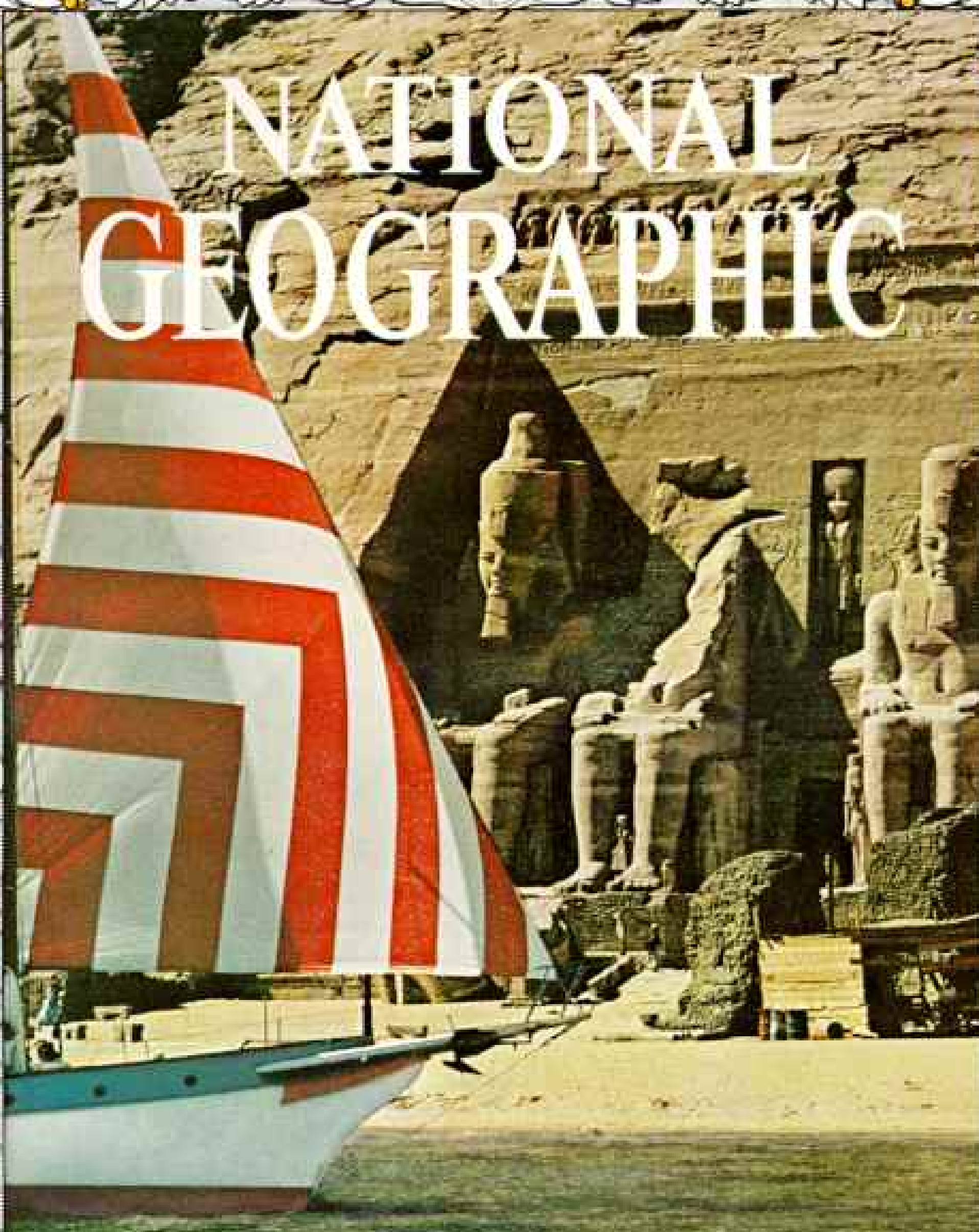


VOL. 127, NO. 5

MAY, 1965

# NATIONAL GEOGRAPHIC



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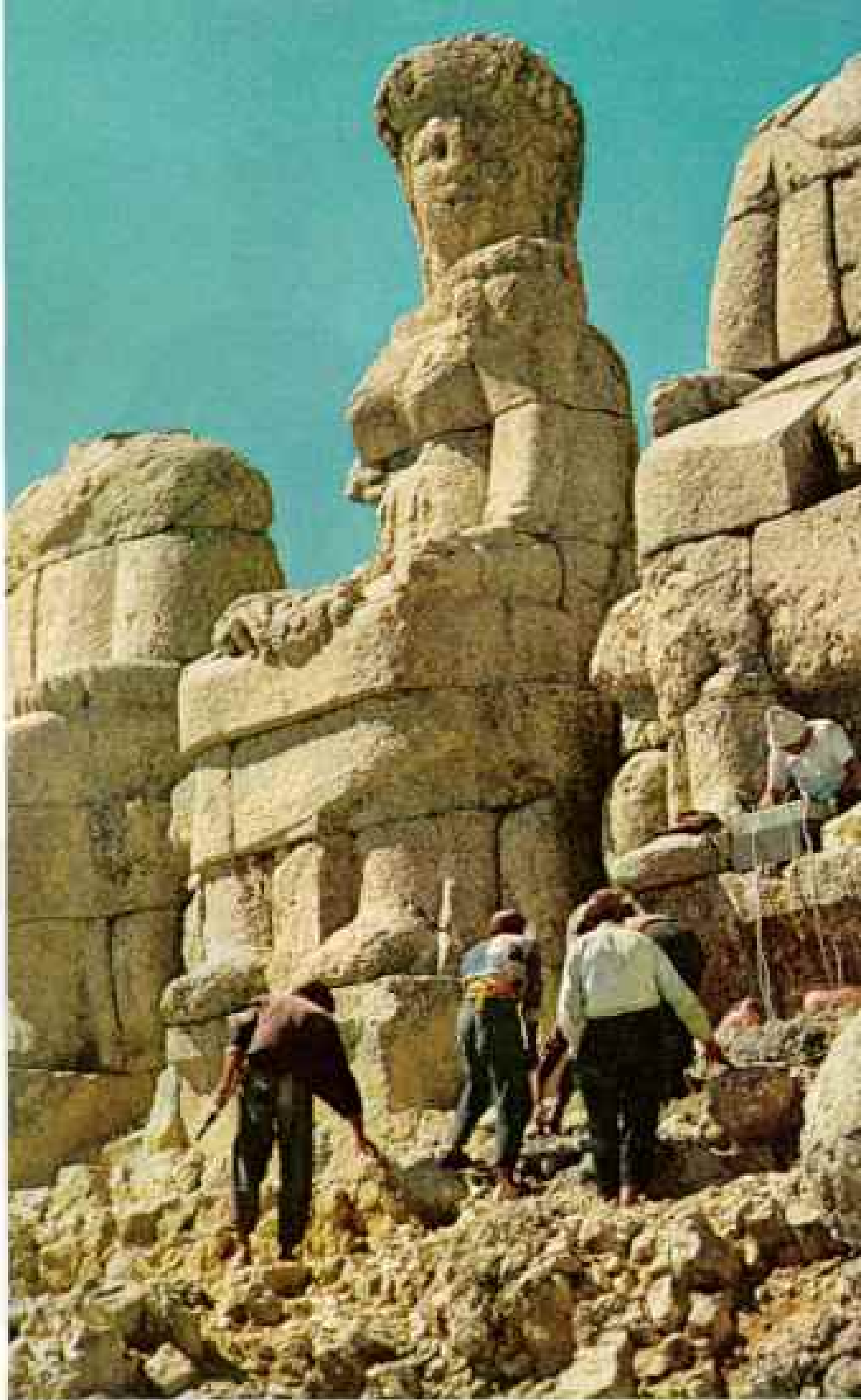
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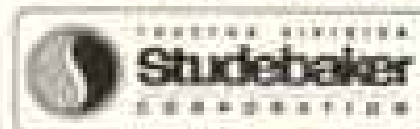


