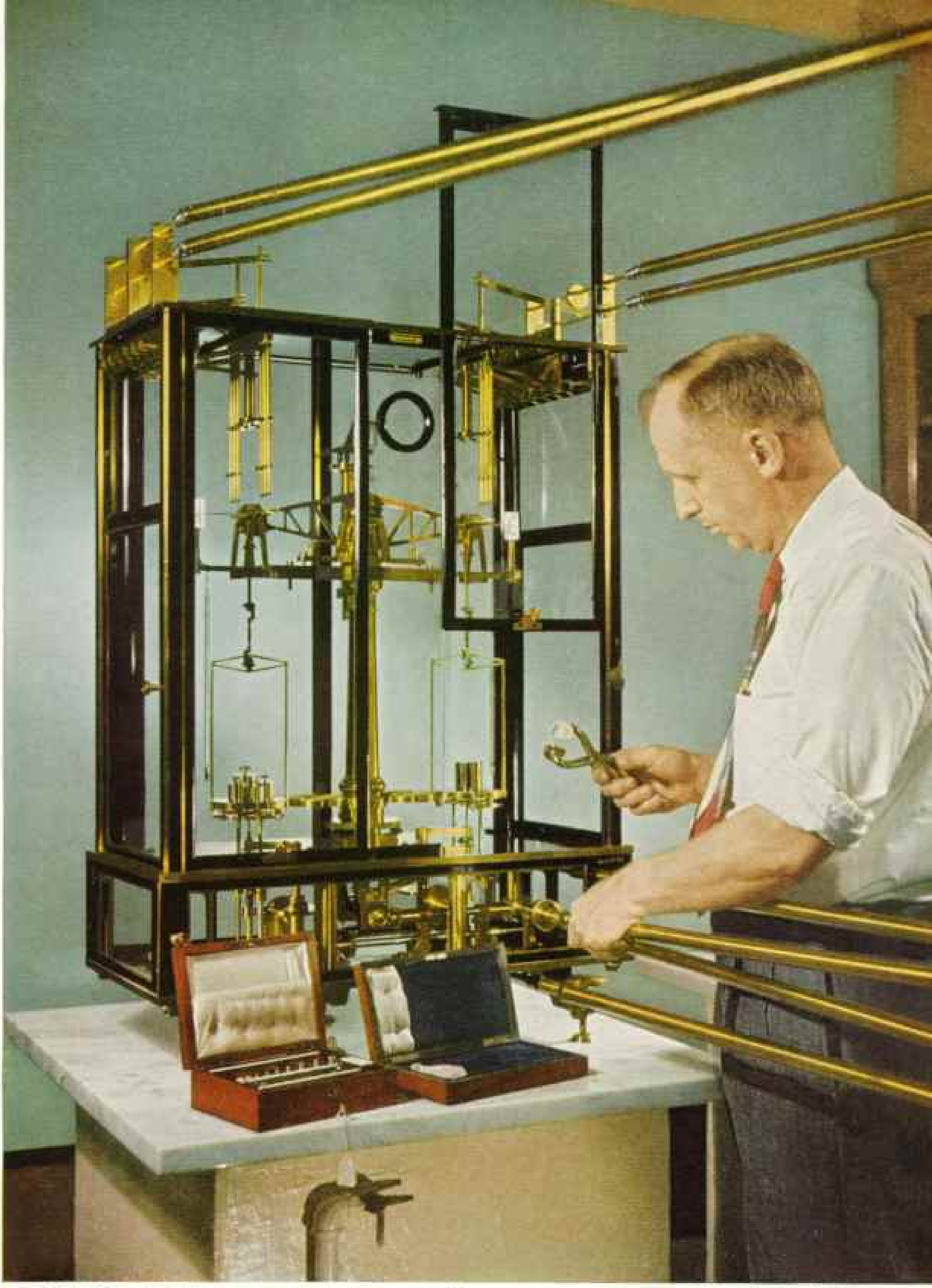
Photographs by Willard R. Culver

Strange Things Happen to Helium Chilled to 456° F. below Zero

Within four degrees of absolute zero, where molecular movement stops, helium II in the upright inner glass tube above acts as a solid, liquid, and gas all at once. Such experiments aid the study of atom behavior. Vapor comes from liquid nitrogen, a refrigerant.

"Detective" Dye Reveals Impurities in Oils, Drugs, Cleaning Fluids

Chemical sleuths are being developed to detect harmful or beneficial acids and bases in various materials. Here a yellow liquid turns a colorless fluid magenta if it contains impurities. Molecular models (left) show complex structures of the dyes.



Ektachrome by Willard R. Culver

Human Hands Never Touch the Nation's Standard Kilogram (on Scale Pan, Right)

Long rods enable operator to work by remote control, so body heat will not affect result. Tongs handle kilogram lest a spot of skin oil change its weight. Standard weights in left pan balance the kilogram (2.2046 pounds).

Ektachrome by Willard R. Culver

Talking Books Enable the Blind to Hear Best Sellers Read Aloud by Phonograph

A Bureau scientist (below) checks quality of sound with an oscilloscope (right) for the Library of Congress, sponsor of recorded books for the blind. Titles are written in Braille so that users may select them by touch (above).

Mexico's Booming Capital

By Mason Sutherland

With Illustrations by National Geographic Photographer Justin Locke

"LOOK out of my office windows," an American resident of Mexico City told me. "Did you ever see so many high buildings going up all at once?"

What he showed me was a jungle of skyscrapers, built and building, on every side.

Some of these structures were so daring they made their older counterparts north of the border seem pallid and conservative. Architects, cutting loose from Spanish colonial traditions, had applied stainless steel, plate glass, and color with the lavish hands of today's automobile designers.

Indians Work amid Steel

Sundecks, terraces, and penthouses replaced the somber outer walls of old palaces. New office buildings were sheets of glass thinly ribbed with stone; entire corners were multistoried solariums. Junior-size skyscrapers staggered with pagodalike setbacks; some turned concave faces to the streets, others were convex (pages 794 and 799).

Later, as I walked the streets and peered into the pits of skyscraper excavations, I saw Indians doing the work of steam shovels. Scarcely more than five feet tall, the toilers carried backloads of earth hung from tumplines attached to foreheads. At noon they ordered no food from cafés, but cooked their own village-grown beans over an open fire. In the midst of steel, they looked as primitive as Stone Age men.

I discovered the face of old Mexico City in house walls flush against sidewalks and in tree-shaded, flower-spangled patios concealed behind those walls. Strolling the streets, I encountered men sweeping walks with besoms, old-fashioned bundles of twigs. Bicycle delivery boys juggled huge breadbaskets on their heads. Sandaled Indians in white cotton pants competed for sidewalk space with handsome descendants of conquistadors.

Strangers Feel the Altitude

Mexico's capital lies just south of the 20th parallel, which, as it stretches across the world, intersects oven-dry Saudi Arabia and steamy Indochina. But, thanks to its lofty position, Mexico City enjoys a year-long spring, or autumn, broken only by the rainy season (summer). Businessmen as well as college boys take advantage of the mild climate to go hatless. Seersucker suits are as rare as coonskin coats.

At 7,350 feet above the sea, the city sits in the Valley of Mexico, a maguey-studded basin enclosed by mountainous ramparts such as snow-clad Popocatepetl (Smoking Mountain, page 815) and Iztaccihuatl (White or Sleeping Woman), two old, familiar volcanoes.

To compensate for altitude's low oxygen volume, Nature gives Mexico City man more red blood cells. When sea-level man comes up to these heights, his blood system calls out the spleen's red-cell reserve, and the bone marrow manufactures more. The average individual takes a week or more to adjust. Alcohol and coffee play strange tricks on visitors unaccustomed to the altitude.

For centuries beyond memory the Valley of Mexico was the focal point of migrating Indian tribes. Brilliant civilizations scattered their temples and pyramids across the vale and, declining, vanished into the limbo of forgotten peoples (pages 816 and 824).

About 1325 the Aztecs wandered here in search of a promised land. Tribal legend says that, fulfilling a prophecy, they spotted the omen they had been seeking, an eagle perched on a nopal cactus with a serpent in its talons; these symbols appear on Mexico's seal and flag to this day.* Where the cactus grew, the Aztecs founded Tenochtitlán, which means "Place of the Cactus Pear."

Cortés Found a New-World Venice

When Hernán Cortés and his band of fewer than 400 followers arrived in 1519 to visit Montezuma, the Aztec Emperor, the Spaniard likened the town to Sevilla.

Venice would have been a better comparison. Tenochtitlán stood on an island in old Lake Texcoco, thousands of canoes thronging its waterways. Its farm produce came from *chinampas*, or floating gardens, won from the lake bed (page 810).

Tenochtitlán has been dead four centuries. Spaniards, conquering the city in 1521, demolished its pagan temples and erected Mexico City on its grave.

Texcoco has been drained; the lake's Indian-built causeways are now broad avenues, but Montezuma's dead hand still marks the city.† The National Palace (page 791) and Chapultepec Castle occupy sites of his royal residences on the Zócalo, the main plaza, and in Chapultepec Park (page 789).

*See "Flags of the Americas," by Elizabeth W. King, National Geographic Magazine, May, 1949.

†See "North America's Oldest Metropolis," by Frederick Simpich, National Geographic Magazine, July, 1930.

786

A Concrete Honeycomb Takes Cars off the Streets

Downtown Mexico City is plagued by too many automobiles, not enough parking places. Nacional, a five-story, open-air garage, relieves congestion by storing 320 cars.

Today these two landmarks are connected by a long main avenue bearing three names.

Mexico's Magnificent Main Street

Avenida Francisco I. Madero, the first section, begins at the Zócalo (pages 790 and 795). A generation ago the street was called Plateros because of its many silversmiths. By day silver, gold, and jewels still gleam in its shop-windows, but at dusk the merchants slam down corrugated iron shutters, blotting out their treasures.

After seven blocks Madero widens into Avenida Juárez, seat of movie palaces, bookstores, and office buildings. Here the new Hotel del Prado in 11 pink stories faces the Alameda, a restful green park.

At the equestrian statue to Carlos IV of Spain, known as the "Little Horse" (opposite), most traffic quits Juárez and, taking a slight jog to the left, swings into the Paseo de la Reforma, a broad, landscaped promenade (page 794). Maximilian, whom Napoleon III made Emperor of Mexico in 1864, constructed the Reforma to shorten the imperial way between the National Palace and his home in Chapultepec Park.

One by one now the Reforma's two-story, French-style mansions, the height of elegance in the 1890's, give way to towering hotels, office buildings, and movie houses.

Vanished Lake Causes Trouble

Mexico City builders have more than steel shortages to contend with. Even as the city spreads up and out, Nature insists that the logical direction is down! Overloaded sections are settling slowly but surely into the spongy, volcanic soil of vanished Lake Texcoco.

As the water table drops, so do buildings supported by its influence on foundations. Some colonial structures, sinking more at the middle than at ends, are sway-backed. Sidewalk cracks form concentric rings around settling skyscrapers. But the casual visitor scarcely notices these phenomena.

Since its conception a few decades ago, the Palace of Fine Arts has gone down bit by bit (page 802). The Cathedral, one of the oldest and largest in the Americas, reveals cracks. I saw steelworkers driving

787

Automobiles, Taxis, and Buses Funnel into Avenida Juárez as if Drawn by a Magnet

Most outbound traffic never reaches the domed Monument to the Revolution but swings to the left around the "Little Horse," the old bronze statue to Carlos IV of Spain. Television station XHTV broadcasts from the tall National Lottery Building (right); the *canal*, spelled out across windows, refers to its channel. This tower "floats" in a concrete "boat" moored in Mexico City's mushy subsoil.

reinforcements into the adjoining Sagrario (page 790).

Mexican Engineers Solve Sinking Problem

Mexicans express no alarm about these conditions. They worry about the colonial buildings but feel their modern structures are as safe as the Rock of Gibraltar. Mexican architects and engineers deserve great credit for applying several ingenious devices to overcome these mushy natural foundations.

They are not always able to arrest subsidence, but do prevent inequalities in balance. They join foundation footings to ensure even settlement; they pump supporting water back into the soil; they drive piles deep down to gravel.

Testing a new construction technique, the National Lottery Building rests as cargo on a huge concrete boat floating on subterranean muck. Calculating the weight of the building, engineers excavated the equivalent mass of soil. In the hole they shaped a giant concrete tub and on all sides anchored jacks, so that if one side tilted the other side might be counterbalanced. Then they erected 20 tapering stories upon the underground barge (above).

In the finished building I watched a drawing of the National Lottery. Every spectator was excited about the 5,000,000-peso grand prize, but no one rocked the boat on which the building rested!

Roaring Industries Fringe City

Factories are humming in the city's industrial suburbs. Here are bottling works, automobile assembly plants, tire factories, chemi-

cal works. Company names, many half American, half Mexican, reflect their capital structure.

Mexico welcomes new foreign enterprises, some with five- and ten-year tax exemptions, but in most cases limits investments to 49 percent and insists that majority stock be Mexican-owned.

"Someday," I was told, "Mexico will be as industrialized as the United States—in proportion to its size, of course."

My informant was Edmundo J. Phelan, president of the Confederation of Industrial Chambers of Mexico and vice president of Goodrich-Euzkadi, B. F. Goodrich's Mexican associate.

Factories Can't Keep Up with Demand

Señor Phelan, son of an American father and a Mexican mother, started work in San Francisco more than 30 years ago, but moved to Mexico City.

"In those days," he said, "young Mexicans devoted their energies to war and revolution; they talked about señoritas, horses, and bullfighting. Nowadays their sons discuss opportunities in industry and commerce.

"Mexico is growing. From 1946 to 1950 industry, on the whole, increased 25 percent. Some companies, plowing back each year's earnings into new plants, have never yet paid a dividend, preferring to expand their plants.

"Our manufacturers sell all they can produce; supply never seems to catch up with demand. As soon as all the worn-out shoes are replaced, for example, a hundred thousand Indians switch from sandals to shoes. The days of the Revolution are over. We may have floods, droughts, or earthquakes, but Mexico appears depression-proof, for the middle class's hunger for goods never lets inventories pile up."

White-collar Class on the Rise

Not too long ago Mexico City had only two classes, rich and poor. The emergence of a middle class is an outstanding phenomenon.

Thousands of people join the white-collar group every year. Each fine Sunday you can see them, out in the family car, hunting new homes in the suburbs. Once they were satisfied with pulque, fermented juice of the century plant (page 814); now they want milk. Cows graze right into the city limits, but cannot cope with demand.

Newspapers, magazines, posters, television, and radio whet appetites for gadgets undreamed of by the previous generation. Crowds gather curb-deep outside dealers' windows to watch a TV program, though all they get may be an antique English-language movie.

Prevailing symbol of affluence is the electric refrigerator. That proud possession often gets a place of honor in the parlor, where every guest may see it. Sometimes it stands empty, the mistress of the home having no real need of food storage, since her Indian maid shops for groceries on a day-to-day basis.

The maid may have an automatic washer at her disposal, but chances are she prefers to pound the family wash on the time-honored concrete slab.

She is a powerful institution, that Indian housemaid. Without her many a Mexico City wheel would stop. In return for lodging and $20 a month, the girl cleans the apartment, tends the children, and buys the food. Sometimes she ekes out her income with her own mark-ups on grocery purchases.

A blow to the maid's profit system was dealt by the new grocery chain called *Super-Mercados S.A.* S.A., the Mexican "Inc." stands for *sociedad anonima* (corporation); many visitors figure it means South America. The self-service store's fixed prices and sales slips left the maid no margin. Mexican businessmen opened the first unit in 1946 and soon established more. Now their shops, full of glass and sanitation, threaten the supremacy of Aztec-style street markets where Indian salesmen spread their produce on the sidewalks and, overflowing into streets, clog traffic.

Rising Prices Worry Consumers

Nowadays grocery patrons worry about "the inflation." Salaries have not kept up with prices.

"Rice is sky-high," one resident told me. "Even tortillas, the people's pancake-thin corn bread since time began, have gone out of sight in price."

Mexico's cost of living still seems reasonable to a visiting American, whose dollar buys 8.65 pesos. A single room in a first-class hotel may cost him less than $4, and, if he shops for bargains, he can find a substantial meal for as little as 35 cents. Half that sum buys a haircut.

Rents are frozen; some fair apartments go for as little as $30 a month; others range up to $300.

Bus fares for standees run as low as 2 cents. A downtown taxicab ride costs 25 cents.

A Coney Island roller coaster provides no greater thrill than a Mexico City taxi ride.

At dawn, when the avenues were clear, my driver delighted in 50 miles an hour; but midday, when traffic had to slow down, brought the real adventure. Then the cabbie, hungry and irritated, cut in and out of lanes. He charged jaywalkers like a bull bearing down

Shady Paseo de la Reforma Flows into Chapultepec Park's Dense, Primeval Woodland

Crowned by Chapultepec Castle, barely visible through the trees, the park holds Montezuma's rock-hewn bath and a grove of giant cypresses known to him. Fashionable Chapultepec Heights (upper right) reflects the city's rapid growth; not many years ago it was an arid wasteland (page 792). Traffic in the lower right wheels around Independence Monument. This shaft rises from one of the Paseo's wide *glorietas*, or circles. Mexico's social security program is carried out in the tall, handsome building in the middle left (page 799).

Church and State Maintain Headquarters on the Zócalo, Site of the Aztec "Forum"

Here about 1325 wandering Aztecs, according to tribal legend, found a serpent-clutching eagle, the promised sign that they could settle down. Later they erected their massive *teocalli*, or temple, where they sacrificed thousands of prisoners, and laid out their *tianguiz*, or great market place.

Spaniards, invading the city across Lake Texcoco's causeways, converged victoriously on the square in 1521. They demolished the pagan pyramid, buried its idols, and in their stead set up gallows and bull ring.

Nine main streets now empty traffic into the Zócalo; trolleys and buses make it their hub, but the business center has moved away.

Earthquake and unstable subsoil have done their worst to level the Cathedral; timely repairs have saved it (page 786). Its foundations rest on an edge of the leveled teocalli. The 24-ton Aztec Calendar Stone, or Stone of the Sun, now on view at the National Museum, lay cemented in the west tower nearly a century.

Successor to Mexico's first Christian church, built on this spot, the Cathedral was begun in 1573 and completed in 1667. Wealthy patrons lavished millions in gold and silver adornments, but civil wars stripped most of these treasures. On clear days the towers' ponderous bells can be heard for miles.

Sagrario Metropolitano (right), a repository of sacred relics, is a distinct church in itself, though it is attached to the Cathedral.

Opposite page: Mexico's National Palace, office of the President, occupies a 675-foot-long block facing the Zócalo. On this spot Montezuma held court. Cortés, appropriating the property, built a fortresslike residence and office, which rioters later ruined. The present palace, begun in 1692, has undergone renovations, including Maximilian's. An upper story of pink volcanic stone was added as recently as 1927.

Three entrances pierce the façade. Above the central doorway hangs the Liberty Bell rung by patriot Miguel Hidalgo on the eve of the War for Independence, September 15, 1810. Each September 15 now the President stands on the balcony and voices Mexico's famous *grito*, or independence cry.

Three Lions, Inc.

on a matador; he'd have hurdled the car ahead if he could.

Traffic stacked up; someone beat a staccato rat-tat-tat on his horn, a reflection on another driver's ancestry. Mexicans have learned to curse with their horns, an offense for which they may be fined.

Suburbs Bulge with New Homes

New apartment houses, springing up by the scores, find tenants so eager that some rent from blueprints. Thousands move into new developments called *multifamiliares*, gigantic clusters of apartments erected by the Government to house its workers at low rentals (page 803).

Old-timers recall the days when land beyond Chapultepec Park held only one "crazy" North American, who wanted privacy. He didn't enjoy it long, for subdividers, scenting the way the city was growing, bought up large areas around him. This once-empty space is now fashionable Lomas de Chapultepec; Americans call it Chapultepec Heights (page 789).

"Sites in the hills worth four pesos a square meter 12 years ago are now selling for 100 pesos," residents told me.

The proverbial seashore frontage sold at low tide and flooded at high water here met its equal. I saw "Lots for Sale" supported by nothing as substantial as water; they appeared to be based on sheer air. These properties, facing a ridge road, slanted down like mountain precipices.

Stucco houses were in "California style," the same fashion which California calls Spanish.

Some homes used long, windowless outer walls as sideboards for *jai alai* courts.

Modernistic Homes in a Stony Desert

I found both stucco and jai alai courts out of fashion in the newest development, the startling Jardines del Pedregal de San Angel. The Pedregal, a lava-scorched badland, once was the hideout of *El Tigre del Pedregal*, a bandit. Botanists searched its surface for rare flowers, and archeologists dug below the lava for the bones of Stone Age Indians, but ordinary men, afraid of getting lost, shunned the place.