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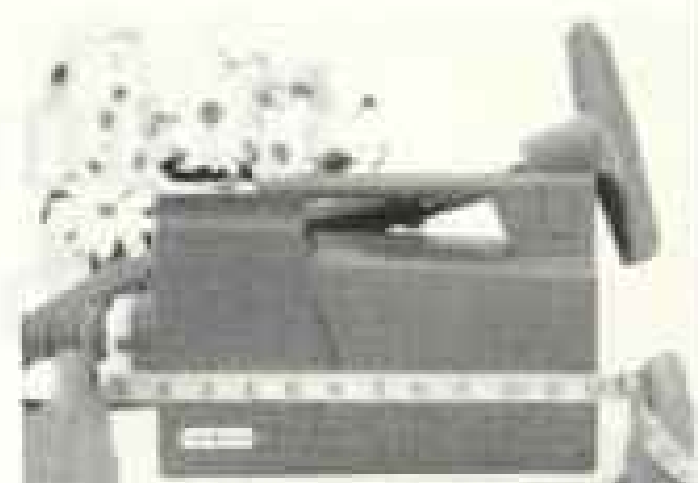


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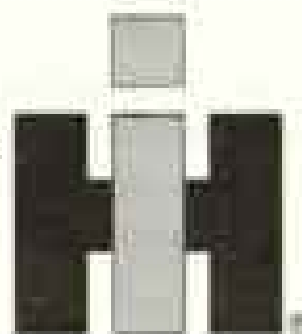


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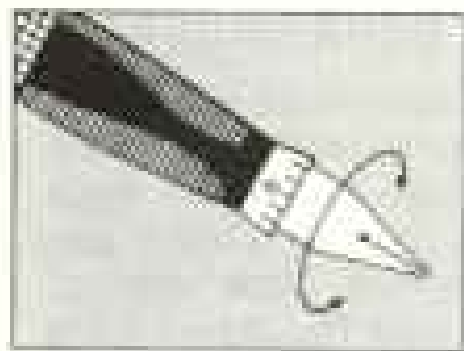


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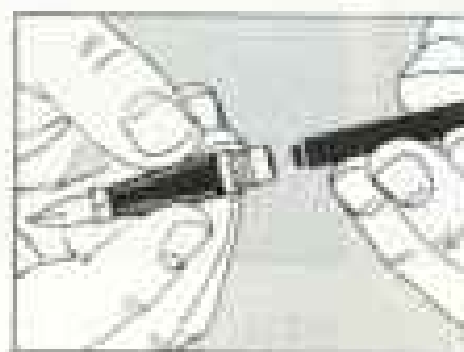
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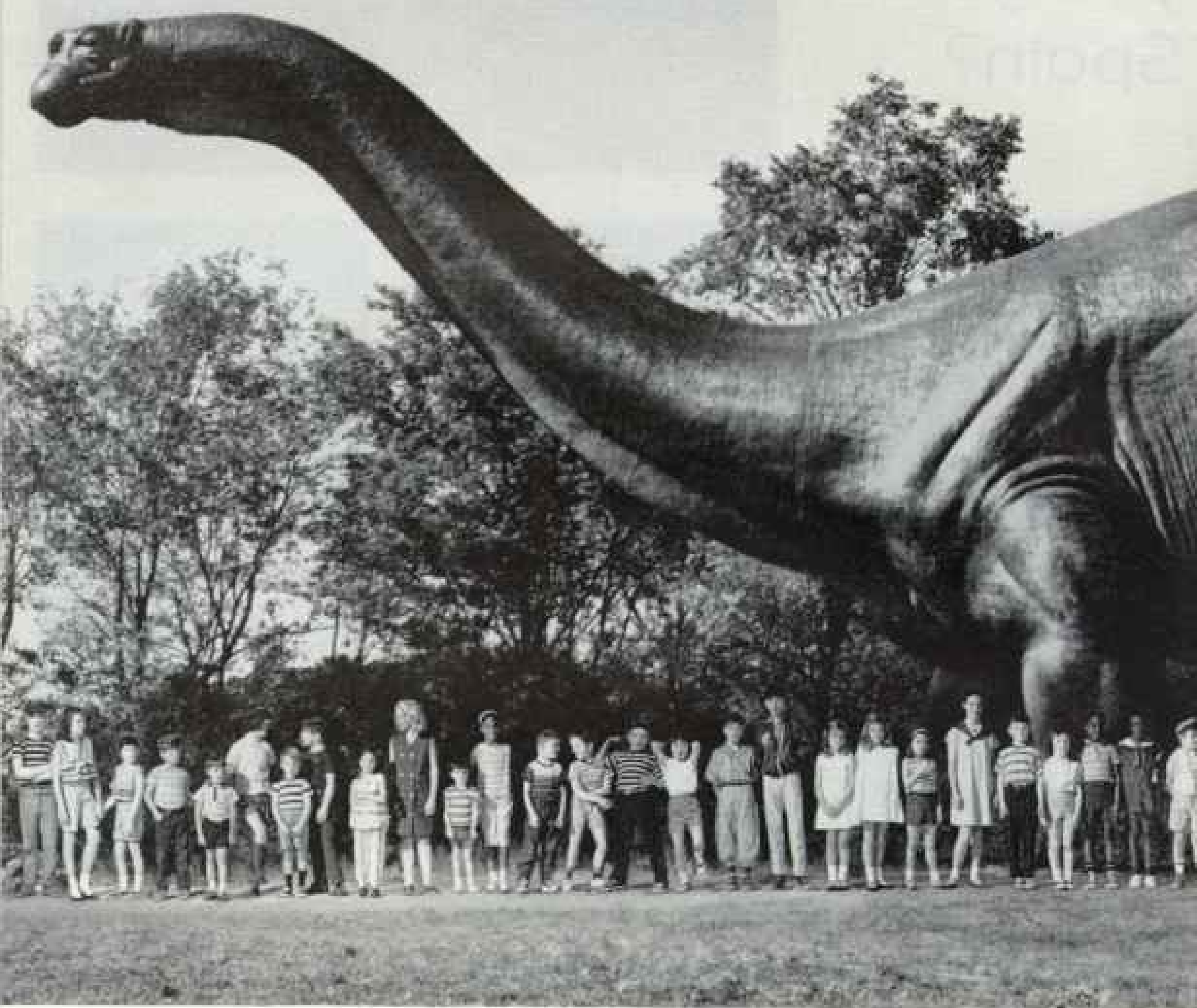
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