Half a dozen years ago "you couldn't have given Pedregal land away," Mexicans told me. Today builders, employing the cactus-grown lava for decorative background, have created a model subdivision where home builders erect the most fantastic and original homes. The natural volcanic rock goes into garden walls (page 800). Caves beneath the rock are turned into dens. Every resident seems to have his back-yard fishpool, a sight which reminded me of the moats in rock zoos. One family has built an aquarium into the walls of its home.

Certain suburban areas are plagued by squatters, who, squeezing in wherever they can find a vacant lot, build shacks of adobe or packing boxes and use rocks to hold down tin roofs.

"My home stands on a 2½-acre lot," one householder told me. "On the same amount of space next door, 326 families have squatted in shanties built all in a line. Fortunately, a high wall separates us, but we can hear the blaring of radios and patting of tortillas day and night. Many of these squatters are Indians fresh from the farm."

Mexico's Federal District, the equivalent of Washington, D. C., has been growing so fast that three million people now rely on public services adequate for a city of 500,000. I saw evidence of growing pains on every hand.

Until the city finishes its 50-mile, earthquake-proof aqueduct, part of it tunneled through mountains, unfiltered water will be suspect, and scarce to boot. Consequently, the capital has become a rich field for United States soft drinks.

Tamales but No Chile Con Carne

At Station XEW I saw a radio show plugging a soda. "*Es delicioso*," said the honey-voiced announcer, "*el Delaware Punch.*" He called it *ponch*. Punsters don't pronounce it that way; they ask for a *de la güera* (a blond).

Mexican radio time is filled with jingles. One recognizes the familiar Pepsi-Cola song; even the National Lottery has its jingle.

On a still evening one hears the night watchman, an old-fashioned Spanish institution, making his rounds. His soft, melancholy whistle assures householders, "I am on the job," but, according to native jest, it advises robbers, "Here I come!"

Streets resound with the sing-song of vendors crying "tamales" and "*helados*" (ices), but no one ever sings out "chile con carne," a Texas invention seldom eaten south of the border.

Nowadays Mexican store shelves reflect the popularity of American foods licensed for manufacture in Mexico.

Instant coffee is the rage. Without corn flakes, served by almost every café, the Mexican businessman seems unable to start breakfast. United States-made machines vend popcorn—"crisp, tender."

Old-style Aztec markets still do business on newspapers spread on dirt floors, but I saw a Piggly Wiggly *Abarrotes* (groceries), to say nothing of a *sandwicheria* and a Wimpy's Hamburger Stand.

Kodachrome by Justin Locke

Somber Picador Astride a Padded Horse Awaits *el Toro*, His Professional Enemy

Matador, the swordsman, must be lithe and agile to dodge the bull, but this mounted lancer, offering armored legs as targets, could be old, fat, and slow. Weight, stamina, and courage are his requirements.

Torrents of Traffic Speed Past Steel-and-glass Palaces on the Paseo de la Reforma

Many people compare the Paseo to the Champs Elysées in Paris. The U. S. Embassy makes its new home in Edificio Reforma, nearest skyscraper. Its neighbor, Recursos Hidráulicos, directs Mexico's water power.

"Go!" Says the Law, Turning His Profile to Cars at Bay

➤ Mexico City's traffic cops used to be known as *mordelones* (men who take bites) because some of them assessed fines and collected payments on the spot. Lately the Mexican Automobile Association initiated December 22 as the "Day of the Traffic Officer," when drivers shower presents on their favorite policemen.

An era of good feeling has resulted. Groceries, wines, and cigarettes surround this officer. He straightens out traffic kinks better than any stoplight system.

➤ The Cathedral, one of the Americas' oldest and largest, stands on the edge of the Aztecs' principal temple and faces the Zócalo, the city's main plaza. A treasury of Aztec sculpture lies buried beneath the pavement. Newspaper headlines proclaim, "A Degenerate Asphyxiates His Son," and "The Bullfighters Give In," the latter alluding to a settlement between Spanish and Mexican toreros, who were not on speaking terms for several years.

Kodachromes by Justin Locke

Kodachrome by Justin Locke

Indians in Dark Shawls and White Cottons Visit the Shrine of Their Protector, the Virgin of Guadalupe

Here in pagan times stood a temple to the Aztecs' "Little Mother." It was logical that in the change-over to Christianity the Virgin should have succeeded the Indian deity. In 1531 Her vision appeared to a simple Indian, and ever since Guadalupe has been Mexico's most important shrine.

← Paper Animals Say Christmas Is Here

From December 16 to Christmas Eve, Mexico celebrates the *Posadas* (Lodgings), commemorating Mary and Joseph's visit to Bethlehem. These are festive days for children; nearly every household gives a party.

The principal game centers around the *piñata*, a fragile clay jar often dressed in papier-mâché animal skins and stuffed with fruits and candies. Adults suspend the piñata from a ceiling and pull it up and down with rope and pulley. A blindfolded child, whirled around until he is dizzy, then tries to break the piñata with a stick and spill its contents.

Great is the scurry for prizes when the jar cracks open. Merriment is even livelier when some teen-ager, smiting a water-filled jar, gets a cold shower. Piñatas are commonly sold in markets (left).

→ The Aztecs, magnificent gardeners, contributed various flowers to the world. Their descendants, still speaking Nahuatl, the Aztec tongue, grew these gladiolus, tuberoses, carnations, and other flowers in Xochimilco, Mexico City's "floating gardens." Sales stands are set up before the Guadalupe Sanctuary in the city's suburbs (opposite page).

Kodachromes by Justin Locke

↑ Huge Adobe Bins Keep Corn Safe from Rodents

These women grind hulled corn for tortillas on a farm near Atlatlahucán in the hot country south of the Valley of Mexico. Their grinding stones have remained unchanged in form for thousands of years.

←Mexico City's bootblacks take pride in their work and love their independent life. This man works beneath the new Social Security Building. He charges 40 centavos (a nickel) for an artistic job.

→The Plaza, the capital's newest hostelry, faces the world with convex-concave faces. When almost completed, it ran into financing difficulties and stood idle for months. Once finished, it will help solve the hotel shortage and, it is hoped, take care of some of the 8,000 Rotary International delegates, wives, and children meeting in Mexico City in 1952. In 1935 the city lacked enough hotels to house 1,500 Rotarians. An elaborate sleeping-car city of 30 trains took care of the overflow. Many hotels have gone up since that year, but the increased demand for space taxes even them.

The orange-juice vendor sells a glassful for less than a dime.

Kodachromes by Justin Locke

Pedregal, the Capital's Lava Badland, Becomes a Fashionable Modern Rock City

Long ago an erupting volcano laid down a petrified sea of basalt south of Mexico City. Stonecutters quarried the jagged rocks, and archeologists explored them for the graves of prehistoric men, but the average Mexican feared the Pedregal's deep cracks and spiny ridges as a wasteland where he could cut his shoes to ribbons and get thoroughly lost. Lately, farsighted developers, dividing part of the Pedregal into lots, have created a bonanza out of nothing. Homeseekers rush to move in. They build garden walls of native basalt. Houses must be in contemporary style. Almost every homeowner has his fish pond and patch of grass.

It is fun to watch Mexicans at their sports. Bowling alleys and swimming pools spring up where there used to be none. *Futbol* and the handsome race track attract tens of thousands. The National University of Mexico's new stadium will seat 80,000.

Bike Riders Pedal up Mountains

Out on a Sunday drive, I saw thousands of cross-country bike racers, hair cut short, faces etched with determination, grimly taking to the roads, pedaling up mountains and coasting downhill. Swallowing the dust of passing cars, they relieved thirst by sipping from thermos jugs tied to handle bars. Cross-country porters, backs loaded with pottery, ignored the cyclists, but Monday's sports pages devoted columns to them.

Crowd noises at the *beisbol* stadium, though delivered in Spanish, sound like those in the United States. There are the same low, appreciative rumbles, the same taunts. "Ole! Ole!" the cry of the bullfight fan, is never heard at ball games unless some gallant shouts it at an attractive señorita.

One night friends took me to see a Mexican League game. From them I learned that a *jonron* (pronounced "home rone") was a home run. A *bola* is a ball and a *ponchado* a strike-out. *Serpentineros* pitch curve balls, and *jardineros* (gardeners) catch *flais* (fly balls).

An umpire, however, remains *un umpire*. Since bottled drinks are served in paper cups, he is protected from assassination by the fans, but the players are free to rave at him—and how they do!—as in many a north-of-the-border ball park.

Americans Walk out of Bullfights

Plaza de Mexico, the world's largest bull ring, holds crowds of 50,000. Almost every Sunday sees a *corrida* (run).

Few athletes earn higher incomes than Mexico's professional matadors. For superlative ones, the piecework rate is sometimes better than $10,000 an afternoon.

Last May, during the off season, I saw three apprentice fighters face six lightweight bulls, two snorting, stamping *toros* to each *torero*.

As the first bull charged into the arena, two New York ladies beside me grew apprehensive. "Shall we leave now?" they asked. Five bulls later they were repeating the question. Several Americans did depart after the first kill, and Mexican boys, watching their chance, grabbed the vacated ringside seats.

"Anything can happen at a bullfight," Mexicans will tell you. I saw fist fights break out in the stands. One spectator fainted. Two bold, ambitious urchins illegally leaped the rail, ran into the arena, and engaged the bull, using coats as capes. Professional fighters glowered at the boys, and policemen chased them, but North Americans showered them with coins.

Smaller boys rode the last slain animal out of the ring behind a three-mule team.

Later, in the company of my friend Wayne Rogers, I saw that bull skinned and carved in the slaughterhouse below the ring.

Mr. Rogers, more than a spectator, has killed his bull. He shares the distinction with three other American GI's who studied anthropology last year at Mexico City College. Their story began at a midnight gathering at which they rashly agreed to stage an all-American corrida.

The Yankees trained three weeks under the guidance of a Mexican fighter. They practiced sword thrusts against cactus leaves and cape work against a boy who, stamping like a bull, charged them with a mounted pair of horns.

Veterans Find Mexico Exciting

Mexico City College, alma mater to several hundred American students, put up 4,000 pesos to buy bulls and rent costumes, but the slim toreros' ornate costumes had to be let out to fit the hulking Americans. Rogers wore his old GI shoes because the professionals' slippers were too small.

The spectacle opened in Rancho del Charro's small ring. Each man faced one bull. Mexican spectators were vastly amused when the Americans strode in talking to the bulls in English.

"We entered the ring as if in a trance," Rogers told me. "The bulls promptly bowled over two of us, but we recovered. Robert Blanchard and John Minard dispatched their bulls on the first sword thrust. I succeeded on the second try, and Lester Findlay on the third."

That night the Americans got together at a party and proudly showed off their scars and bruises. Two of them won small roles in the movie, *The Brave Bulls*.

This incident illustrates the high jinks of hundreds of GI's, including a few former colonels, going to college in Mexico City.

Drawing U. S. Government checks of $75 or more a month, the veterans find the dollar stretches farther in Mexico. Some have married Mexicans: their brides assist them as "talking dictionaries," answering problems about the Spanish language.

Hunting takes the GI's to the hot country for jaguar and tapir; deep-sea fishing lures them to Veracruz and Acapulco.*

* See "Wildlife of Tabasco and Veracruz," by Walter A. Weber, NATIONAL GEOGRAPHIC MAGAZINE, February, 1945.

802 Pan American World Airways System

Domed Palace of Fine Arts Houses Some of the Republic's Most Precious Possessions

When this structure was begun in 1904, architects did not understand the mechanics of the porous subsoil. Sinkings were noticed even before foundations were complete. Now the marble walls have subsided a dozen feet. Heart of the palace is its theater, whose 74-ton stained glass curtain shows the volcanoes Popocatepetl (page 815) and Iztaccihuatl brilliantly changing colors under powerful lights.

The city's American colony contains an estimated 9,000 people. "Life is easier here," many a one told me. "The income tax is scarcely half what it is in the States, and nearly every middle-income family can afford a house and a maid."

More and More Mexicans Study English

Many Americans pick up Spanish quickly, but others, residents for years, know scarcely a word. On the other hand, I met American children who, left in the care of Mexican maids, could hardly speak English.

Each year Mexico issues visitors' permits to some 300,000 North Americans. They distribute so much money that many ambitious Mexicans find it pays to learn English.

One day I lunched with a dozen businessmen at the Mexican Bankers Club. All used Spanish except my immediate neighbors who, for politeness, spoke my language. Innocently, I remarked that I felt honored because the day was my birthday. The word spread; immediately the whole company began singing *Happy Birthday* in English!

On another occasion I attended an English class in the Institute of Mexican-North American Cultural Relations, a nonprofit corpora-

503 John Gutmann, Fix

Mexico City's Huge *Multifamiliar* Houses Some 5,000 People in 1,080 Apartments

The Federal Government built this development exclusively for its employees by investing part of their pension fund. Apartments rent for only $9 to $15 a month. A city within a city, Centro Urbano Presidente Alemán has its own stores, nursery, school, swimming pool, and postal station. Ciudad Juárez and Nuevo Laredo boast projects like it; the capital is erecting still another.

tion governed by Mexican and American directors.

"La Coca-Cola me likes very much," said one student, thinking in his native idiom. Translating his thoughts from Spanish, in which nouns normally precede adjectives, another announced, "The English is a language crazy."

"Theirs is not always a literary passion," said Dr. John Elmendorf, executive director. "These boys and girls know their salaries will be doubled or trebled if they learn English. Some will cater to travelers in stores, restaurants, or travel bureaus; others will do office work for Yankee-managed firms; and a few will go to the United States for university courses."

The Institute has room for 3,300 students. At one registration 5,000 tried to get in, some as early as 5 a.m., and they formed a queue three blocks long.

A few boys crashed the skylight to get at the head of the line!

Police were called to keep order at the last registration. After they had done their job, two of the patrolmen got into line and enrolled. They shared the classrooms with waiters, nurses, doctors, merchants, and two members

Drinking a Jet from a Wine Flask Is a Hit-or-miss Adventure

La Bodega, a Mexico City tavern, captures Spanish atmosphere with guitar music, flamenco songs, imported wines, and northern Spain's favorite drinking vessel, the *porrón*. Accomplished drinkers hold the spout confidently at arm's length (left). Most beginners turn on the jet at mouth level and lengthen the flow cautiously. For them, bib and raincoat might well be appropriate attire.

of the Mexican Senate, all eager to learn English.

"We try to interest students in our history, geography, and literature," Dr. Elmendorf said. "They think America has no literature, that all culture stems from Europe."

The Institute's lunchroom serves certain forms of North American culture in the form of banana splits, hot-fudge sundaes, and *superhamburguesas*. Students order in English from waiters trying to learn the language.

Americans Feel the Lure of Mexico

I found many of my fellow countrymen in the plush new quarters of the American Club (established 1895), whose 1,180 members swear by its United States-style cooking. Some of them boast of having lived in Mexico 40 years.

"Mexico gets in my blood," said one old-timer. "After a visit to the States, I get itchy feet and hurry back to my ranch."

"I am an oil man," said another. "I recouped in the Middle East; now I am retired. Mexico is the only place for me."

A moment later these two sounded off like chambers of commerce as they debated the merits of their native States.

A young American secretary employed by the United States Embassy was impressed by the native courtesy.

"Strangers on the bus," she confided, "give you a seat and help you on and off. Your host says, '*Es su casa*'—it's your house. It's a different story if an American girl wears her slacks on the streets; whistles and jeers remind her that it isn't done. The Mexican attitude is, 'Men are men and women are

Boys Sell Antiquity's Stone Masks, Real and Counterfeit, at the Pyramid of the Sun

Around the 3d century, some 2,000 years after Egypt's last major pyramid builders, a New World people began erecting this four-faced pyramid in Teotihuacán, their priestly city (page 824). Squared off at the top, the monument was not a royal sepulchre like Egypt's, but a lofty platform. On it stood a temple and, according to legend, a huge stone statue whose golden breastplate reflected the sacred sun's first rays.

women, and each should stick to his own clothes.'

"Mexican men adore American girls," she added. "They think nothing is too good for a blond. I am tempted to bleach my own dark hair."

A young bachelor told me about his experiences in Mexico City society.

"The señoritas are lovely," he said, "but a courtship can be perfectly medieval. When I call on a girl, her mama never leaves the room.

"On several dates I had to take the mother along as chaperon.

"Do not take offense," he continued, "if a Mexican calls you a gringo; he smiles when he says it. The word, originally a term of contempt, may frequently be almost a form of endearment. If you blunder through ignorance of customs, just say, 'Excuse me, I am only a gringo,' and the Mexicans will love you for it."

With his right hand, my gringo friend tapped his left elbow. The gesture, he said, meant that a man was as tight as the skin on the bended arm; that he came from Monterrey.

"A million stories," he said, "are told about the supposed stinginess of Monterrey people. Radio comedians chant these tales; listeners howl and scream.

"I can find no factual basis for the Monterrey legend. As everybody knows, the city is progressive and its people are generous. I can only conclude that Mexicans steal our Scottish stories; and there is a widely held suspicion that Monterrey invents many a tale just to get publicity!"

Valley of Mexico's Stone-and-adobe Igloos Descend from Aztec Steam Baths

These baths, not unlike the Finnish steam houses, have changed little since pre-Columbian times. Mexico calls them *temascales* (from the Aztec *temo*, to bathe, and *calli*, house). The bather enters on hands and knees, plugs the door, pours water on hot stones to produce steam, and sweats in darkness, sometimes for hours. Americans trying the system have likened themselves to lobsters boiled alive in a pot. Here a resident of Huexoculco fans furnace flames in one of the village's 70-odd sweat baths.

Continuing the lesson in gestures, my friend lifted a finger to an eye. "Watch that man," he said. Hands crossed at the wrists and waved—"Let's get out of here." Thumb and forefinger held barely apart—"Just a minute." Edge of hand against the opposite palm—"I'll split the difference." A forefinger solemnly wagged—"No," a bit of pantomime sometimes used by babies.

A League of Nations Bridge Game

My informant, who learned his Spanish in Mexico, said he had picked up Latin America's gestures automatically, "like one dog hearing another bark."

Certain other residents of cosmopolitan Mexico City seemed to have come from the ends of the earth.

Walking into a bridge club, I found Englishman, Hungarian, Hollander, and émigré Russian all bidding in Spanish, but when I cut into the game they generously switched to English.

I met a Hungarian opera troupe trying to get visas to the United States, and saw convention delegates whose badges read "New Zealand." A cattleman from Chihuahua had me convinced he was a native until, at parting, he said: "I am José Chavez, born in Austria of Spanish parents." One MacGregor, as native as a chile pepper, told me he owed his Scottish name to a pirate ancestor shipwrecked on Mexico's shore.

One night I witnessed a festive celebration in the Zócalo, the highway hub of all Mexico. Tens of thousands of citizens, elbow to elbow, marched into the plaza by torchlight as bugles blared, drums rolled, sound trucks roared, and

the Cathedral's bells pealed.

Colonial palaces glowed with red and green neon lights, fiery balloons floated across the sky, and boys played with firesticks snatched from bonfires.

Masked Youths Dance by Torchlight

Youths in Indian masks and feathered caps danced around a kind of Maypole.

They danced in the Zócalo! The place evoked images of the Aztecs, who made the square their forum. On this spot they erected their massive *teocalli*, or "House of God." Cortés's men, under attack at a distance, saw their captive comrades slain atop the pyramid in 1521.*

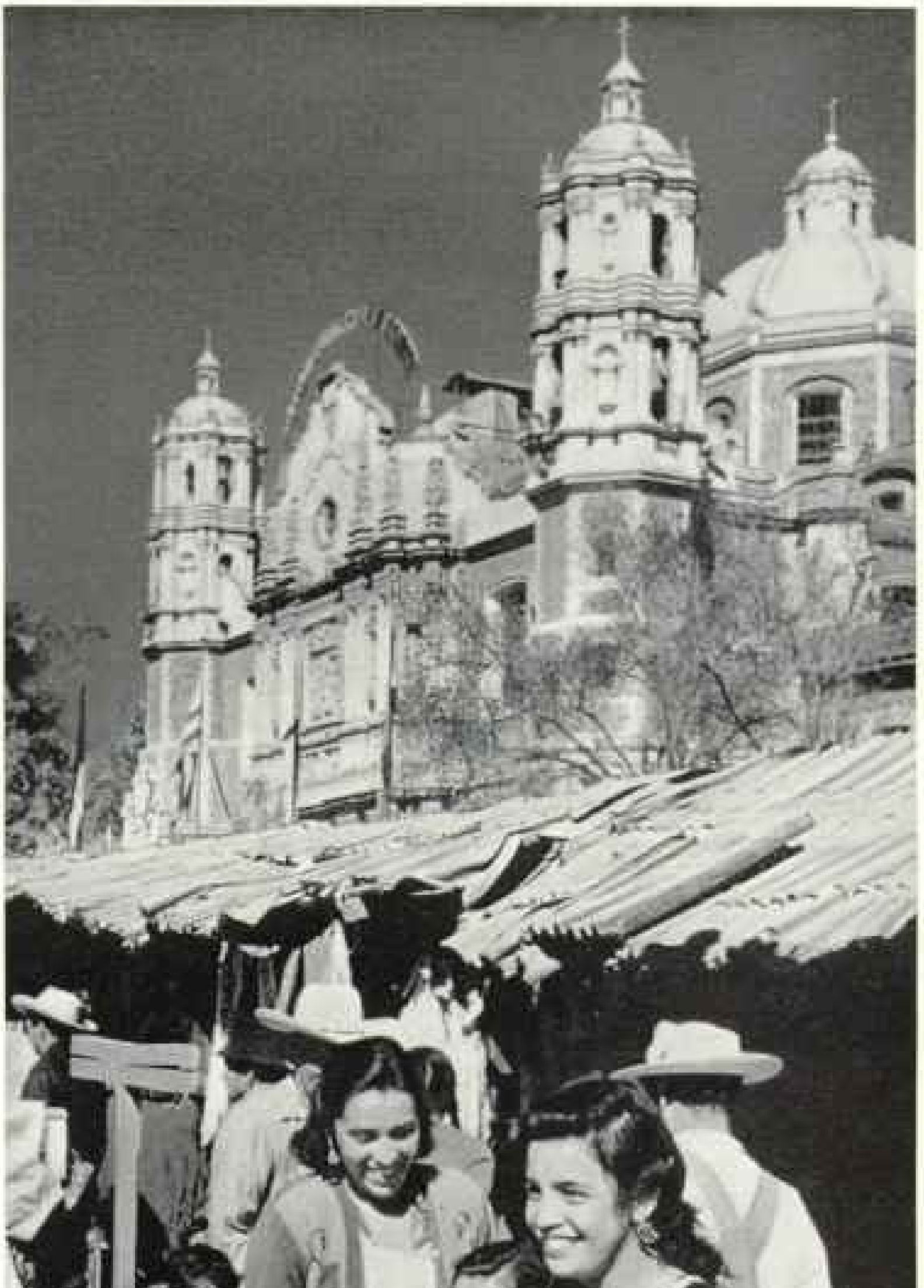
Later the Spaniards demolished the teocalli and substituted the Cathedral (page 790). They established the New World's first bull ring in the square.

Thousands Sacrificed by Aztecs

Subsoil of the Zócalo remains a reliquary of heathen art—flat-faced idols and stone serpent heads. Here Mexicans uncovered the 24-ton Calendar Stone, or Stone of the Sun, which looks like an immense millstone. For almost a century they kept it embedded in the Cathedral.

I saw that stone in the National Museum, a part of the National Palace, which fronts the Zócalo. Its companion

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "'Pyramids' of the New World," by Neil Merton Judd, January, 1948; and "On the Cortés Trail," by Luis Marden, September, 1940.



Vendors Sell *Gorditas* (Little Fat Cakes) in Honor of the Virgin

December 12, anniversary of the Virgin's appearance to a humble Indian 420 years ago, attracts such enormous throngs to the Guadalupe shrine that thousands camp in the open; they crowd the Basilica (above) until movement becomes all but impossible (pages 796 and 797).

piece, the Sacrificial Stone, bears a concavity supposed to have held the hearts of sacrificed victims. The Aztecs, although high in culture, slaughtered thousands of captive enemies as tribute to their gods.*

A few steps away from the Zócalo, an excavation exposes the base of the main Indian temple. News vendors pin their wares to a wire fence protecting its pagan statues. Indian women, devout Christians, stare through the netting utterly indifferent to the work of their ancestors, whose way of life was destroyed by Cortés.

Chapultepec's Bearded *Ahuehuetes*

In all Mexico City there is not a statue to Cortés. Muralists have cartooned him, most politicians condemned him as an enslaver of the Indians. On the other hand, every honor is given to Cuauhtémoc, the Aztec prince, whose army, fighting street by street, causeway by causeway, valiantly resisted the Spaniards.

In the city or its environs are two probable living witnesses to Cortés's triumph. They are Mexican cypresses, called *ahuehuetes*, the "ancient ones" (page 809). Together with a few other groves, these trees are thought to be relics of a vast forest which once covered the shores of Lake Texcoco. Pendant moss gives them the mournful appearance of trees in a Louisiana bayou. Some of them compare in mass with California's redwoods.

Perhaps the most famous of these giants is the crumbling specimen in Tacuba. During the Spaniards' retreat from Tenochtitlán on July 1, 1520, Cortés sat near by and wept over his worst defeat; hence, it is called Tree of the Sad Night.

Chapultepec Park's Tree of Montezuma, one of its 200 ahuehuetes, stands 170 feet high and measures 50 feet in circumference—dimensions acquired after an estimated 700 years. Did Montezuma sit in its shade?

Aztec Sculpture Pictures Montezuma

In Aztec times, Chapultepec's craggy plug of granite, rising abruptly out of flatlands, was crowned with a temple. There Montezuma maintained his summer palace, with harem, hunting lodge, birdhouses, fishing ponds, gardens, and baths. A sculptured bronze grasshopper illustrates the Aztecs' name for the park—Chapultepec, Grasshopper Hill.

In Chapultepec Castle, the museum which now tops the hill, I saw a painting which depicted Montezuma's arrival in the park with his litterbearers.

"How authentic do you think the portrayal is?" I asked Dr. Silvio Zavala, director of the castle's Museum of History.

"That you can judge for yourself," he replied, "by comparing the picture with the Aztec original."

Under Dr. Zavala's direction I visited a wilderness a hundred feet below the castle. There Aztec sculptors, carving a granite outcropping, pictured their emperor and his court.

A vine-tangled trail shows that the sculpture's existence is known only to a few. The visitor, who has to do a bit of mountain scaling, arrives out of breath.

If you suffer from the climb, think of the Americans who stormed these slopes in 1847 during the Mexican War. They had more than vines, trees, and rocks to contend with: bullets were whistling from the fort, then Mexico's West Point. Teen-age cadets who gallantly defended the citadel are enshrined in Mexican hearts as *Los Niños Héroes*—the Boy Heroes.

Here Carlotta Kept Watch

History pervades the castle. Its lower story, lined with a broad balcony, preserves memories of Maximilian and his bride, Carlotta. Pacing the balcony, the Empress often stood watching for her husband's return from the Zócalo.

One day in 1867 Mexican patriots took their uninvited Emperor out to a hill in Querétaro and shot him. Carlotta survived until 1927, when, shriveled and insane, she died in Belgium.

On a Sunday morning Chapultepec's winding drives are thronged with pleasure cars. Horsemen, decked in expensive *charro* cowboy costumes, swing down bridle paths. Lakelets teem with rowboats; children tumble on the grass. Shoeshine boys wander among the crowds, crying *"Grasa! Grasa!"* An animal trainer spreads a ring for his performers, costumed monkeys on roller skates.

That's Mexico City—steeped in antiquity, seething with life.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "In the Empire of the Aztecs," by Frank H. H. Roberts, Jr., June, 1937, and "Luster of Ancient Mexico (Aztecs)," by William H. Prescott, July, 1916.

For additional articles on Mexico City and its environs, see "NATIONAL GEOGRAPHIC MAGAZINE Cumulative Index, 1899–1950."

Notice of change of address for your NATIONAL GEOGRAPHIC MAGAZINE *should be received in the offices of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your February number, The Society should be notified of your new address not later than January 1. Be sure to include your postal-zone number.*

Kodachrome by Justin Locke

Texcoco's *Ahuehuetes* Creak with Age. Even to the Aztecs, They Were the "Ancient Ones"

Giant cypresses, Mexico's rivals of California's redwoods, kindle a sense of drama with their enormous boles and writhing roots. This noble grove was a favorite haunt of Netzahualcoyotl, Indian poet-king.

▲ Tlahuac, a Green, Watery Vale, Shows Little Change from the Oasis Discovered by Invading Spaniards Four Centuries Ago

In Cortés's time, lakes dotted the Valley of Mexico. Drainage projects dried up most of them; dust storms now swirl across their arid beds. Tlahuac, like its neighbor Xochimilco, represents a survival out of Aztec times. Once the distant, tree-bordered fields were afloat. There long ago Indian farmers built *chinampas*, so-called "floating gardens," by dredging soil from the lake bottom and loading it on mats of twigs. Eventually these platforms took root. Mexico City, a few miles away, draws food from this spot.

▼ Toluca Valley farmers sort carrots in a wooden canoe. Fields are golden with ripening grain.

Kodachrome by Justin Locke

812

Kodachrome by Justin Locke

Coyoacán's Church of San Juan Bautista Gleams with Fresh Paint, Plaster, and Gold Leaf

Cortés made his headquarters in suburban Coyoacán, the Aztecs' "Place of the Coyote." His successors built the church in 1583. Artist Pascual Villareal and helpers (opposite page) spent eight years on the redecoration.

Miguel Covarrubias ➤ Paints a Mural

Whether Señor Covarrubias has more fame as artist or author is hard to say.

As the author of *Bali*, Covarrubias did his share in popularizing that island. *Mexico South*, another of his works, finds its reflection in this mural of the Tehuantepec region. This section is part of a wall-size pictorial map decorating Mexico City's new Museum of Crafts and Popular Arts.

The topmost figure, a Minatitlán woman with a water jar on head, clings to pre-Columbian half-dress, though oil-field workers have invaded her neighborhood. The elderly Tehuana carries candles for a wedding. Legend says her headdress, the *huipil grande*, originally was an infant's garment washed ashore after a shipwreck and mistakenly worn as a blouse; but "that story is pure nonsense," the artist insists.

Pascual Villareal (above, right) paints a saint in the Church of San Juan Evangelista. Helpers apply gold leaf.

Kodachrome by Justin Locke

A Cholula Boy, Using Gourd as Pipette, Sucks Sap from a Maguey to Make Pulque, Favorite Drink of Indians

Just before the century plant grows its 30-foot flower stalk, gatherers cut out the heart and collect the *agua miel* (honey water). Introduction of *madre*, or mother pulque, produces fermentation. Aztecs esteemed the drink, believing it enabled them to commune with the gods. Popocatepetl volcano smokes in the distance.

Popocatepetl, the Aztecs' "Smoking Mountain," Lifts a Snowy Head 17,887 Feet Above Sea Level. Its Jagged Crater Spans Half a Mile

In colonial days Popo erupted violently. Today he only fumes, but now and then wrecks a plane lost in the clouds. Hundreds climb the cone every year; some make thrilling descents down the ice on straw-mat toboggans. Cortés's soldiers replenished their gunpowder by taking sulphur from the pit.

Huehueteotl, Old God of Fire, Wears an Incense Burner as a Hat

Some 5,000 Indian ruins exist in Mexico; most of them remain unexplored. Many living villages sit on ancient settlements.

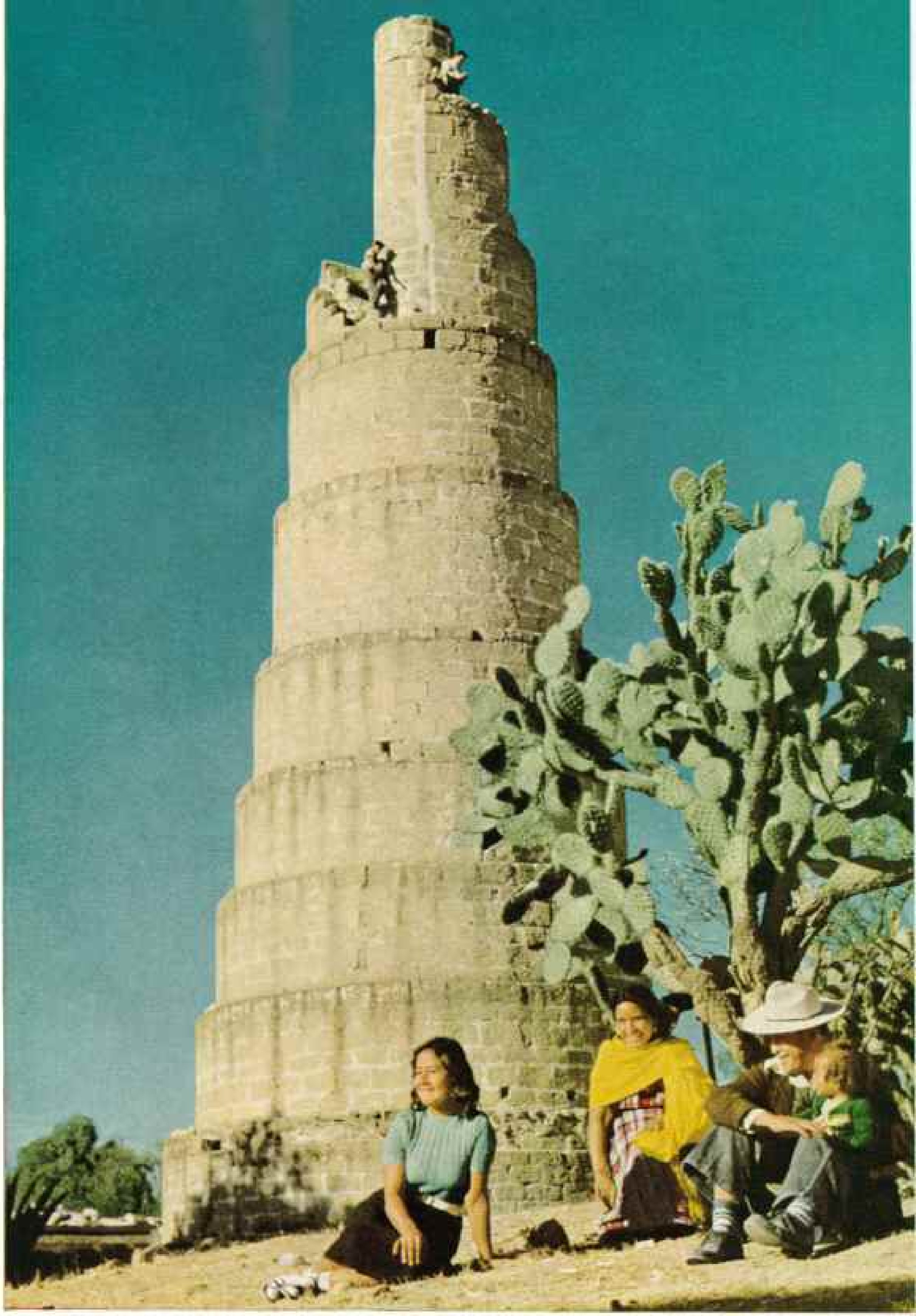
Pre-Cortésian man attained a high civilization. He invented picture writing; told time by the stars; mastered metalworking, sculpture, and gardening. Though lacking draft animals, he erected pyramids as impressive as Egypt's.

Many Mexican archeological treasures were brought to light by the National Geographic Society and the Smithsonian Institution, cooperating in nine expeditions. These prizes included colossal stone heads, thousands of pieces of jade, and the New World's earliest dated work of man.

Dr. Matthew Stirling, leader of the expeditions, discovered Huehueteotl in 1941 at Cerro de las Mesas, Veracruz.

Here, wrinkled, hunchbacked, leering, and almost toothless, the god stands in Mexico's National Museum. Buried for centuries, he retains traces of his original coloration on earplugs, brow piece, and copal-burning *incensario*.

←Francisco Zúñiga, embellishing a Greek and Roman idea with Maya features, carves the *Siesta of a Faun* at Mexico City's School of Painting and Sculpture.



  Kodachrome by Justin Locke

Youngsters Climb the Old Aqueduct Tower in San Bartolo Naucalpan

Naucalpan enshrines the Virgin of los Remedios. Spaniards resisting the War for Independence made her a general in their army, but Mexicans won victory under their own Virgin of Guadalupe (page 796).

Kodachrome by Justin Locke

Huejotzingo Revelers in Whiskery Masks Celebrate the Romantic Exploits of a Mexican Robin Hood

A century ago, when Huejotzingo was a stagecoach stop, Agustin Lorenzo's gang terrorized the town. Now once a year hundreds of citizens masquerade as soldiers and bandits. They re-enact Lorenzo's elopement with a rich landholder's daughter, his mock marriage, and death. These men represent French Zouaves.

Enormous Hats Crown the Youths Who Leap at Tepotzotlán's Marathon Dance

During the two week ends preceding Lent, Tepotzotlán celebrates carnival. Principal performers are called *chinelos* (Chinese), and they are organized into societies, each with its band.

In midafternoon a gunpowder blast tells the musicians to start playing "leaping" music. Then the chinelos, whooping and yelling, march down to the plaza with high, prancing steps. Bandsmen may rest, but the dancers pause only to drink the pulque sold at numerous refreshment stands. Hour after hour, into the dark, they continue to jump up and down. Spellbound audiences never tire of the spectacle, though it is repeated year after year.

Chinelos wear long satin gowns, with capes hung over shoulders; plumed, beaded hats, and bearded masks (not shown). Olivio Mendoza (foreground) carries batteries to illuminate tiny bulbs in his headdress. His costume cost about $100.

The Aztec king and his court show off flashing swords, plumed crowns, and silvered masks during carnival in Huejotzingo (opposite page).

Love of Pets Shines in the Starry Eyes of Children at the Yearly Blessing of the Animals

521 Kodachrome by Justin Locke

Mexico City's Dogs, Cats, Lambs, Rabbits, and Birds Go to Church on St. Anthony's Day

Kodachrome by Justin Locke

Mexico Unfurls Its Cherished Standards on Flag Day. Emblems of the Revolution (Left) Fly in Front of the Cathedral

Action! Romance! Battle! Film Makers Slice Drama from Mexico's Warlike Past

Mexico City relishes the movies. Love, hate, jealousy, and revenge are popular subjects, especially with women. Adventure films please the small fry, a few of whom wear cowboy boots. Small descendants of the Aztecs have been heard cheering the United States cavalry's mock heroics against North American Indians.

Hollywood's products, screened in English, hold a tight grip on the Mexican fancy. A few favorites date back before sound films; Charlie Chaplin's *The Kid* still packs them in. Last year Mexico turned out 120 features for the Spanish-language market.

Mexico helped produce portions of several English-language hits, among them *The Brave Bulls, Captain from Castile,* and *Treasure of Sierra Madre.*

Half a dozen film companies make Mexico City their headquarters. Rodriguez Films set up these scenes for *The Women of My General,* a story of the Revolution in Porfirio Diaz days. Left: Troops in French-style uniforms advance on an insurgent garrison. Below: "Slain" men dangle from a balcony while cameras click. Live ammunition accidentally used in this production resulted in a death.

Kodachromes by Justin Locke

Great Stone Faces Reflect Tula's Glory under the Toltecs

Ruined Tula, the Toltec capital, stands about a mile from modern Tula, a cement center. Its giant figures were sculptured not in monoliths but in mortised and tenoned sections. Feet buried in earth, the colossi once stood, like Greek caryatids, holding up a temple roof with their flat heads. In the 12th century a nomadic tribe, succeeding the civilized Toltecs, burned their temple and tossed the statues into the rubble.

Teotihuacán's sculptured reptiles project from the Temple of Quetzalcoatl, the Plumed Serpent. Tláloc, the spectacled rain god, shares the frieze. Here a mysterious people centuries ago erected a sacred city. Later they vanished, leaving no clue to their origin, language, or identity. The Aztecs, coming onto the scene much later, regarded the city as divinely built, and so named it—Teotihuacán, "Place of the Gods." Legend says the Indian deities here created sun and moon to light the world. Huge pyramids named for those celestial bodies stand near the temple.

Kodachromes by Justin Locke

The Ghosts of Jericho

By James L. Kelso

Professor of Old Testament, Pittsburgh-Xenia Theological Seminary

With Illustrations from Photographs by the Author

NEARLY EVERY visitor to the Holy Land is drawn, as if by a magnet, eastward along the tortuous black-top road that leads from Jerusalem over the Mount of Olives and down through the dun-colored wastes of the Jordan Valley to the Dead Sea.

As to distance, it is a comparatively short journey—some 30 miles. But it is an adventure in time, for the centuries seem literally to roll backward with each of the 50 minutes or so that it takes to cover the route.

Even though the roadbed has been shifted somewhat to accommodate the motor traffic of the 20th century, it still passes through places with names as significant to the traveler as inscriptions on the stones of his family burial plot. First, there's the Mount of Olives itself, then Bethany, then the Good Samaritan Inn, then Jericho, and beyond it the Jordan River, which runs down to the salty blue landlocked sea.

It's no wonder that the traveler to Palestine seldom feels his journey complete until he has traversed this historic route and at least dipped a hand into the Dead Sea's oily-feeling surf.