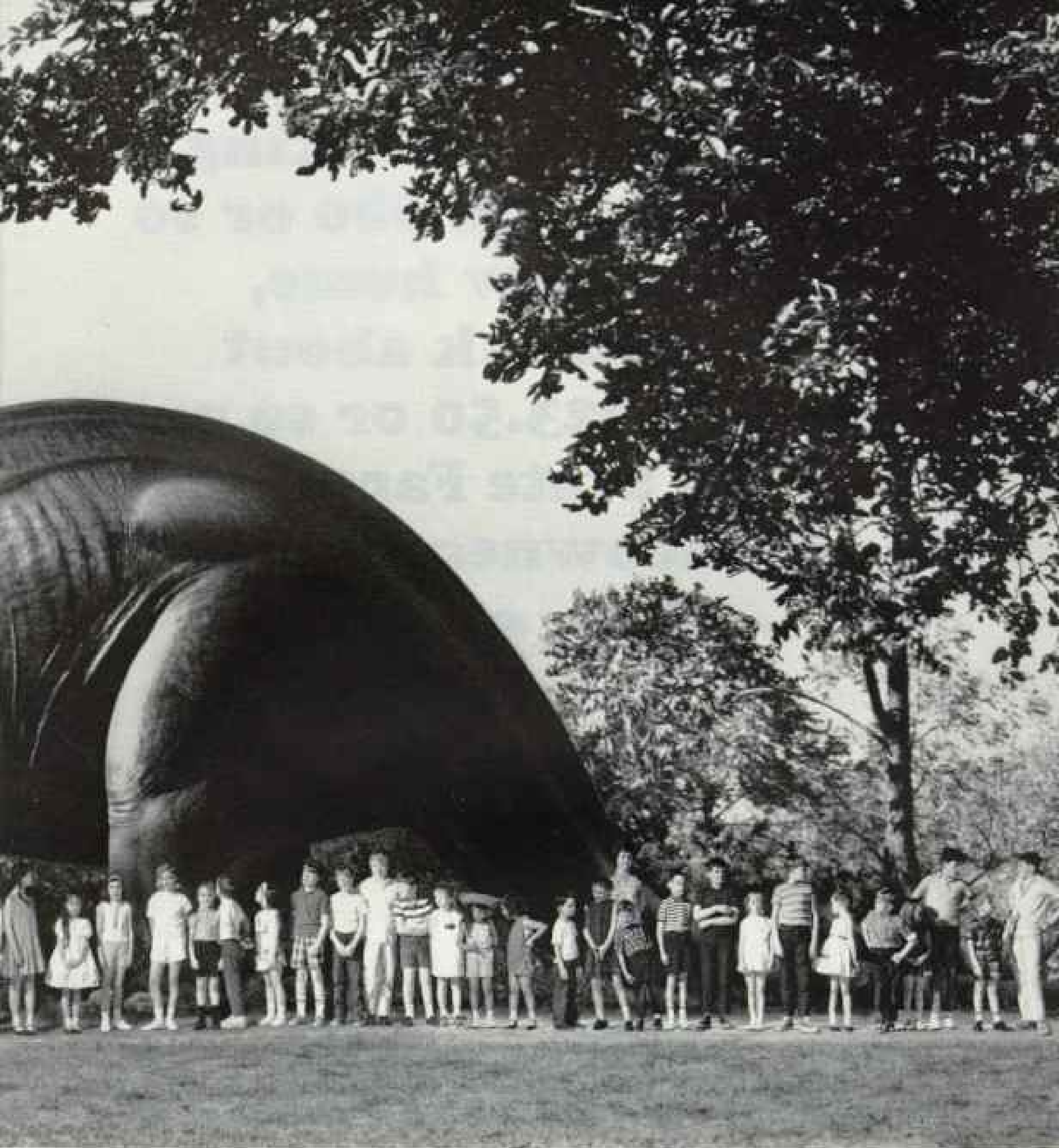
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**Joi de vivre**—the warm, gay, elegant ambiance of France. Dancing, music, new friends. Even doing nothing at all becomes a fine art!