Traveling over this tiny bit of geography is particularly stimulating in these days when the cycle of history seems to have come full circle within its limits. The trip is likely to begin at the verge of no man's land on the Arab side of Jerusalem. As late as the fall of 1950, the uneasy truce between the Arabs and Jews was marked by a display of arms on either side of the barriers and an occasional "practice" sniping, especially in the Valley of Gehenna. It was enough to remind the traveler of the pressing problems of our times, of Israel again carved out of this ancient land by the force of arms (map, page 828).*

New Testament Jericho Unearthed

At the other end of the road on the eastern side of this mountain ridge, toward the Jordan River, lies all that is left of the Jericho that fell so long ago to the trumpeting of Joshua's hosts. Now it is only a mound of uninteresting rubble, its mud-brick walls showing here and there. But, as long ago as Neolithic times, it was a proud city.

Even today thousands of Arab refugees get their water from the same spring that supplied that Neolithic settlement. Perhaps it is this concentration of human endeavor in so small a space—the works and mementos of mankind's activities down through the ages, literally piled one on top of the other—that makes the Holy Land so rewarding for the tourist and scholar alike.

In my own case, a professional curiosity has led me repeatedly back to Palestine. I go to probe under the sandy loam with which the winds have covered those many monuments which the ancient Jews must have considered then as enduring as we do our concrete and steel cities of today.

Only last year I followed this much-traveled historic route from Jerusalem to the Dead Sea—and arrived at my most exciting discovery to date. The expedition I headed unearthed New Testament Jericho (p. 837).

Our "find" lies just a little beyond the traditional site of the Good Samaritan Inn, now a coffee shop and police station (page 840). It is some 15 minutes in driving time over the rough old Roman road which branches off the main motor highway at an Arab Legion camp. The ruins are sufficiently well preserved to enable even the least imaginative visitor to reconstruct the scene of some of the Holy Land's most savage and colorful historic episodes.

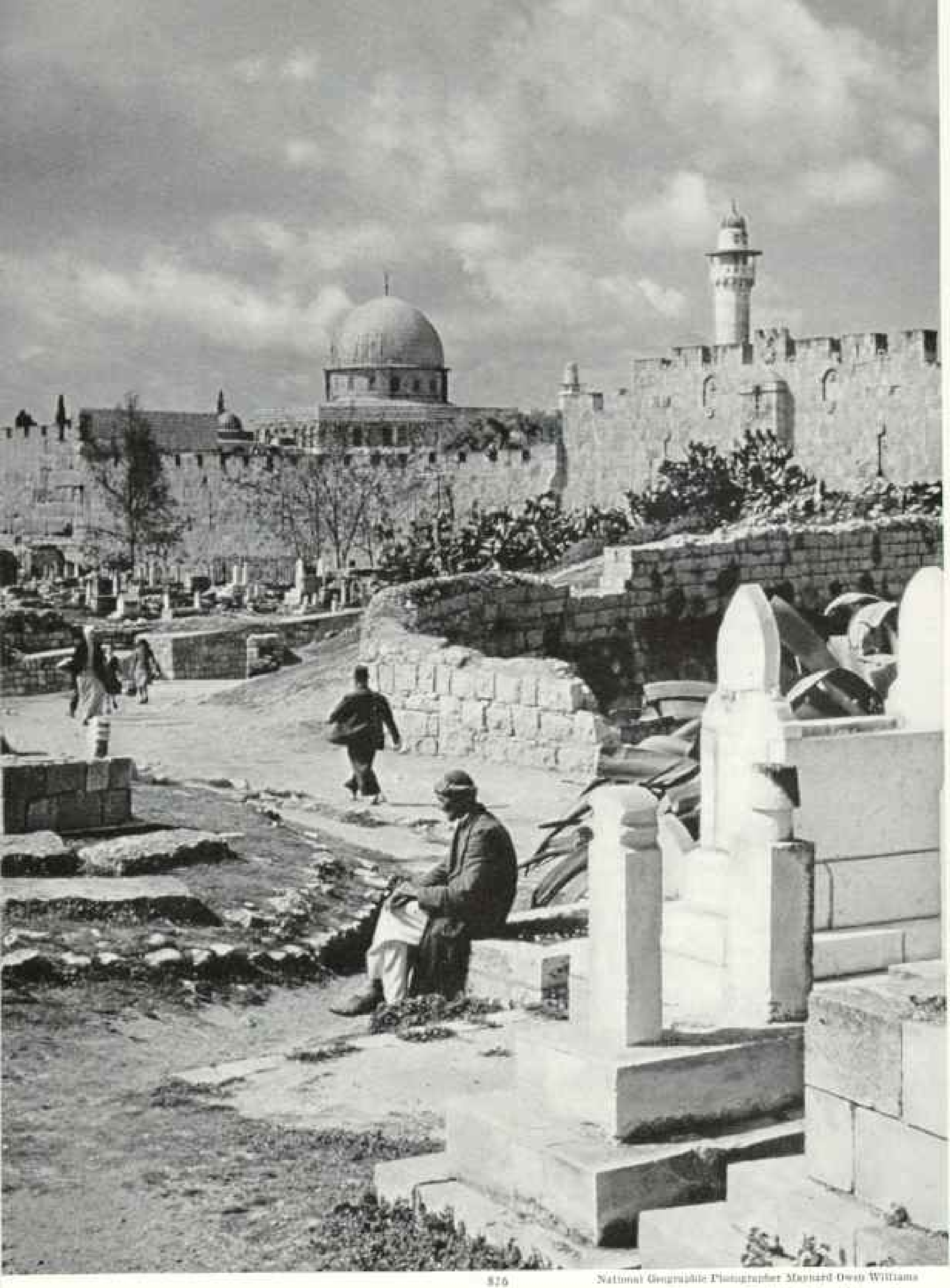
Winter Capital of Herod the Great

New Testament Jericho, we know from historical records of the times, was the seat of the winter capital of Herod the Great and his son Archelaus. It was here that Herod the Great put to death his innocent young brother-in-law, Aristobulus, the high priest.

Here also died Herod, perhaps the greatest puppet of them all, not excluding our modern Quislings. What is now left of this once fabulous resort has become an Arab national monument and has undoubtedly been included by the numerous guides and chauffeurs on their tour of that valley so reminiscent of the traveling ministry of Jesus and the travails of ancient Israel.

When we first arrived over the site where Herod's magnificence had once been cele-

* See, in the National Geographic Magazine, "Home to the Holy Land," by Maynard Owen Williams, December, 1950; "Geography of the Jordan," by Nelson Glueck, December, 1944; and "Canoeing Down the River Jordan," by John D. Whiting, December, 1940. See also "Bible Lands and the Cradle of Western Civilization," map supplement to the National Geographic Magazine, December, 1946.



National Geographic Photographer Maynard Owen Williams

Sacred to Three Faiths Is Jerusalem's Old Walled City, Where Solomon Built His Temple

Jesus walked and talked in this enclosure. Dome of the Rock (center), a Mohammedan shrine, stands on Mount Moriah, where Abraham prepared to give his son Isaac as a sacrifice to Jehovah. King Abdullah of Jordan was assassinated last July in Al Aksa Mosque near by.

brated, it was typical Arab farmland. Part of it was brilliantly green with growing wheat. The rest was a wasteland of bramble bushes and a few small palm trees. The Arab name for the location is colorfully descriptive of what we found in early January, 1950—Tulul Abu el Alayiq, or "The Hills of the Father of the Bramble Bushes."

The existence of a city at this point, about a mile west of present-day Jericho, had, however, been suspected by scholars and archeologists. In fact, trenches had been dug by Sir Charles Warren as long ago as 1868 and by Ernst Sellin in 1911.*

Before we began our own digging, the major features of the site were two artificial mounds on the north and south banks of the Wadi Qilt at the point where it issues from the steep mountain gorge and debouches onto the Jericho plain. *Wadi* is the Arabic name for a stream that runs only during winter and early spring, the wet seasons.

Historic Site a Grazing Ground

The possible historical significance of the spot was of little interest to the local Arabs, who used most of it as a grazing ground for their sheep and goats.

One of our chief early-morning diversions throughout the long months of excavation was to watch the shepherds helping their flocks across the swollen wadi. Their methods have not changed since the time of Christ and recalled His use of the shepherd in parables.†

At high water, the female goats and sheep ignored their young in their own frantic efforts to swim across. While one shepherd drove the flocks, two or three others would stand downstream and catch the helpless kids and lambs as they floated down, then toss them safely upon the bank.

Another unfailingly fascinating sight was those philosophers of the desert—the camels. More often than not, they would wade through the wadi's turbulent waters with their twitching noses high in the air, not deigning to drink despite the fact that the last water they passed may have been a day's march away. Occasionally, too, we spotted a fox at the wadi getting his daily drink.

Although we saw goats in the herds, the goats did not participate in the excavation of Jericho as they did in some of our earlier digs. They had frequently acted like human "kids," scrambling along the walls or sliding down the big dumps where the excess dirt had been deposited.

Across this same wadi there was a daily procession of refugee women who waded the stream with bundles of thornbush on their heads (page 841). They had collected the bush in the wilderness, often as far as five miles from their homes. Some American college girls who visited the excavations could not lift the biggest bundles. Even a load like that was only four days' fuel for cooking.

We began our work at the old trenches dug by Warren and Sellin on the mound on the south bank of the stream. Rapidly we unearthed the remnants of a fortress which, in the end, turned out to be four buildings, constructed at different periods of history. The topmost ruins were those of an Arab fort of the 8th century in which we discovered a marble tablet inscribed with some verses from the Koran. These inscriptions contained early textual material for that book.

This fortress consisted of a thin defensive wall surrounding a group of rooms which in turn shielded an open court. The rooms seemed to have been built from stones taken from earlier buildings on the site.

Incidentally, as proof of the way history piles up in this little corner of the earth, we ran across bully beef cans and beer bottles in uncovering the ruins. The site had been used by British soldiers in World War I. Indeed, the Reverend Edwin Moll, who is now in charge of the Lutheran World Federation relief work in Jerusalem, actually served in the cavalry stationed at this camp.

Beneath the foundations of this Arabic fortress we uncovered parts of a concrete Roman structure which was more likely a public building than a military post. The ground plan of this building had been obliterated by stone looters and by the trenches of former excavators.

Stone looting, incidentally, is not a practice limited to ancient times. Even now anyone digging near a city where building is going on, as it was in present-day Jericho, must hire an honest night watchman who will not sell the stone.

While we could not reconstruct the ground plan, we did find fallen sections of walls, vaults, and piers scattered everywhere, and the debris was full of pieces of painted plaster and plaster moldings. These remnants indicate that the edifice was in keeping with the grand scheme of Jericho which unfolded during our further excavations.

Hellenistic Fortress Dug Up in Palestine

Below this Roman ruin was evidence of a typical Herodian structure. Its walls were made of small stones drafted in the same manner as the massive stone blocks used in the Wailing Wall at Jerusalem or the mosque

* See "An Archeologist Looks at Palestine," by Nelson Glueck, NATIONAL GEOGRAPHIC MAGAZINE, December, 1947.

† See "Among the Bethlehem Shepherds," by John D. Whiting, NATIONAL GEOGRAPHIC MAGAZINE, December, 1926.

Drawn by Herbert E. Eastwood and Irvin E. Allonso

When Lot Beheld Jordan's Green Valley, He Likened It to "the Garden of the Lord"

Balsam forests, source of antiquity's balm, or salve, once stretched across the low hills, and the plain was "well watered" (Genesis 13:10). Now the eroded ranges are bare, but irrigation canals make the valley bloom anew. Mark Antony presented the entire region to Cleopatra as a gift. Herod the Great built at Jericho a civic center copied from the best Rome had to offer (page 831). Mount of Temptation traditionally marks the spot where Jesus resisted Satan's enticements. Map shows site of the author's excavations.

at Hebron over the cave where Abraham and his descendants are buried.

Under the Herodian walls we came upon a Hellenistic tower, probably erected about 200 B.C., either by the Greek-Syrian rulers to keep the Jews down or by the Jews in defending themselves against these overlords. This tower had been built on the flat plain just where it drops off into the wadi, and over the centuries the earth had banked around it to form the mound (page 836).

Most of this debris is from the sun-dried bricks which were the upper courses of the fortress. Herod the Great had evidently leveled off the tower to form a foundation for his new project.

Discovery of the Hellenistic fortress alone would have made our mission a success, for it was the first of its type to be unearthed in Palestine. It had a square exterior and a circular interior to strengthen it against assault by battering rams.

In digging out one of the tower's nine rooms, we went down more than 20 feet. None of us enjoyed the work, because the walls were built of large stones interlaced in the crevices with loose boulders about half the size of a man's head. Nobody could tell when a stone might fall.

Arab Workmen Loyal and Efficient

One of the 150 Arab day laborers whom the United Nations Relief for Palestine provided for the venture said to me, "I pray my God every night this thing won't fall in."

I told him sincerely, "I do the same."

A few weeks later, when working at another dangerous spot, this same Arab had a narrow escape from injury when the ground suddenly disappeared beneath him.

This man, by the way, was typical of the loyal fellows who worked with us. Strong as an ox, he was a jovial and tireless worker. As a foreman, he was a morale builder every

829

Diggers Remove Jericho's Dust of Centuries and Toss It on a Dump Heap

Here the author brought to light, not that very ancient Jericho whose walls were felled by Joshua's trumpets, but the adjacent, Roman-style Jericho built by Herod the Great not long before Christ was born. Modern Jericho, much less illustrious, stands apart from its predecessors. Some of these Arab laborers once owned orange groves near Jaffa, but war in the Holy Land dispossessed them.

place he labored, because the other men were delighted to work with him. I was particularly touched by his impulsive act of kissing my hand when we left.

Nearly all the workmen proved highly efficient. Even though there was a turnover every two weeks, the new men caught on fast, and most of them knew they were doing more than just digging. Some who had been professional masons and builders helped voluntarily to interpret many of our problems.

There were refreshing characters among them, too, like another foreman, Sami, who was leader of a jazz orchestra on the side. He could probably have had a job as court jester in the days of Herod.

By and large, however, there was little fun on the dig. The singing I remembered from past years was replaced by a sort of stunned silence. This was not hard to understand, for many of these laborers were men who had owned their own orange groves in the rich land around Jaffa between Jerusalem and the sea. There was no horseplay, either, like the famous duels of wit between Abd el Aziz and the Haj, two lawyers who had represented landowners involved in some of the prewar excavations in which I had participated.

I was able to renew acquaintance this trip with Abd el Aziz, whose unique features would qualify him to play the part of the Cat in Maeterlinck's *Blue Bird* without using make-up. But the Haj had passed on to Mohammedan paradise.

On one occasion, I remember, the Haj had been induced to eat some food which he later learned was pork and beans. A deeply religious man, the Haj had made the long pilgrimage to Mecca. He was, therefore, obliged to eat enough salt to bring the pork back up, so that he would not offend against the Mohammedan canon. It was strongly suspected that his legal rival was behind the incident.

One interesting detail about the Hellenistic tower made our rather hazardous work more rewarding. This was the fact that we found

830

Arabs Unearth Jericho's Grand Façade from Rubble Accumulated Since the Time of Christ

Each digger cleans out one of the 50 niches which faced the sunken garden of Herod's civic center (opposite page). Recesses here were damaged; others were virtually intact. A foreman wears a straw hat as his badge of authority.

A Technician Reconstructs a Shattered Roman Wine Jar Found in Jericho's Ruins

Most pottery on the table came from the Arabic city built above Herod's winter capital. When an earthquake razed the city in the 8th century, most survivors moved to modern Jericho, a mile away. Mahfouz Nassar performed an archeological jigsaw-puzzle job rebuilding broken pots.

wood bonding still in place after 2,000 years. A course of beams was used to divide the tower into two stories.

The use of logs as bonding in military architecture was recommended by the famous Roman architect, Vitruvius. From the evidence we found, our assumption is that this tower is one of two, Threx and Taurus, which Pompey destroyed in 63 B.C.

Next our work revealed remnants of a grand staircase leading downward from the mound to the flat area along the wadi. The staircase in turn led to a grand façade. This façade, evidently fronting on a sunken garden or sports arena along the bank of the stream, was about two city blocks long. The wall was broken in the middle by what looks like a semicircular open-air theater rising away from the plain in steps.

On each side of it were some 25 statuary niches, each eight feet high and three feet wide, built into the façade. Flowerpots were found in place in the benches, indicating that the theaterlike structure may have been a sort of terraced garden. At each end of the façade were ruins of large rooms, and all along the façade and around the curve of the theater was a mirror pool. After an irrigation ditch spilled over one day and filled it up, we found that it still holds water (pages 832-3).

Across the wadi, meanwhile, we unearthed the foundations of two expansive winter villas or public buildings with the red plaster still bright on the walls. The brightly colored plaster of this period instantly called to mind Pompeii. Another villa shows downstream on a lower bench of the wadi.

The second artificial mound also yielded a series of fortresses. The original structure may have been one of heavy brick walls. Within these walls we found two stone forts, one inside the other.

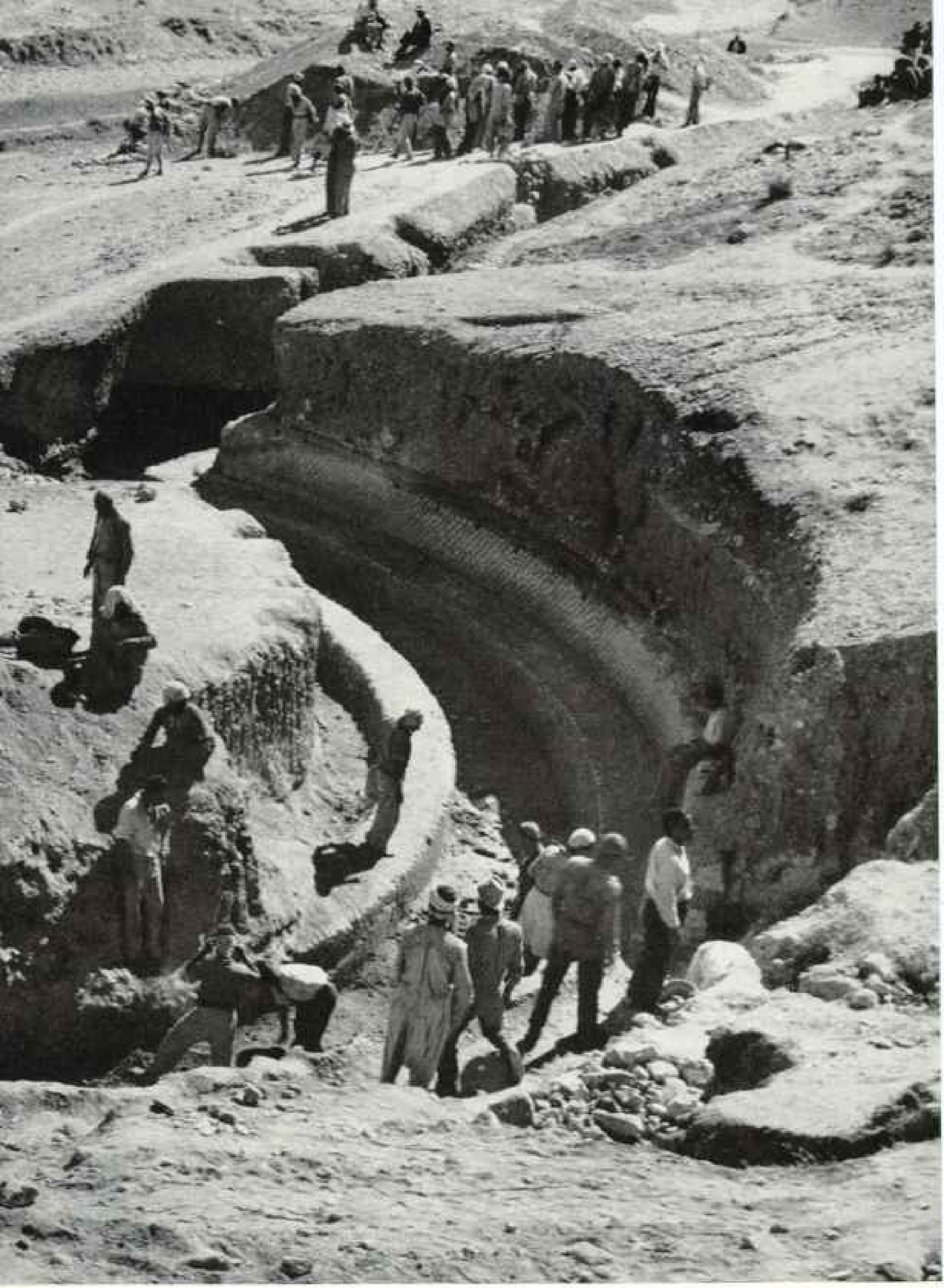
On the east side of this fortress we unearthed another room. It was almost intact, and the plaster, painted in bright reds, yellows, blues, greens, and blacks, was as vivid as the day it was laid.

It was quite different, however, from the painted plaster of the earlier period found in the villas. Its design imitated the marble slabs that lined the walls of the rich houses. The poor man has always imitated the rich, and marble is still imitated in the painted plaster walls in that land.

812

Lords and Ladies of Herod the Great's Court Lounged Here in a Terraced Garden

Workmen dig up flowerpots which adorned the benches of the theaterlike enclosure. Close by, they unearthed well-preserved timbers of a fortress built about 200 B.C.



831

A Magnificent Reflecting Pool Mirrored the Royal Games and Other Gala Scenes

Excavators discovered the reflecting basin (lower right) sheeted with water one morning when an irrigation canal accidentally spilled over and filled it (page 831). Roman plaster was still waterproof despite centuries of neglect.

Long before all this was brought to light, we knew we had a real find. I was conducting the expedition on behalf of the school where I teach, Pittsburgh-Xenia Theological Seminary, and the American School of Oriental Research in Jerusalem, of which I was acting as director for a year's term.

A staff of experts assisted me in the work. My associate director was Dimitri C. Baramki, former senior officer of Palestine antiquities under the British Mandate. Others who offered valuable aid included Prof. C. Umhau Wolf, of Chicago Lutheran Seminary, and the Reverend Carl Kissling of Saio, Ethiopia, formerly a professional architect. G. W. Lankester Harding, director of antiquities of the Hashemite Kingdom of the Jordan, and Father Roland de Vaux of the French School of Archeology helped us in assessing the archeological evidence.

It was the Jericho of the Herods all right and, as such, an important political capital of historic significance, second only to Jerusalem itself. In addition, much of it was of a type of pure Roman architecture which had never before been found in the Holy Land and which is very rare anywhere east of Italy.

How Luck Led to Jericho

Actually, it was a combination of good luck and the Palestine political situation that led us to look for Jericho. My original intention when I left the United States in the fall of 1949 had been to return to the scene of some of the earlier diggings in which I had participated—Kirjath-sepher, or, in translation, "Book Town"—where I was convinced I could find some important documents similar to the famous ones at Ras Shamra in Syria.*

But Kirjath-sepher turned out to be in no man's land. It had been a border fortress from long before Abraham's time until Nebuchadnezzar's armies finally wiped it off the map. Today it is again a border town.

Then Baramki and I examined a Byzantine church east of Jerusalem, in the Wilderness of Judaea, as a possible site. We had about decided to dig there when bullets whistled over our heads and buried themselves in the ruins. We found we were just over the hill from an Arab Legion target range.

Jericho was the next logical choice, because it was in the Jordan Valley, the only area dry enough in the winter for archeological work, and on the Wadi Qilt, which the American School had suggested we explore. And, incidentally, it gave us an opportunity to make use of the magic of the old school tie, which I found to my surprise is just as potent a force in the Near East as it is along the eastern seaboard of the United States.

Because one of the landowners of the Jericho site had gone to the American University of Beirut with Baramki, he let us have use of the land free of charge and didn't even resort to the ancient custom of getting us to hire his friends.

Our exploration of the wadi was to ascertain whether any significant archeological remains would be endangered by an irrigation dam suggested by the United Nations Economic Survey Mission for the Middle East. Except for Jericho, which in any case is below the point where a dam would be erected, and two well-known monasteries, we failed to find any obvious archeological items worthy of protection along the wadi.

Herod's Ghost Seems to Walk the Ruins

As we progressed with our work, it seemed to me that the ghost of Herod literally rose out of the ground and paced the battlements and the façade. For example, we found several skeletons in the ruins, one of which gave evidence of murder. Although this skeleton was much more recent than the time of Herod, it was certainly symbolic of his violent reign.

Then, too, the Roman architecture recalled how Herod had seized his throne only after the Jews had been subdued by Roman legions in the bloody battle of Jerusalem in 37 B.C. It was in keeping with Herod's lifelong subservience to Rome, which is emphasized by the temple he had erected in Samaria in honor of Augustus Caesar. The obvious grandeur of Jericho also was characteristic of Herod, who is remembered for being, among other things, perhaps the greatest builder in the long history of Israel.

In some places the walls we unearthed were four feet thick. They were of poured concrete and faced with small, square-based pyramidal stones arranged in diamond shapes. The windows and doorjambs and exterior corners were trimmed with rectangular stones, laid like modern bricks. Despite the care given to putting this diamond-shaped facing on the concrete walls and despite the beauty of its pattern, the outside of the buildings in their prime was smooth white plaster.

This type of construction—the concrete and the small cut stones—was entirely new in Palestine. To discover it was as startling as it would be to come upon Rockefeller Center in the middle of China. Walls like these were common, however, in Rome and the wealthier areas of Italy during the time

* See, in the National Geographic Magazine: "Secrets from Syrian Hills," July, 1933, and "New Alphabet of the Ancients Is Unearthed," October, 1930, both by Claude F. A. Schaeffer.

815

Cloth Cemented over a Mosaic Enables Workers to Remove an Inscription

Thousands of tiny stones set in concrete carried a message from the past. Held by the stiffened cloth, they were removed intact. The mosaic was found in the Byzantine church at Khirbet en Nitla (pages 838, 844).

of Augustus Caesar.* The construction is similar to that found in the villa of the Latin poet Horace, for example. Much of Pompeii is of a related architecture, but there brick was used along with the stone.

The layout itself, as we can picture it from the ruins, was that of a transplanted Roman civic center. As has been indicated, the façade acted as a retaining wall between the hillside and a level area stretching to the bank of the wadi. At either end of the façade, massive walls extended at right angles in the direction of the stream.

Originally there was a third wall, nearer the wadi and running parallel to the façade, but very little of this remains. Steps lead down from the street level at the western end. All this suggests a sports arena where the type of games favored throughout the Roman Empire might have been conducted, or a garden where the king entertained guests.

Just outside this enclosed area on either end of the façade are units consisting of one large barrel-vaulted hall and small adjacent rooms. The front of each hall appears to have been decorated with a small arch at the extreme end followed by a larger arch resting on two pilasters projecting from the wall.

Many fragments of columns coated with fluted plaster were discovered in the debris in front of the east hall, together with many stamped plaster fragments. These columns probably supported a light ceiling of plaster laid on bundles of reeds. The structure would thus have been a pleasant pergola in which royal guests could loll on hot days.

One of these groups of rooms had an 8-inch aqueduct leading into it, suggesting a fancy fountain complex for air conditioning. In the light of these discoveries, our most modern resorts do not seem such a far cry in comfort from those in the days of the Pax Romana.

Coins Point to Archelaus as Builder

While the discovery of such foreign architecture was surprising, it squared easily with the history of Herod's life and times. Herod journeyed often to the capital of the great Roman empire to make certain that his political position was solid. Indeed, after one of these visits to the emperor, he may have brought back with him the master artisans who created Jericho. It is possible, however, that the walls unearthed to date were erected by his son Archelaus, who reigned from 4 B.C. to A.D. 6.

Indicating that Archelaus may have been the builder is a cache of coins found in the ruins. The earliest coin is one of his era and the latest A.D. 86. The coins were under

* See, in the National Geographic Magazine: "The Roman Way," by Edith Hamilton, and "Ancient Rome Brought to Life," by Rhys Carpenter, both November, 1946; and "Augustus—Emperor and Architect," by W. Coleman Nevils, October, 1938.

Crumbling Forts and Palaces, Each Built upon the Ruins of Its Predecessor, Form an Artificial Mountain in Jericho

Here Herod leveled off a Hellenistic tower, constructed an edifice of his own, and laid out a stairway descending to his sunken garden (pages 828 and 831). Below: Refugee Arab workmen dwell in a tent city pitched on the archeological site.

At Dawn in the Bare Hills, Diggers March to Field Headquarters to Pick Up Their Tools

New Testament Jericho occupied the ground between tents and mountains. Once a fortress crowned the highest peak in the center. The expedition verified its existence, but lacked time to dig out the ruin (page 839).

538

A Mosaic Inscription from a Byzantine Church Pleads for God's Mercy

After long study, scholars have determined that the letters signify *Domine miserere*—the first word abbreviated to *do*, and the first syllable of the second spelled with an *e* instead of the modern *i*. The mosaic was taken from the church at Khirbet en Nitla, near New Testament Jericho (pages 833, 844).

the sill of one of the rooms, where they probably had been secreted by some thrifty person in a manner typical of Biblical times.

The historian Josephus tells us that Simon, one of Herod's influential freedmen, led a revolt immediately after Herod's death and burned his palace and other buildings. Archelaus, he recorded, sumptuously rebuilt the palace. In the light of this it was interesting to find that one of the four levels of the first mound we excavated, the one done in the Herodian type of stonework, had apparently been burned.

Rare Snowfall Paralyzes Palestine

In the days when Jericho prospered, "The Hills of the Father of the Bramble Bushes" were certainly not so bleak as that name implies. Present-day Jericho, with its small white houses buried in a lush green oasis of citrus and banana groves and date gardens, is indicative of that.

During our four months of intensive work at Jericho the weather was all that one could ask. It was bright and sunny about six days of the week, and much of the time we worked in shirt sleeves.

There are winter windstorms in Palestine, however. One of these swept away the big tent in which we stored our tools; consequently, for the rest of the dig we rented a house. Rooms in a Jericho hotel served as a place to work at reconstructing pottery and other items we found in the ruins (p. 831).

One day all Palestine had such a heavy snowfall that it piled up to five feet in the trans-Jordan hills. This was most unusual. One of our workmen said his grandfather had told him that *his* grandfather (that would be the workman's great-great-grandfather) had once seen snow in Jericho.

The surprising snowfall marooned us in our Jerusalem headquarters. Nothing on wheels moved very far in Palestine, for tire chains are unheard of there.

Surprisingly, we found new automobiles available at reasonable prices in Palestine. But it takes a jack-of-all-trades chauffeur to drive them. One never goes out in the desert with a driver who is not a good mechanic.

In our own case, we had some harrowing experiences. The school's station wagon had seen better days, and we seemed to have trouble with an overheating rear axle every time we drove in the desert. On one occasion the car actually burst into flames. We put the fire out by smothering it with rags. Then the chauffeur took the wheels apart two or three times without any notable success.

Luckily, it was an Arab holiday, and some refugees who were driving between Petra and 'Amman to a family reunion picked us up. It is an unwritten law of the desert that a traveler must stop and give assistance.

Formerly, the banditry of earlier days would have made this practice rather dangerous. But today the new Government of the Hashemite Kingdom has almost eliminated banditry. Proof is the fact that the Bedouins who once lived by raiding farming settlements are now settling down in the towns.

The Government includes an elected assembly; while we were working, candidates were campaigning for the seats allotted for Jericho. It was just like an old-time American political campaign, complete with songs, banners, and motor parades. The Jericho election was looked upon as very important, because this district, once part of the British Mandate, is new to the Hashemite Kingdom. But the Jericho district has always been important to its rulers.

With proper irrigation—and we found irrigation aqueducts from Herod's time in place—the soil is rich. The owners of the land we excavated now have a fine irrigation system, and their crops testify to the land's fertility. They have tapped a part of the same water sources that the Herods used.

A Wealthy District in Herod's Time

Even the portions of land without irrigation were a mass of wild flowers in the spring, flowers so fragrant that they literally perfumed the air. We found new varieties nearly every day. In the time of Herod this was a wealthy district, famed throughout the world for its balsam groves.

Shortly after Herod became king, Mark Antony forced him to give over the Jericho district to Cleopatra, but the wily Herod leased it back from her for what historians call "the huge rent of 200 talents." The district then was reportedly one of the chief sources of royal revenue in Palestine. Another major source of Herod's income was the copper mines on the island of Cyprus.*

The views here are magnificent. No wonder that so many generations built upon the commanding mound left by the ruins of the Hellenistic tower. From there can be seen the sparkling blue waters of the Dead Sea to the south, and the surrounding cliffs in one of which shepherds from Bethlehem discovered in 1947 the famous Dead Sea scrolls. These scrolls, which were found in a cave on the cliffside, included the famous Isaiah manuscript, older even than Herodian Jericho.

Two mountains on each side of the Wadi Qilt dominate the site of Jericho. On each of these are ruins of a fortress. To the west is the spectacular Wilderness of Judaea. To the east is the jungle of the Jordan River, through which Herod the Great probably roamed in search of game, for hunting is recorded as one of his chief diversions. Still farther east rise the blue-faced mountains and plateau of Jordan, a backdrop to the Jericho stage.

Having been aided to the throne by Roman troops during a veritable massacre, Herod was understandably not popular with his Jewish subjects. He did, however, marry a girl of royal Jewish lineage named Mariamne.

Herod was passionately in love with the beautiful Mariamne, but she regarded her husband, who was not of royal blood, as an upstart and did not return his affection.

Herod Eliminated Rivals by Treachery

Even his love for his wife did not stay Herod's hand when he saw that her young brother, Aristobulus, was being received enthusiastically by the crowds as high priest.

Herod had appointed Aristobulus to this position in a move to curry favor with the people, but he was not willing to put up with a potential rival. When they both attended a banquet at Jericho—probably a gay occasion given over to uproarious games and swimming in the pools of the palace garden—Aristobulus was somehow drowned. Professing the deepest grief, Herod gave his brother-in-law a magnificent funeral.

Six years later, 29 B.C., Herod, a dupe of his own fierce jealousy and a plot laid by his conniving sister, Salome, had Mariamne put to death on charges of being false to him.

Jericho again figures in the annals of Herod as the place where he staged one of the first public trials of his sons by Mariamne, Alexander and Aristobulus. Largely as the result of further plotting by Salome, who, incidentally, is not the Salome referred to in the grisly story of the beheading of John the Baptist, Herod believed Alexander and Aristobulus were planning to take his life. After repeated trials and reconciliations, he was finally convinced that his fears were true and ordered them to be strangled.

Herod apparently took a long time dying at Jericho. Accounts by Josephus indicate that he suffered cancer of the bowel. While he was on his death bed, he was called upon to deal with an outbreak of religious fervor. It was occasioned by the fact that Herod caused a golden eagle to be erected over the great door of the Temple in Jerusalem, which he had rebuilt as a sop to the religious feelings of the Jews. The eagle was apparently Herod's way of trying to reconcile his devotion to his national god with what was perhaps a stronger devotion to Rome.

At any rate, the eagle outraged the Phari-

* See, in the NATIONAL GEOGRAPHIC MAGAZINE: "American Fighters Visit Bible Lands," March, 1946; and "Unspoiled Cyprus," July, 1928, both by Maynard Owen Williams.

Good Samaritan Inn Now Serves Coffee to Motorists

Nearly every visitor to the Holy Land wants to drive the 30-mile black-top road, whose way stops carry him back thousands of years to some of the Bible's most familiar places. Within 50 minutes the driver can see Jerusalem, Mount of Olives, Bethany, Jericho, and the River Jordan (page 825).

These parched hills rise in what the Bible calls the Wilderness of Judaea. In New Testament times brigands infested the road, and some travelers "fell among thieves," as did the man who, in Christ's words, "went down from Jerusalem to Jericho." Robbers "stripped him of his raiment, and wounded him, and departed, leaving him half dead" on the road. Two passers-by, not unlike some of today's hit-and-run witnesses, ignored the victim, "but a certain Samaritan . . . had compassion . . . bound up his wounds . . . set him on his own beast, and brought him to an inn" (Luke 10: 30-34).

This walled caravansary occupies the traditional site of the Biblical tavern. Police station and coffee shop are the modern tenants.

Fuel Is Scarce in the Desert. Walking Thornbushes Bear Spiny Loads of Twigs for Cooking Fires

Arabs have a name for the place—"The Hills of the Father of the Bramble Bushes" (page 827). For ages their camels have grazed the leaves and their wives have burned the wood. Visiting American girls could not lift the heaviest bundles, but these women carried head loads as far as five miles.

841

sees, the strictest of the Jews in upholding the religious law which forbade the use of any images. Two Pharisee doctors harangued their students about this eagle to such a point that, when a rumor went around that Herod was near death, a group of the students scaled the Temple porch, let themselves down by ropes, cut away the eagle, and, in the presence of an admiring throng, hacked it to pieces.

An assembly of Jewish notables was immediately convoked in the theater at Jericho, and Herod was carried in on his sick bed. The old man wrathfully admonished the group. When they told him there had been no general sympathy for the deed, Herod yielded to their pleas that only the guilty parties be punished. Forty students were executed, those who actually cut the eagle down being burned alive, as were the two professors.

Given a Magnificent Funeral

Finally, in March, 4 B.C., Herod died. He was given a funeral suitable to his title, the Great. His body, clad in royal purple, a scepter in his hand and a crown on his head, was borne on a golden bier from Jericho to Herodium, where it lies today in that magnificent ruin still shoving parts of its walls out of the earth south of Jerusalem.

The story about the eagle gives rise to speculation as to just what was in the statuary niches along the Jericho façade. Herod, we know, except for the glaring example of the eagle, was ordinarily scrupulous in avoiding injury to the religious sensibilities of his subjects by erecting statues. No evidence of any statuary was found in the ruins, but then statues are among the first spoils of war in any era. The niches were large enough to have been adorned by small trees.

The eagle story also poses the question of the location of the theater in which Herod appeared to pass judgment on the culprits. There are evidences of two large theaters in the area. Whether any significant ruins can be recovered remains to be seen. We know that it was often the Roman custom at this time to use wooden seats in theaters, much as we do in our bleachers today.

Immediately after the death of Herod the Great, Archelaus, who was named successor in Herod's will, ascended the throne provisionally until the Emperor Augustus could rule finally on the succession.

Archelaus had been educated and spent much of his adult life in Rome. Although the people were more or less willing to give him a chance, he started his rule badly by ordering the army to quell riots. The result was another massacre, in which 3,000 were slain.

While Archelaus and his ministers were in Rome getting his title to the throne settled, disorders broke out all over the kingdom. The unrest apparently convinced Augustus that it would be easier to continue controlling the Jews through vassal kings than to establish direct Roman rule. So the Emperor approved Herod's final will and split the kingdom into three sections, over which he placed Archelaus and his two brothers, Antipas and Philip, as rulers. Archelaus got the lion's share with the title of ethnarch and the promise that he would be king should he prove worthy.

While historians report that Archelaus's rule was "tolerably efficient," he seems to have aped his father's methods and treated his subjects harshly. The seriousness of the situation was indicated by the fact that the Jews and Samaritans, normally bitter enemies, combined to complain to the Roman emperor in the year 6. Archelaus was deposed and banished to Gaul, where he lived out his life.

Meanwhile, Rome took over Archelaus's portion of the Holy Land and administered it directly for the next 35 years. This accounts for the presence of Pontius Pilate, the procurator who figured so prominently in the Gospels. One Herod of the Gospels, the tetrarch who ruled over Galilee and ordered the head of John the Baptist produced on a platter for his young stepdaughter Salome, was Archelaus's brother, Antipas.

Where Jesus Abode with Zaccheus

But, even as Herod's gory ghost haunted the battlements of the Jericho we excavated, these same walls were hallowed in our minds by the memory of another who walked that way. Jericho was the last city visited by Jesus as He made His way to Jerusalem to face the Crucifixion. This incident is recorded as follows by St. Luke (19:1-7):

> And Jesus entered and passed through Jericho.
>
> And, behold, there was a man named Zacchæus, which was the chief among the publicans, and he was rich.
>
> And he sought to see Jesus who he was; and could not for the press, because he was little of stature.
>
> And he ran before, and climbed up into a sycamore tree to see him: for he was to pass that way.
>
> And when Jesus came to the place, he looked up, and saw him, and said unto him, Zacchæus, make haste, and come down; for today I must abide at thy house.
>
> And he made haste, and came down, and received him joyfully.
>
> And when they saw it, they all murmured, saying, That he was gone to be guest with a man that is a sinner.

843 © The Oriental Press Photo Company from Black Star

River Jordan, Flowing Past Salt Pans, Meets the Dead Sea 1,286 Feet Below Ocean Level

The Old Testament called earth's lowest body of water the Salt Sea. Arabs speak of it as the Sea of Lot. Greeks named it the Dead Sea. Josephus knew it as the Asphalt Sea. Egyptians prized its asphalt as an embalming agent; the very word "mummy" comes from the Arabic *mumiya*, meaning asphalt. Today the sea yields valuable minerals as well as asphalt. Only minute organisms can withstand its heavy brine content.

I think it can be said with certainty that, if he did not actually live in one of the villas on the north bank of the Wadi Qilt, Zacchæus lived in a similar house in this general section of Jericho. For one thing, he was rich, and all that we have uncovered so far is the wealthy section of the city. For another thing, Zacchæus was obviously an important man in so far as the Roman rule was concerned. He was what you might call an assistant secretary of the treasury, with headquarters at the winter capital.

Just where the sycamore tree incident took place would be difficult to say. At any rate, there is still a splendid sycamore fig tree with a trunk about five feet in diameter on the road north from modern Jericho. It is a sight no visitor should miss, for it brings to life the story of Zacchæus.

It was along the road outside of Jericho that Jesus healed two blind men (Matthew 20:29-34). The blind are still a common sight in Jordan and, on the days when we hired new workmen, the blind came and pleaded that their sons be hired. We were always glad to comply.

A more accurate pin-pointing of some of these historical events was among the many riddles we were forced by the passage of time to leave to other scholars. Happily, the work is continuing this year under the guidance of the American School. There will be much more to find. For one thing, we did not locate the great public buildings, such as Herod's palace, which we assume are buried there. Indeed, as soon as the wheat was harvested from the land just west of the southern fortress, foundations of a large edifice appeared.

In addition to more buildings, there should be some valuable inscriptional material. Inscriptions are difficult to find in Palestine, where most of such work was done on limestone, which washes with the rain. In this case, however, it is reasonable to suppose that inscriptions may be legible, since the wood we found preserved in the Hellenistic fortress attests the dryness of the climate.

Other intriguing questions yet to be answered are: Just what caused the downfall of this fabulous resort? And why didn't the poor move in and take over, as they generally

have elsewhere? The city seems to have declined about the 3d century, and there is no evidence of the poor ever having lived in the portion of Jericho we dug up except during the brief Arab reoccupation of the 8th and 9th centuries.

Whatever is uncovered will be left for the world to see. The Hashemite Government has issued instructions that anything of general interest be kept above ground, open to the public. It undoubtedly hopes that one day Jericho will rival Pompeii, where buses bring people by the hundreds daily to scramble over the historic remains.

A Dig near Where Jesus Was Baptized

Not nearly so interesting but worth reporting is a minor dig we conducted at Khirbet en Nitla, a few miles to the east. The site was just off the dirt road leading to the traditional scene of Christ's baptism. The baptism at the hand of John the Baptist is supposed to have taken place near where the Wadi Qilt flows into the Jordan River.

The site where we dug has in the past aroused the interest of many explorers. It derives its name from a near-by tamarisk tree, preserved probably because it is considered sacred. The fact that the Arabs, desperately in need of fuel, allow these trees to stand is a carry-over from the Canaanite religion.

Although some archeologists have identified this place as the site of ancient Gilgal, where Joshua set up headquarters and marshaled his hosts for the advance on Jericho, we found no evidence of ancient occupation.

We did, however, uncover at Nitla the ruins of a church which had undergone many changes in construction and repair between the 4th and 9th centuries. The original church was a three-aisled basilica of stone. Each successive rebuilding was only a small chapel of poorer materials. But there were mosaic floors containing intriguing inscriptions. Scholars have now decided that the inscriptions are in Latin (pages 835, 838).

Joined to the church were remains of a monastery with tiny rooms that were truly cells. This is one of 18 monasteries in the Jericho district. Only Jerusalem itself boasts more.

The church and monastery at Nitla were just more bits of evidence of the centuries of living which have made this Jordan Valley so rewarding to the curious. Some of these skeletons of a past civilization, like Phasaelis, the city to the north of Jericho which Herod the Great built in honor of his brother, still lie beneath the loam. We had intended to dig this site, where buildings still show through the ground, but time prevented it.

But there are many spots, among which New Testament Jericho now takes its place, for the tourist to see. For example, there is the breath-taking sight of St. George's Monastery hanging on the cliffs above the Wadi Qilt, west of Jericho. And along the main motor road from Jerusalem is a tomb dating from the time before Moses. Somebody tried to fashion it after the Egyptian pattern.

Down where the road levels off onto the plain is Nabi Musa, the famous Mohammedan shrine in which the bones of Moses are supposedly interred. North of present-day Jericho, beyond the sycamore fig, there is Old Testament Jericho with its great spring, still the source of water for the blooming orchards of the modern city. Not every visitor will be as lucky as the mining engineer who several years ago spotted a gold Assyrian ring among these ruins.

Beyond here, at Khirbet el Mefjer, lie the ruins of a majestic Ommiad palace which was under construction when the mighty earthquake of the 8th century shook it down.

Above all this towers the lofty Mount of Temptation, from which the whole valley can be seen as an inspiring panorama. Mount Hermon is visible far to the north, and to the south the eye travels across the Dead Sea into the jumble of mountains of the 'Araba.

Air Mail by Donkeyback

The journey to Arab Palestine can be made even in these troublous times. Trans World Airlines and Pan American Airways planes land at Cairo and Beirut, respectively. From there other planes fly to Kolundia Airport, the Arab field for the divided city of Jerusalem.

There is a curious paradox in the fact that air mail must be carried by donkey through the streets of the old walled city, too narrow for automobiles, since the division of Jerusalem has shut off the motor approach to the post office.

Visitors coming by sea may land at Beirut and motor over the scenic Lebanon Mountains, through the age-old city of Damascus, and down the desert's edge to 'Amman, capital of the newly created Hashemite Kingdom of the Jordan.

However they arrive in the Holy Land, it is certain that in years to come travelers will still yield to the temptation to go eastward toward the Jordan. Perhaps they will feel that the opportunity to examine the walls which Jesus must once have looked upon is at least as compelling a reason for their journey as the popular custom of taking a moonlight dip in the Dead Sea.

For additional articles on the Holy Land, see "National Geographic Magazine Cumulative Index, 1899–1950."

NATIONAL GEOGRAPHIC SOCIETY

ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

To carry out the purposes for which it was founded sixty-three years ago, the National Geographic Society publishes the National Geographic Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

Articles and photographs are desired. For material The Magazine uses, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1939, discovered the oldest work of man in the American for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 291 B. C. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1935, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

A notable undertaking in the history of astronomy was launched in 1949 by The Society in cooperation with the Palomar Observatory of the California Institute of Technology. This project will require four years to photomap the vast reaches of space, and will provide the first sky atlas for observatories all over the world.

In 1948 The Society sent out seven expeditions to study the eclipse of the sun along a 4,320-mile arc from Burma to the Aleutians. The fruitful results helped link geodetic surveys of North America and Asia.

The Society granted $35,000, and in addition $75,000 was contributed by individual members, to help preserve for the American people the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California.

One of the world's largest Icefields and glacial systems outside the polar regions was discovered in Alaska and Yukon by Bradford Washburn while exploring for The Society and the Harvard Institute of Exploration, 1938.

Shown above: 1. WENDA—gold-filled, $64. 2. FAY—white-gold-filled case and bracelet, $67.50. 3. DONALD—14K gold, $110. 4. JEFFREY—gold-filled case and bracelet, $71.50. 5. BELDON—gold-filled "ελ" —sealed against moisture and dirt, $71.50. All prices include Federal Tax—subject to change without notice. Every Hamilton watch is adjusted at the factory to temperature, isochronism and position.

Better jewelers everywhere have a wide selection of Hamiltons from $49.50 to $12,000. Yours FREE—"What Makes a Fine Watch Fine?"—a 36-page illustrated booklet about America's finest watch. Write Hamilton Watch Co., Dept. C-9, Lancaster, Pa.

let's see . . .

There are eyes, and eyes!
There are *eyes that grope* in a world of blurs and double images . . . neglected eyes, straining to see, plaguing their owners with untold misery.
Then there are *eyes that really see!* Eyes, so bright, so clear, they add a plus value to everything in life.
They are a precision tool on the production line, speeding the job, guarding against accidents.
They give skill at games, they take the strain out of reading, sewing, movies, television.
They add to well-being by banishing nervous tension . . . they give beauty by abolishing ugly wrinkles.
All eyes are on the job every minute of every waking hour . . . and all eyes weaken and change as years go by.
But the *eyes that really see,*
are the eyes that are *regularly protected and corrected* by the expert care and service of conscientious ophthalmologists, optometrists, and ophthalmic dispensers (opticians), who through the miracle-working wonders of modern, visual science, enable us all to *put our best eyes forward.*

Better Vision Institute, Inc., 630 Fifth Avenue, New York 20, N. Y.

EYE CARE
Nothing you buy gives you so much, yet costs you so little

Science says, millions of different eyeglass-lens corrections are possible. Actually, many thousands are made, using over one hundred different kinds of glass. But only one combination of correction and glass, is just right for the needs of your individual eyes!

Artur Rubinstein at the Steinway

PHOTOGRAPH BY JERRY COOKE

For your home: the piano chosen by the world's great artists

The Steinway is used exclusively by Fleisher, Garbousova, Johannesen, Kurtz, Michelangeli, Morley & Gearhart, Solomon, Wallenstein, and many others. Illustrated is the beautiful Hepplewhite. Now you may purchase a Steinway at convenient terms. See classified telephone directory for dealer's name.

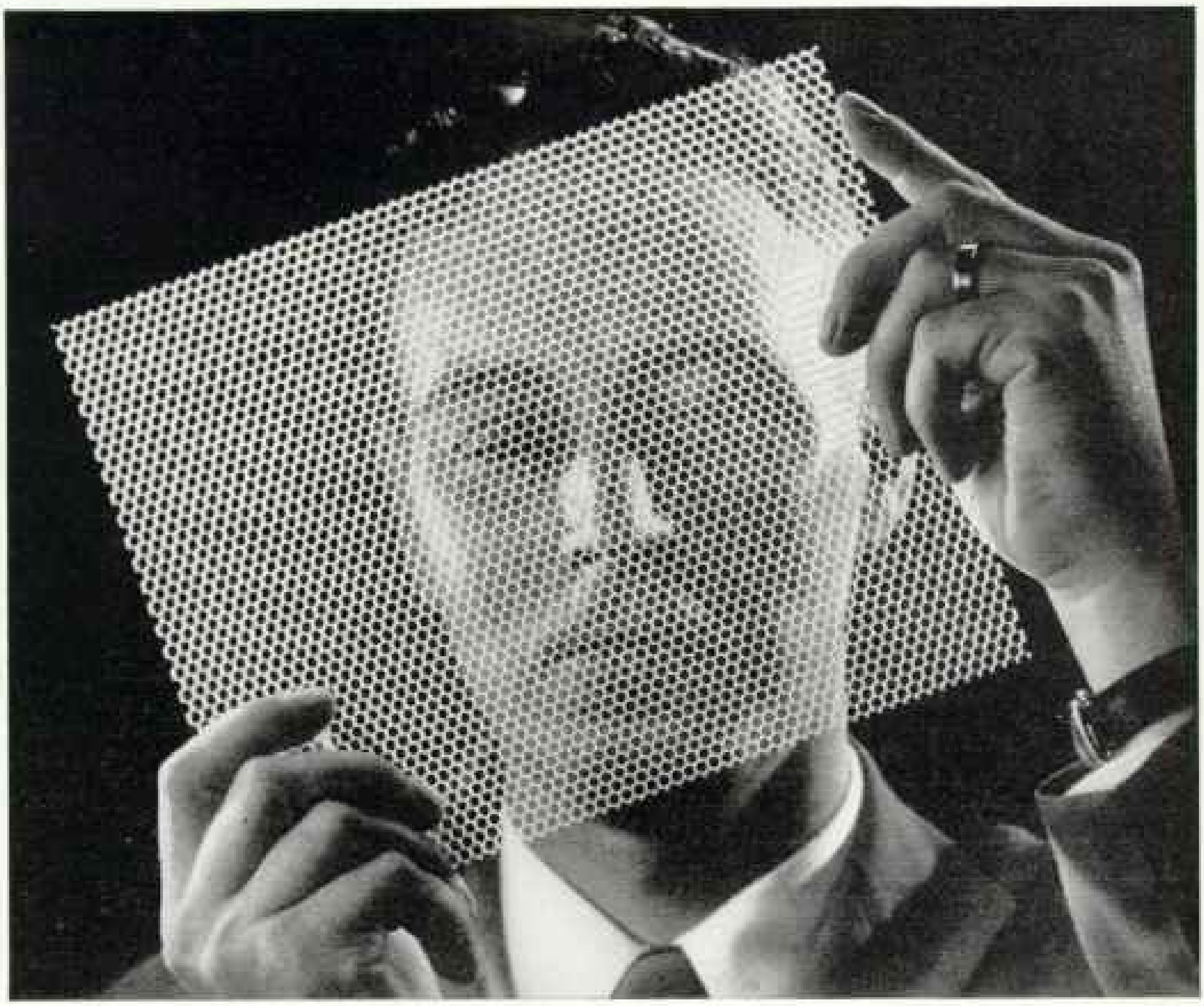
An artist judges a piano by its tonal beauty, its sensitivity of action, and its durability. Because the Steinway meets these standards to a greater degree than any other piano, it is the choice of nearly every famous musician.

For the home, the Instrument of the Immortals is the most rewarding of piano investments. Every Steinway model, Vertical or Grand, is equipped with the exclusive Diaphragmatic Soundboard, which helps to create its glorious resonance; and the Accelerated Action, an inspiring aid to the beginner and experienced player alike.

Make this a truly joyful Christmas by giving your family the one piano that has won the acclaim of great artists and music teachers for nearly a century! For a free copy of our helpful booklet, "How to Choose Your Piano," write to Steinway & Sons, Steinway Hall, 109 West 57th Street, New York 19, N. Y.

STEINWAY

THE INSTRUMENT OF THE IMMORTALS



How to cut glass with light!

The holes in this glass are as accurately made as if they had been cut in metal by a high-precision machine.

But actually they have been etched through the glass—by a new process, developed at Corning Glass Works, for machining glass by photo-chemistry.

A photographic screen pattern for the holes is first laid over a piece of special photosensitive glass, which is then exposed to ultraviolet light. When heat is applied, an identical pattern is developed inside the glass. The heating process changes the composition of that part of the glass which has been exposed to the light so that the holes can be etched out cleanly by immersion in acid.

By this method, any design that can be recorded on photographic film can be reproduced in three dimensions in glass.

Corning's research indicates that this method of machining glass will have many uses in the fields of electronics, lighting and decoration.

Throughout industry, Corning means research in glass — research that has helped glass become a material of almost limitless uses. If you are thinking in terms of improved products or processes, consider Corning's glass before your planning reaches the blueprint stage.

Write Box N8, Corning Glass Works, Corning, New York.

CORNING
means research in glass

VISIT THE CORNING GLASS CENTER, CORNING, N. Y.

Mexico nothing else like it under the sun!

FUN-WISE... dollar-wise... you couldn't possibly choose a better spot for that mid-winter holiday than this enchanted land "South of the Border."

Whether you seek pleasures or treasures, Mexico boasts a bounty of both with such fabulous places as the magnificent beaches of Acapulco ...the floating gardens of Xochimilco...and the breath-taking silver marts of quaint old Taxco.

See for yourself how little it takes to take you on the vacation of a lifetime in this favorite playland of the Americas. For complete details, mail the coupon below for American's FREE color folder, "Mexico"!

AMERICAN AIRLINES INC.

America's Leading Airline

TO: American Airlines, Inc. Dept. A
100 Park Avenue, New York 17, N. Y.

Gentlemen: Please rush your FREE color folder, "Mexico" to:

Name _____

Address _____

City _____ State _____

(PLEASE PRINT CLEARLY)

EASTERN'S *experience* *proves* *Sinclair's dependability*

Through 23 years of air transportation, covering billions of passenger miles, Eastern Air Lines has set an enviable operating record. Dependable personnel and dependable airliners — plus rigid standards of aircraft maintenance which call for the finest lubricating oils and greases—have made this record possible.

Eastern uses Sinclair aircraft engine oil *exclusively* in its great Silver Fleet.

Long experience has proved that Sinclair's detailed knowledge of every phase of aviation lubrication produces products worthy of confidence . . . another reason why Sinclair is a leader in the petroleum industry.

SINCLAIR
A Great Name in Oil

SINCLAIR OIL CORPORATION • 600 FIFTH AVENUE • NEW YORK 20, N.Y.

for Christmas

Just a few of more than a thousand different Interwoven Socks from which to choose.

Nylon Socks . . . Solid Colors—Plain or Clocked . . . Verticals and Fancy Patterns in marvelously blended colorings.

Ribbed Socks in Nylon . . . Mercerized Cotton . . . Plain or Clocked.

Interwoven® Socks

Sport-Type Socks Argylls . . . Diamonds . . . Wide Ribs . . . in Soft Cotton . . . Wool . . . Spun-Soft Nylon.

GIVE WITH PRIDE...

the most exciting movie camera ever designed!

THE NEW 16 MM Bell & Howell "200"

Winner of the coveted Society of Motion Picture Art Directors Award . . . a masterpiece of home movie equipment. Here is the crowning achievement in the 16mm field . . . a movie camera that invites selection as the one gift worthy of her—or of him. For smart appearance, for ease of use . . . indoors or out, for perfection in home movie making, there is no finer camera than the new Bell & Howell "200."

Priced for Christmas giving, this handsome camera will be readily appreciated for its fine performance. Single lens model (with 1" f/2.5 Filmocoted lens) only $189.95. Trade-ins and liberal terms offered by most dealers.

Keep those family hours . . . just as you will always want to remember them. And do it with the new Bell & Howell "200"... ideal as the one important gift to be shared by every member of the family . . . young and old.

Guaranteed for life: During the life of the product, any defect in workmanship or material will be remedied free (except transportation).

Price subject to change without notice.

You buy for life

when you buy

Bell & Howell

Chicago 45

it winds itself

it shrugs off shock

the truly perfected watch

of unceasing precision—

Gyromatic*

Shown (left): Gold filled, shock protected, self-winding. 17 jewels, $71.50.

Shown (right): Stainless steel, self-winding, shock protected and water resistant. 17 jewels, $65.

Prices include Federal tax. Other G-P watches from $45. At selected jewelers.

GIRARD PERREGAUX

Fine watches since 1791

*Reg. U. S. Pat. Off.

30 Rockefeller Plaza, New York 20 - In Canada: Hamilton, Ontario

Official watch of Capital Airlines

Sleeperette* service is offered only by Pan American. You get double the usual leg room . . . and your chair reclines to provide full bed-length comfort. On many Clipper routes . . . no extra charge.

Lower-deck club lounge is a delightful feature of the double-decked "Strato" Clippers. Only Pan American World Airways flies these modern sky giants between five continents. No extra fare!

Now you can fly around the World

IN 5 DAYS FOR ONLY $1660.90

The first round-the-world airline (June, 1947), Pan American, has recently reduced the price of its globe-circling Clipper* service . . . and improved its comfort and luxury.

PAN AMERICAN

Breakfast in bed! Big, foam-soft berths are available on Pan American overseas flights to five continents. While you sleep, the miles fly by!

When you fly around the world by Pan American, you need spend as few as *five* days in actual travel! The rest of the time is yours for seeing the sights. Generous stopover privileges at no extra cost. Pan American offers you a choice of many different round-the-world routes . . . $1660.90 from New York.

Today, over half of all United States overseas passengers go *by air*. And more of them choose Pan American than any other airline!

Call your Travel Agent or Pan American.

*Trade-Mark, Reg. U. S. Pat. Off.

World's Most Experienced Airline

"A take-along 'must' for everyone travelling abroad," writes *James A. Michener*, author of "Tales of the South Pacific."

"Surely few more useful books on *how to* travel have ever been published. . . Wish I had thought of writing it myself!"

Lowell Thomas

PACKED WITH FACTS YOU'LL NEED

PAN AMERICAN WORLD AIRWAYS
DEPT. NH-G, P. O. BOX 1111,
New York 17, N. Y.

I enclose one dollar. Please send me immediately my postpaid copy of your 196-page, illustrated book, "NEW HORIZONS."

Name _____
(please print)

Street _____

City _____

Zone _____ *State* _____

ENVELOPE PACKAGE
200 ENVELOPES (3¾ x 6⅝—envelopes as in Standard Package only). They seal *easily*, quickly. Perfect for mailing checks, club notices, bulletins, etc. Printed.
$1.00

STANDARD PACKAGE
200 NOTE SHEETS (6 x 7) and 100 NEW, IMPROVED ENVELOPES. Ideal for informal notes and household business correspondence. All neatly printed.
$1.00

DELUXE PACKAGE
125 LETTER SHEETS (6⅞ x 10½) and 125 MATCHING ENVELOPES, all in *heavier* paper. A distinctive correspondence stationery. All neatly printed.
$2.00

PRINTED ENVELOPES

Do you pay by check? You'll find American Stationery envelopes a *grand convenience*. Each envelope is neatly printed in rich blue ink with your name and address. A great time-saver. A perfect safeguard for your mail—it can't go astray!

In the big, generous Envelope Package you get enough for *months* of ordinary use—200 quality rag content bond envelopes. (Same envelopes as in the Standard Package.) The price is an unbelievable $1.00!

Order in quantities as listed. No "split-package" orders accepted. Maximum printing—4 lines, 30 characters per line including punctuation and spacing. Remit with order. West of Denver, Colorado, and in U.S. possessions, add 20% to prices. (No foreign orders.) We pay the postage. *Satisfaction guaranteed.*

THE AMERICAN STATIONERY CO., 300 PARK AVE., PERU, IND.

THE FINE STATIONERY
IN THE PLAIN BOX

American Stationery

Look inside

then compare!

SEE WHY DU MONTS DO MORE

The **SHERBROOKE**
by **DU MONT**
19-inch tube; AM and FM radio; 3-speed automatic phono. Cabinet of fine mahogany veneers or blond finish. Styled by Herbert Rosengren.

You need not be an expert to see for yourself the reason for Du Mont's outstanding performance. This is television's most precise instrument, built with more tubes, extra-size parts, and a solid, orderly design that reflects expert engineering and painstaking craftsmanship.

Look at the Du Mont chassis. Compare it with others.
Then you will know why owning a Du Mont is full assurance of long years of satisfaction.

DU MONT

First with the finest in Television

Looking for picturesque ante-bellum homes and lovely old Southern gardens—historic battlefields, or hoping to re-discover the Mississippi River? Perhaps you prefer modern, up-to-date resorts along the Coast, dude ranches, or golf on championship courses, all available by modern, paved highways.

Whatever you're seeking, you can count on finding "something old and something new" in Mississippi. For "The Hospitality State" still retains all the charm and scenic beauty of the Old South, plus all the twentieth century assets to be found in any vacation state.

MAIL COUPON TODAY

NG-12-51

Mississippi Agricultural & Industrial Board
State Office Building—Jackson, Miss.

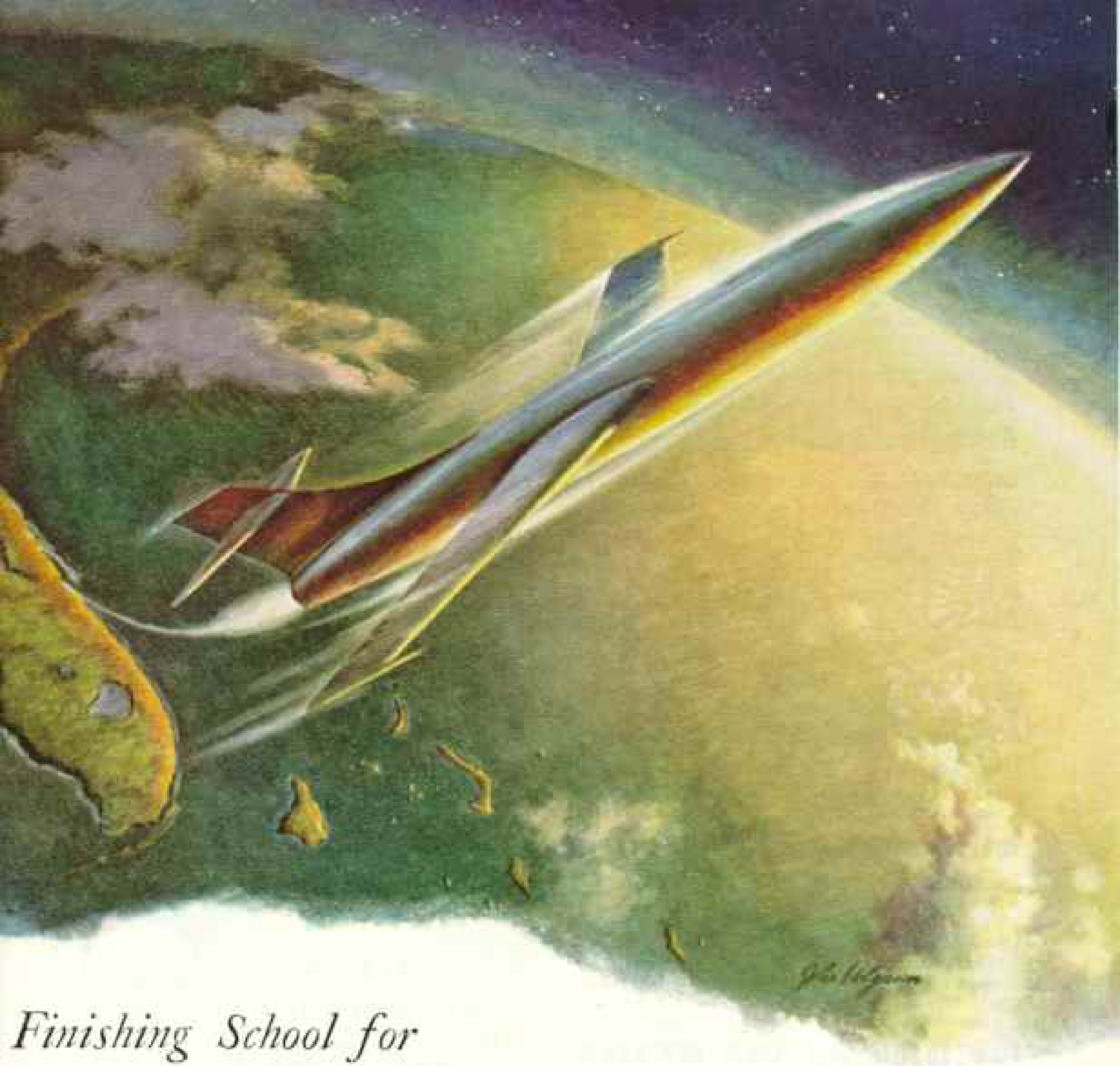
Please send me free vacation package on Mississippi.

Name _____

Address _____

City _____ Zone ____ State _____

Visit MISSISSIPPI...
"The Hospitality State"



Finishing School for

GUIDED MISSILES

The Air Force Missile Test Center, used by all our military services as a long-range proving ground, stretches thousands of miles from Florida, out over the Bahamas, into the South Atlantic.

A pilotless bomber roars away from its launching stand, picks up speed, zooms into the blue. Setting its course for a far-off target in the ocean, it rockets over a chain of tiny islands where men and machines check its flight, its behavior, the operation of its guidance and control systems. It's a vital part of our air power of the future—aeronautical research and development laying the foundation for continued U. S. air supremacy!

Operated by the USAF's Air Research and Development Command, the Missile Test Center is geared up to test the wide variety of missiles, rockets and pilotless aircraft vital to modern air power. It reached its full stature with the recent completion of down-range observation stations. And the dramatic B-61 pilotless bomber, the Matador, designed and produced by Martin as part of its diversified missiles program, was the first to use the completed range. THE GLENN L. MARTIN COMPANY, Baltimore 3, Maryland.

Martin AIRCRAFT

Builders of Dependable Aircraft Since 1909

For reasons of security, the missile shown here is an artist's conception—not a drawing of an existing weapon.

DEVELOPERS AND MANUFACTURERS OF: Navy P5M-1 Marlin seaplanes • Air Force B-57A Canberra night intruder bombers • Air Force B-61 Matador pilotless bombers • Navy P4M-1 Mercator patrol planes • Navy KDM-1 Flower target drones • Navy Viking high-altitude research rockets • Air Force XB-51 developmental tactical bomber • Martin airliners • Guided missiles • Electronic fire control & radar systems • **LEADERS IN** Building Air Power to Guard the Peace, Air Transport to Serve It.

San Diego is so different

It's the kind of Southern California you dream about!

Send Coupon for **FREE** literature

Come here this winter and enjoy the whole County.

It's warmer - the warmest winter coastal climate in the Southland.

There's much less rainfall than in the rest of Southern California.

La Jolla & Coronado, famous the world over for charm and loveliness, are part of your San Diego winter enjoyment.

Two landlocked bays, both encircled by the city, offer winter water sports, with miles of ocean and beaches if you prefer.

Balmy, clear air is relaxing, invigorating. There's no smog.

Sailing - deep sea fishing and all outdoor sports are "year 'round" here.

New desert resorts beckon you to sun 'n' fun in nearby Borrego. A drive thru pine clad mountains you'll long remember.

OLD MEXICO is just 30 minutes South, with all the fascination of a foreign land. No passport needed by American citizens. No currency exchange.

Borrego is the new, unspoiled desert fun area . . . in San Diego County.

Jai Alai and Sunday Racing at Caliente offer new thrills.

San Diego WHERE CALIFORNIA BEGAN

Fill in and mail to: **SAN DIEGO-CALIFORNIA CLUB**
499 W. Broadway, Room 189, San Diego 1, California
Please mail me without cost or obligation your descriptive folder which will help to make my California trip more interesting.

NAME _____

ADDRESS _____

CITY _____ ZONE ___ STATE _____

I will come by ☐ Auto . . . ☐ Train . . . ☐ Air . . . ☐ Bus

Year in and year out you'll do well with the HARTFORD

— all forms of fire, marine and casualty insurance and fidelity and surety bonds.

See your Hartford agent or insurance broker

HARTFORD FIRE INSURANCE COMPANY

HARTFORD ACCIDENT AND INDEMNITY COMPANY

HARTFORD LIVE STOCK INSURANCE COMPANY

HARTFORD 15, CONNECTICUT

Take a Christmas vacation in

PHOENIX

and the VALLEY of the SUN*

Skip the chills and sniffles this year. Greet Santa from a sun-drenched swimming pool. Golf, ride, play, loaf in shirt-sleeved comfort. See 16 national monuments. Visit old Mexico. Come now!

*Clearest, driest, sunniest U. S. resort area, 1895 - 1951, U. S. Weather Bureau.

VALLEY OF THE SUN CLUB, DEPT. G 12
PHOENIX, ARIZONA

Please send free NEW colorful folders.

NAME _____
(please print)

ADDRESS _____

CITY _____ STATE _____

I am interested in hotel ☐ resort ☐ motel ☐ ranch ☐ trailer court ☐ apartment ☐

Did you hear what the Cowboy said about the "Golden State"?

We think you'll enjoy our *"Golden State,"* especially if you're an experienced traveler. We have many friends who repeat, winter after winter, "chasing the sun Southwest" on this smooth, extra-fare S.P.-Rock Island streamliner. It's convenient. Takes you via El Paso and Southern Arizona's winter resorts to Palm Springs, Los Angeles.

She's been re-streamlined, too, from stem to stern. We've issued a folder to celebrate the event and would like to send it to you. Helps you choose your accommodations, whether Pullman (Drawing rooms, Compartments, Bedrooms, Roomettes) or Chair Car (economical; Coffee Shop).

By the way, the *"Golden State"* is extra fast, too—44¼ pleasant hours, Chicago-Los Angeles or vice versa. Fine connecting streamliners. Perhaps you'd like to try *another* great S.P. streamliner on *another* great scenic S.P. route, going home. That way you see twice as much, usually for no extra rail fare. The little map shows how.

Why don't you plan on the *"Golden State"* for this winter or next summer? And meantime, let us send you that folder?

"GOLDEN STATE," *Chicago-Los Angeles via El Paso, Douglas, Bisbee, Tucson, Phoenix, Palm Springs. 44¼ hours. Through Pullmans, Minneapolis and St. Louis to Los Angeles. Through Chair Car, Minneapolis-Los Angeles. Connecting service to San Diego.*

SOUTHERN PACIFIC LINES **S·P** AMERICA'S MOST MODERN TRAINS

Leroy C. Ioas, Southern Pacific, Dept. 151
310 So. Michigan Ave., Chicago 4

Kindly send me, free, "Your Vacation in Arizona" and "Your Trip on S.P.'s New Golden State."

NAME_____

ADDRESS_____

CITY_____ STATE_____

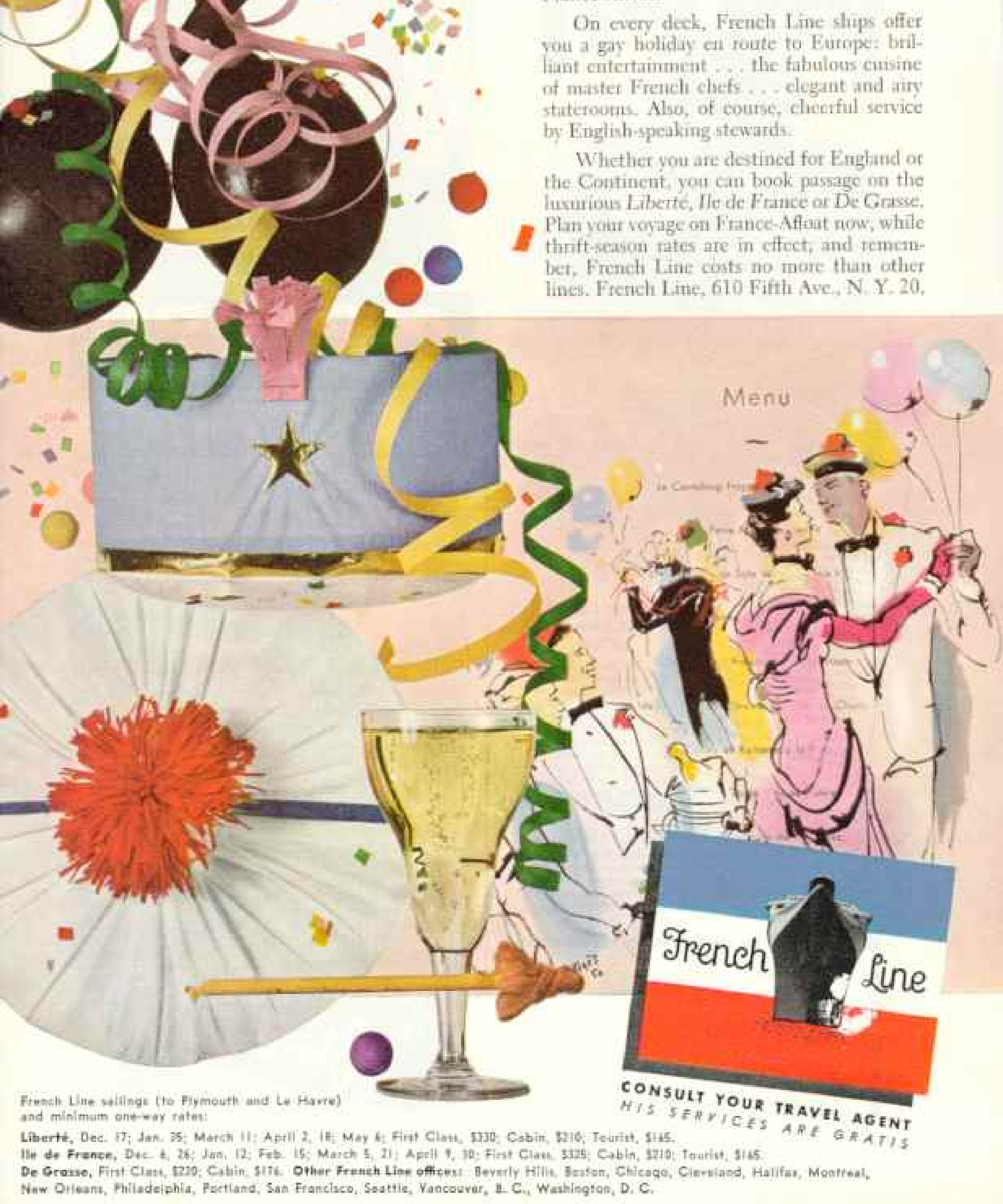
French Line

YOUR GAY ENTRÉE TO EUROPE

Paris on the Atlantic? *Certainement!* For you're in Paris the moment you step aboard France-Afloat.

On every deck, French Line ships offer you a gay holiday en route to Europe: brilliant entertainment . . . the fabulous cuisine of master French chefs . . . elegant and airy staterooms. Also, of course, cheerful service by English-speaking stewards.

Whether you are destined for England or the Continent, you can book passage on the luxurious *Liberté*, *Ile de France* or *De Grasse*. Plan your voyage on France-Afloat now, while thrift-season rates are in effect; and remember, French Line costs no more than other lines. French Line, 610 Fifth Ave., N. Y. 20.



French Line sailings (to Plymouth and Le Havre) and minimum one-way rates:

Liberté, Dec. 17; Jan. 25; March 11; April 2, 18; May 6; First Class, $330; Cabin, $210; Tourist, $165.
Ile de France, Dec. 6, 26; Jan. 12; Feb. 15; March 5, 21; April 9, 30; First Class, $325; Cabin, $210; Tourist, $165.
De Grasse, First Class, $220; Cabin, $176. **Other French Line offices:** Beverly Hills, Boston, Chicago, Cleveland, Halifax, Montreal, New Orleans, Philadelphia, Portland, San Francisco, Seattle, Vancouver, B. C., Washington, D. C.

Unforgettable days await you in . . .

Mexico

At your doorstep extends this land filled with vestiges of once great civilizations which flourished centuries before the Pilgrims set foot on Plymouth Rock.

Beautiful Spas and resorts invite to perfect relaxation amidst exotic, tropical surroundings.

Everywhere ideal weather, most every day a colorful fiesta and wherever you go, you will find modern comforts and conveniences.

And travel is so very inexpensive in México.

your travel agent will tell you!

DIRECCION GENERAL DE TURISMO,

Av. Juarez 89, Mexico, D. F.

New York . . . . . 630 Fifth Avenue, Suite 801,
Chicago . . . . . 333 North Michigan Avenue,
Los Angeles . . . . 511 West Sixth Street.

THE STEREO Realist

(the camera that puts 3rd dimension on film)

is preferred by people who know picture taking and picture making

Edgar Bergen says: *"Charlie's no dummy when it comes to cameras. Both of us prefer Stereo-REALIST—the perfect camera for true-to-life realism, brilliant color, and breath-taking depth."*

Taking pictures with a REALIST camera is a thrilling experience — for the expert as well as the novice. The REALIST is the one fine camera that shows each scene as it really is . . . in amazingly realistic third-dimension . . . just as you see it with your own two eyes. Your pictures are so real they almost live and breathe — each one a masterpiece in thrilling natural color.

You'll find the REALIST pleasantly simple to operate while producing the finest pictures you've ever seen. It's economical, too, because it gets the most out of every roll of 35 mm film — 16 stereo pairs on a 20-exposure roll, 29 on a 36-exposure roll. You'll want a REALIST for yourself —and so will the people at the top of your Christmas list. It's the finest present money can buy.

If you haven't had the thrill of seeing REALIST pictures, visit your camera dealer. He'll be glad to show some to you. For his name and a copy of the REALIST catalog write: DAVID WHITE COMPANY, 355 W. Court St., Milwaukee 12, Wisconsin.

Priced according to Fair Trade Practices. Camera and Viewer $182.22 (Tax Inc.)

STEREO Realist

THE CAMERA THAT SEES THE SAME AS YOU

Stereo-REALIST Cameras, Projectors, Viewers and Accessories are products of the David White Co., Milwaukee.

MOST welcome...Christmas Morn'

Of all gifts for the camera owner, none so welcome as a WESTON Exposure Meter. For advanced photographers, choose the Weston MASTER . . . for casual photographers the simplified, budget-priced CADET. But to avoid last-minute disappointment, make your selection now, before heavy Holiday demand exhausts supplies. Don't miss this opportunity to give *the gift most welcome Christmas morning.* At all dealers.

WESTON EXPOSURE METERS

The Meters Most Photographers Use

The Sunland's colorful, friendly, captivating. Warm, dry, brilliant days; exhilarating nights assure fullest enjoyment of your vacation plans. Loaf luxuriously in healthful sunshine or play as much as you wish. Always something doin', new scenic and historic wonders to see.... Carlsbad Caverns, White Sands, ancient missions, Big Bend, deserts, mountains, glamorous Old West. Go abroad for 2c to picturesque Old Mexico, drive the *new* all-paved Central Highway to romantic Mexico City.

EL PASO Sunland Club, 300 San Francisco St., EL PASO, TEXAS

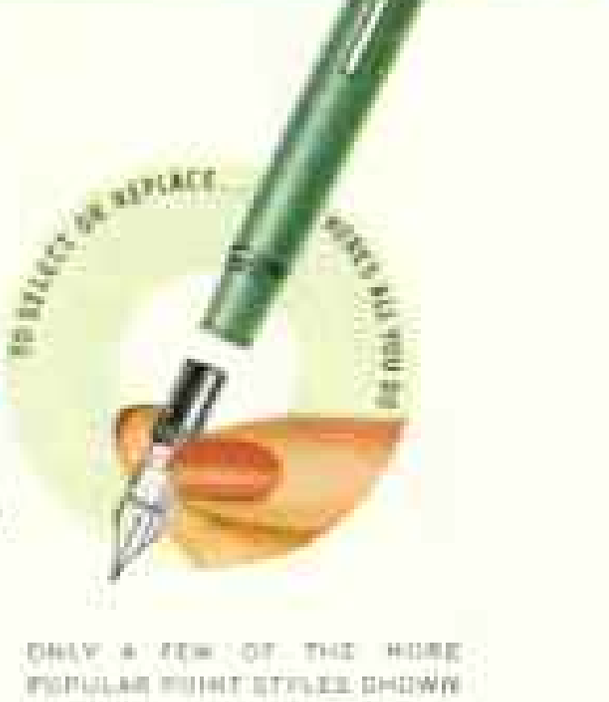
Please send FREE folder about EL PASO Sunland ☐ *Mexico* ☐ *to*

Name_____

Address_____

City_____ Zo___ St_____

For Christmas give an Esterbrook with the point you know they're sure to like



What better way to wish your friends a Merry Christmas than to give them an Esterbrook Fountain Pen—personalized with the right point for the way *they* write!

From the world's largest variety of point styles, choose points to match their kinds of writing, their particular writing jobs. All points instantly renewable in case of damage.

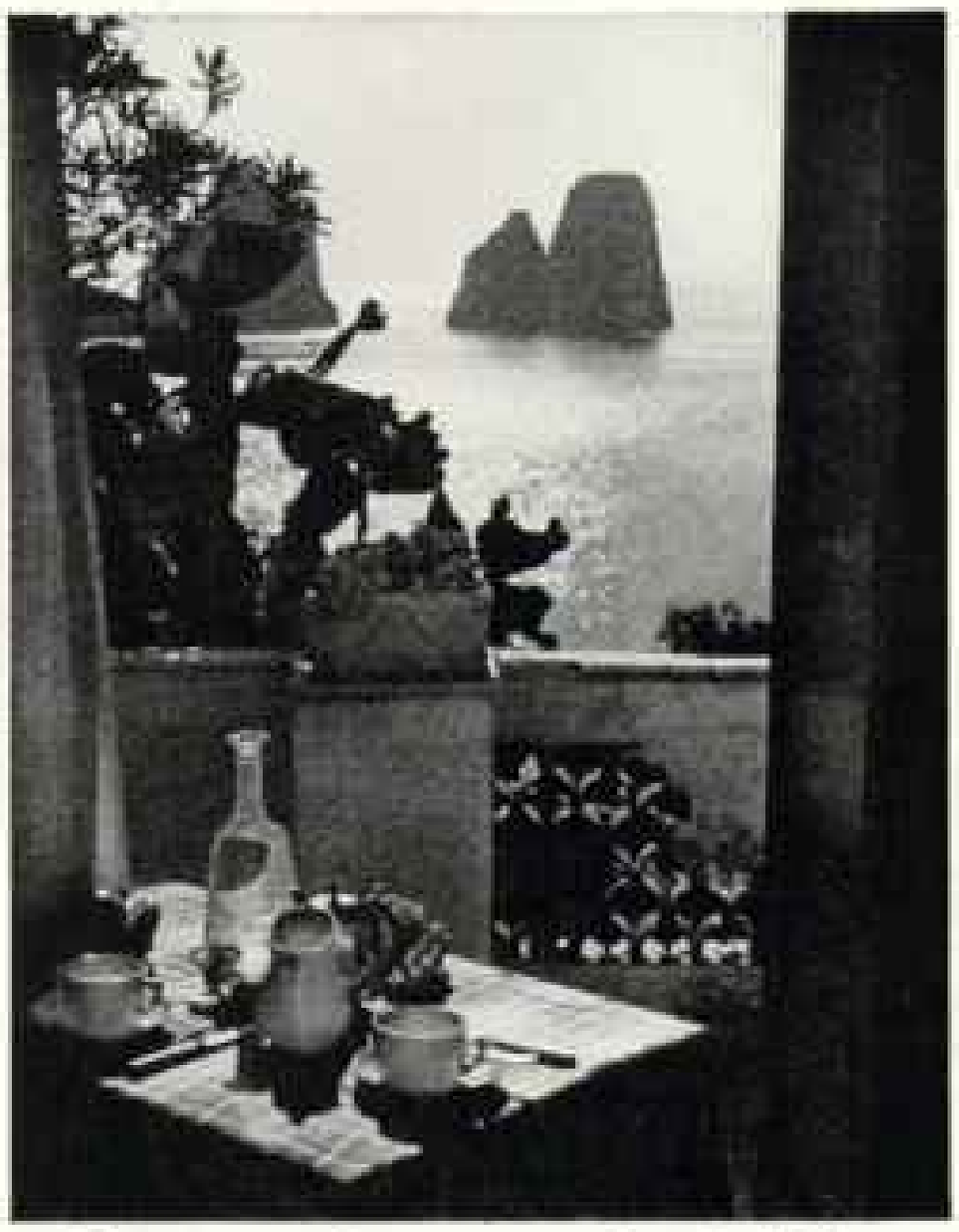
MATCH THE PEN WITH A PUSH-PENCIL and make your gift a complete pocket set. Pencil holds two feet of lead, writes for months without refilling. Choice of either standard or thin lead models.

DIP-LESS 444 DESK PEN SET with full choice of famous Esterbrook Renew-Points. "Ink-Lock" base holds 40 times more ink than ordinary fountain pen desk sets. Fill it once, write for months.

Esterbrook®

FOUNTAIN PEN

ESTERBROOK—AMERICA'S PEN NAME SINCE 1858



for your winter or spring holiday

Italy

a glorious, sun-filled world!

Something there is that makes a winter or spring visit to Italy a delightfully rewarding experience.

Perhaps it's the brilliant contrast of a shining, new Italy set midst scenes that nostalgically reflect the Renaissance past . . . perhaps it's a sudden, unexpected vista of the blue Mediterranean . . . perhaps the hushed timelessness of Roman ruins in the Campagna. Or . . . it may be the enveloping warmth and friendliness of the Italian people.

On the practical side, you're in for a pleasant surprise, too, when you sample Italy's food, hotels, transportation and dollar values.

Yes, in Italy you'll find everything under the sun to enhance your winter or spring holiday this year. See your Travel Agent now and take advantage of the transatlantic "Thrift Season" rates.

ITALIAN STATE TOURIST OFFICE—E.N.I.T.
21 East 51st Street, New York 22, N. Y.

A *Thrilling* GIFT
for all Camera Owners

the new
RADIANT SCREENS
with more Reflecting power

Movies or Slides
Black and White or Color

Makes all projector showings *twice as enjoyable*—gives them real "theatre quality." "Million Mirror" screen reflects light *powerfully*—makes your pictures much brighter, clearer and more brilliant. Portable, sets up in a flash!
Ask your dealer for demonstration. Write for *free sample* of "Million Mirror" fabric.

A better Show always with

RADIANT

Radiant Mfg. Corp., 1243 So. Talman, Chicago 8, Ill.

SUN for YOU

and a Western Howdy Do!

MESA
ARIZONA (Next Door to Phoenix)

Breathe dry, bracing desert air. Scent fresh green fields and citrus fragrance. Feast your eyes on date-laden palms, rugged mountains, enchanting desert scenery. Ride horses, thrill to rodeos and Indian dances, enjoy desert picnics and chuckwagon dinners. Relax or play—**do what you please in the Mesa Area.** Welcome to warmth, grandeur, and genuine Western hospitality. You will be GLAD you came to MESA!

Mail Coupon for FREE FOLDER

Mesa Chamber of Commerce
Bldg. (N 20)
Mesa, Arizona

Send color folder and other free literature on the Scenic Mesa Area.

NAME_____

ADDRESS_____

CITY_____ STATE_____

Zenith Announces Spectacular TV Invention...

The ordinary TV picture sharp only in the center, blurred at the edges.

Zenith TV with new full-focus picture . . . perfect top to bottom, side to side.

New "ELECTRONEX" Tube Brings World's Finest

FULL-FOCUS PICTURE

Powered by New Zenith Wonder-Chassis with Connection for Auxiliary Color Set, Provision for UHF and New Distance-Reception

TV science has long dreamed of a tube that would give a full-focus picture. This dream has been realized in this great achievement brought to you by Zenith . . . the new "Electronex" Tube with built-in Radionic® lens to compensate for line voltage variations that impair performance of ordinary sets. At last, the nuisance of blur, distortion and edge-fading is over! Zenith's picture is perfect top to bottom, side to side.

This spectacular invention is powered by Zenith's new Wonder-Chassis—with feature after feature to protect your TV investment!

Only Zenith Quality TV Has All These Features!

New Zenith "Wordsworth" TV Console. 17-inch (148 sq. in.) "Electronex" Tube screen. Sheraton influence in cabinet of Mahogany veneers and selected hardwoods.

New Zenith "Walpole" Table TV. 17-inch (146 sq. in.) "Electronex" Tube screen. Beautiful cabinet of Mahogany color Pyroxylin, and Mahogany finish woods.

Connection for Auxiliary Color Set! Provision for presently authorized color with plug-in for auxiliary Zenith color receiver.

Provision for UHF! Provision for simple insertion of tuner strips (takes 15 minutes) to receive coming new-type stations without converter.

Clearest Picture Known! *"Electronex" Picture Tube* automatically assures full-focus picture over entire viewing area. Stays in focus regardless of variations in line voltage.

New Distance-Reception! New—*Zenith exclusive*—"Fringe Lock" produces and permanently holds distant pictures even seen in weak or outlying signal areas. Set it once for best reception and forget it.

Minimum Reflection! Special tilted face plate and wide angle frame cut down reflection and assure a perfect picture from anywhere in the room.

Eye-comfort Viewing! The famous Glare-Ban Blankide® Picture Tube brings out richness of contrast in fully-lighted rooms as eye doctors say TV should be viewed!

Simple Automatic Tuning. Zenith's famous one-knob automatic Turret Tuner brings in perfect quality pictures and sound at one twist. No multiple knobs to fuss with.

Let Your Own Eyes Decide!
See your Zenith dealer.
Prove to yourself Zenith is the finest TV your money can buy—bar none!

©1181

ZENITH RADIO and TELEVISION

Zenith Radio Corporation, Chicago 39, Illinois
Over 30 Years of "Know-How" in Radionics® Exclusively • Also Makers of Fine Hearing Aids

THE ALCOHOLIC

Alcoholism is the abnormal and uncontrollable use of alcohol to an extent seriously detrimental to physical and mental health. This condition is now recognized as an important medical and public health problem.

The National Committee on Alcoholism estimates that there are about 65 million people in our country who drink alcoholic beverages at least occasionally. Only 4 million of them, however, have found that the use of alcohol constitutes a problem in their lives.

The National Committee also reports that about 750,000 of these users of alcohol have drunk uncontrollably to such an extent as to have seriously impaired their health. Physicians label this last group as true chronic alcoholics.

Fortunately, medical, health, welfare and religious agencies, industrial and other employers have taken a practical, realistic view toward alcoholism. This enlightened approach offers great hope to all chronic alcoholics—as well as to those who risk this condition.

1. What is the cause of alcoholism?

Authorities have found no *one* cause for this condition. Research shows, however, that alcoholics are usually people who do not seem able to face life in a mature manner because of some underlying mental or emotional condition which the alcoholic himself may not clearly recognize. They seem to seek escape by excessive drinking—and eventually they become dependent on alcohol just to go on living.

Some authorities also believe that an alcoholic's body chemistry differs from that of normal persons, and that this difference results in an unnatural appetite for alcohol. Excessive drinking, however, is in all cases a *symptom*. Often the symptom can be removed, but it is very apt to return unless the underlying trouble is eliminated.

2. How can medical science help the alcoholic?

Although there is no specific remedy for alcoholism, much can be done to help a person stop drinking completely. The success of any form of treatment, however, depends upon the alcoholic himself who must absolutely want to break the habit. Once he has stopped, most authorities agree that the real alcoholic cannot drink again with safety.

Psychotherapy may be used to help the patient recognize his problems and how to deal with them without the use of alcohol. Certain medicines, which should be used only under the guidance of a doctor, are also available. These medicines may help to wean the patient away from drink.

It is important, too, for the alcoholic to re-establish a routine of healthful living through proper diet, sufficient relaxation and sleep, and attention to other health measures that are usually disrupted by excessive drinking. In some cases, occupational guidance may be appropriate.

3. How can everyone help the alcoholic?

The general public—all of us—can help overcome the prejudices that have long existed about alcoholics by looking upon chronic drinkers as persons subject to serious physical and mental handicaps.

We must also help them to obtain the type of treatment that they need. This treatment may be individual or group therapy given by the doctor, or mutual aid through organizations such as Alcoholics Anonymous.

We can also support and encourage the development of programs for the *scientific* study and control of this problem. In these ways, we can all do our part toward restoring thousands of men and women to healthy, happy, useful lives. Additional information on alcoholism is in Metropolitan's free booklet, 1251N, "The Alcoholic."

NO CITY LIMITS Most recent U. S. Census figures contained one significant change. This was the extraordinary increase in population of areas immediately surrounding the cities.

If you travel the highways, you may see this growth in progress. It is apparent not only in wider-spreading suburbs but more significantly in the individual homes, each with its own plot of lawn and garden, which are strung along the roads radiating in every direction.

This freedom of living, blending city with country, is a direct result of modern facilities of transportation. And The Budd Company, which has contributed so materially to the development of transportation vehicles, both rail and motor car, is in itself a striking example of their use. The Budd plants in Philadelphia, Detroit and Gary are surrounded by parking room for 5,068 private cars. Many of the workmen in these plants travel daily distances of twenty, thirty and even forty miles from their rural homes.

Budd

PIONEERS IN BETTER TRANSPORTATION

. . . talk about being *good* !

For taking color pictures . . .

Kodak Signet 35 Camera—$95—*Kodak's newest color camera with Kodak's finest lens.* Famed as "tops" in many photographic fields, the Kodak Ektar Lens (*f*/3.5) is now available in a moderately priced 35mm. camera with modern luxury features. Flasholder with guard, $12.35.

Kodak Pony 135 Camera—$36.75—*More and more folks are asking for Kodak's budget-model color camera.* And they're getting the most gorgeous color slides you could ever want. They project beautifully . . . or make wonderful big color prints. Flasholder with guard, $12.35.

Kodak Christmas Gifts that open up the royal road to *gorgeous color pictures*

For showing color pictures . . .

Kodaslide Table Viewer 4X—$49.50—*Here's where all good color slides hope to end up . . . in a modern Kodaslide Table Viewer.* 4X model combines projector and screen in one compact unit. Shows color slides, enlarged more than four times, crisp and brilliant even in a fully lighted room.

Kodaslide Merit Projector—$24.50—*Your color fan is sure to go for this Kodaslide Projector.* Shows color slides crisply and brilliantly—as big as life and just as beautiful. Has new-type jiggleproof slide feeding.

Prices are subject to change without notice and include Federal Tax applicable when this advertisement was released for publication.

EASTMAN KODAK COMPANY, Rochester 4, N.Y.

Kodak
TRADE-MARK

120 Golf Courses in the state.

Boating, from canoe to yacht.

Ringling Museum, at Sarasota.

Fishing in lakes, ocean or gulf.

Pick tree-ripened oranges.

Florida

Best Place under the Sun

for Rest, Sport, or Fun

Dance and dine under the stars.

Sports to play or watch

Year 'round living at its best.

Come let the magic of Florida sunshine put new sparkle in your eye, new spring in your step, new color in your cheeks.

Whether you come for a short vacation, or join the thousands who stay all winter, you'll find wonderful accommodations, fine food, excellent schools and churches.

Whatever you seek...rest and tranquility in a peaceful little spot...glamour, excitement, and luxury living...fishing, golfing, tennis, boating, or spectator sport...you'll find it in Florida.

You can be in Florida in a matter of hours. Plan now to see *all of Florida* and stay all winter.

Photo illustrations by Florida State News Bureau

FREE! 36 Page booklet in full color... Mail this coupon now!

STATE OF FLORIDA,
1102-A COMMISSION BUILDING, TALLAHASSEE.

Please send new, colorful booklet: "Florida, All-Year Vacation Land."

Name_____

Address_____

City_____ Zone____ State____

PLEASE FILL IN BLANK BELOW, DETACH, AND MAIL TO THE SECRETARY

Recommendation for Membership

FOR THE YEAR 1952 IN THE

(The list for 1951 is filled)

NATIONAL GEOGRAPHIC SOCIETY

* *The Membership Dues, Which Are for the Calendar Year, Include Subscription to the National Geographic Magazine*

To the Secretary, National Geographic Society,
Sixteenth and M Streets Northwest, Washington 6, D. C.: _____ *1951*

I nominate _____
PRINT NAME OF NOMINEE

Occupation _____
(This information is important for the records)

Address _____
PRINT ADDRESS OF NOMINEE

_____ *for membership in The Society.*

Name of nominating member _____
PLEASE PRINT

Address _____

* DUES: Annual membership in United States, $5.00; Canada, $5.50; British Isles, $5.00; elsewhere abroad, $6.00. Life Membership, $150.00 U. S. funds. Remittances should be payable to National Geographic Society. Remittances from outside of continental United States and Canada should be made by New York draft or international money order.

12-51

Now, with her Zenith Hearing Aid, Mother can **HEAR**

as well as Dad and Sonny!

ZENITH ROYAL $75

Tiny, light-weight, beautiful golden finish. Complete, ready to wear. See also the extra-powerful Zenith "Super-Royal." Same fine features. Same low price.

Give the Gift of Hearing

ONLY ZENITH HEARING AIDS

GIVE YOU ALL THESE QUALITY FEATURES

Exclusive, New, Patented Permaphone—assures excellent performance even under extreme heat, humidity.

Reserve Battery Switch—insures continuous hearing in event of "A" battery failure.

4-Way Finger Touch Tone Control—you can emphasize high, medium, low or full range of tones covered by the instrument.

Fingertip Volume Control—instant variation of volume as needed.

The Royalty of Hearing

By Makers of World-Famous Zenith Radio, Television and FM Sets.

A Zenith Hearing Aid changed mother's life. It brought her from a world of half-heard sounds to full enjoyment of family activities. Thousands with impaired hearing, even many with *severe* hearing loss, find a Zenith Aid their means to full participation in home life, church and social activities, school and business. And these enlightened people know the wearing of a Zenith Hearing Aid is as acceptable as the wearing of glasses.

Zenith says—hear better or pay nothing! We believe no hearing aid need sell for more than $75. Here is Zenith's unconditional guarantee of quality: "If any $200 aid in your opinion, in any way outperforms a $75 Zenith, YOUR MONEY BACK (under our unconditional 10-day return privilege). You are the sole judge." Zenith Hearing Aid dealers in hundreds of cities, coast-to-coast join in this offer. Consult your classified telephone directory for name of nearest Zenith Hearing Aid dealer.

Bone Conduction Devices available at moderate extra cost.

Look only to your Doctor for advice on your ears and hearing.

Clip and Mail Today!

THIS FREE BOOK MAY BE WORTH $100.00 OR MORE TO YOU

Zenith Radio Corporation
Hearing Aid Division, Dept. 1264
5801 Dickens Ave., Chicago 39, Ill.

Gentlemen: Please send me your free 24-page book that tells the whole truth about hearing aids, true and false claims, and how to buy correctly. I understand it will arrive in plain wrapper and in no way obligates me.

Name _____
(please print)

Address _____

City _____ Zone _____ State _____

Telephone Folks Will Play Santa for Thousands of Kids

As you read this, telephone operators all over the country are dressing thousands of dolls for distribution to children's homes and hospitals at Christmas.

Down in Texas, other telephone people are packing gay gift boxes for remote farm families. On December 24, the pilot who patrols Long Distance cables across the lonely plains will drop them by parachute and wave a friendly "Merry Christmas to All" by waggling the wings of his plane.

Throughout the Bell System, thousands of other telephone men and women are collecting food, candy, toys and dollars for those less fortunate than themselves.

It's a long-time telephone tradition — and a rather natural one. The spirit of service and the spirit of Christmas are pretty close together. And telephone folks try to be good citizens *all* year 'round.

BELL TELEPHONE SYSTEM

We squeezed first . . . and

NOW IT'S YOUR TURN. Pick up one of those new pliant, unbreakable plastic bottles. Squeeze it. Feel how it gives under your hand, then see how it comes right back for more.

That's polyethylene (just say POLLY-ETHEL-EEN), one of the exciting new miracle plastics produced by the people of Union Carbide.

But before you squeezed it, they squeezed ethylene gas under terrific pressure and carefully controlled conditions. Result: the molecules of gas were *permanently* rearranged into long lines—one of the marvels of modern chemistry. And then out came this tough, flexible plastic utterly unlike any other material—natural or man-made.

Why do you find the people of Union Carbide leading in the development of polyethylene?

Because working with tremendous pressures, high vacuum and extremes of heat and cold is part of their everyday jobs. By the use and control of these forces they supply the world with a wide variety of plastics and the raw materials from which a multitude of synthetic fibres are made. They also make hundreds of other basic materials essential to modern science and industry.

Perhaps your business could profit by the use of some of these materials. Why not ask us about them?

FREE: *Learn more about the interesting things you use every day. Write for the 1951 edition of the booklet "Products and Processes" which tells how science and industry use the* ALLOYS, CARBONS, CHEMICALS, GASES, *and* PLASTICS *made by Union Carbide. Ask for Booklet A.*

UNION CARBIDE
AND CARBON CORPORATION
30 EAST 42ND STREET NEW YORK 17, N. Y.

UCC's Trade-marked Products of Alloys, Carbons, Chemicals, Gases, and Plastics include

SYNTHETIC ORGANIC CHEMICALS • LINDE Oxygen • BAKELITE, KRENE, and VINYLITE Plastics
PREST-O-LITE Acetylene • PYROFAX Gas • NATIONAL Carbons • EVEREADY Flashlights and Batteries • ACHESON Electrodes
PRESTONE and TREK Anti-Freezes • ELECTROMET Alloys and Metals • HAYNES STELLITE Alloys