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\*Based on 1/2 round-trip off-season Tourist fare to Southampton—even less with 15% or 25% reduction excursion rates.





The Hammond L-111 Spirit Organ is hand-rubbed mahogany. Traditional styling, \$995. Other models in a wide choice of styles and finishes. Prices f.a.b. factory, subject to change without notice.

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The Hammond people have turned this dream into reality for thousands who thought they couldn't play. We can do the same for you. Today.

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Machu Picchu, sacred Inca city, is high in the Peruvian Andes. Built in pre-Inca days, its origins are shrouded in mystery. It is a very special place.

You round a bend in the path leading from the hotel. You climb a wall on a protruding rock stairway. You walk between two stone buildings . . . and there it is.

Suddenly you're aware of a silence so complete you can hear the Urubamba river flowing two thousand feet below. The silence sharpens your imagination . . . you can almost see Pizarro's Conquistadores marching along the river, searching unsuccessfully for Machu Picchu and its treasure. You share the misery of a conquered people. And you mourn as the jungle slowly covers Machu Picchu, a city that is to remain asleep for over four hundred years.

Now *you* can explore its houses, temples, tombs. Peer down from its watchtowers. And in no time,

you'll find that instead of capturing Machu Picchu—it has captured you!

Machu Picchu, easily reached from Lima, is just one of the many exciting places on South America's West Coast. On your trip you can include the beautiful Chilean lake country, breath-taking Iguazú Falls, or cosmopolitan Buenos Aires. It's easy when you fly Panagra, the one U.S. airline specializing only in South American travel.

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Sunlane Cruises to Europe



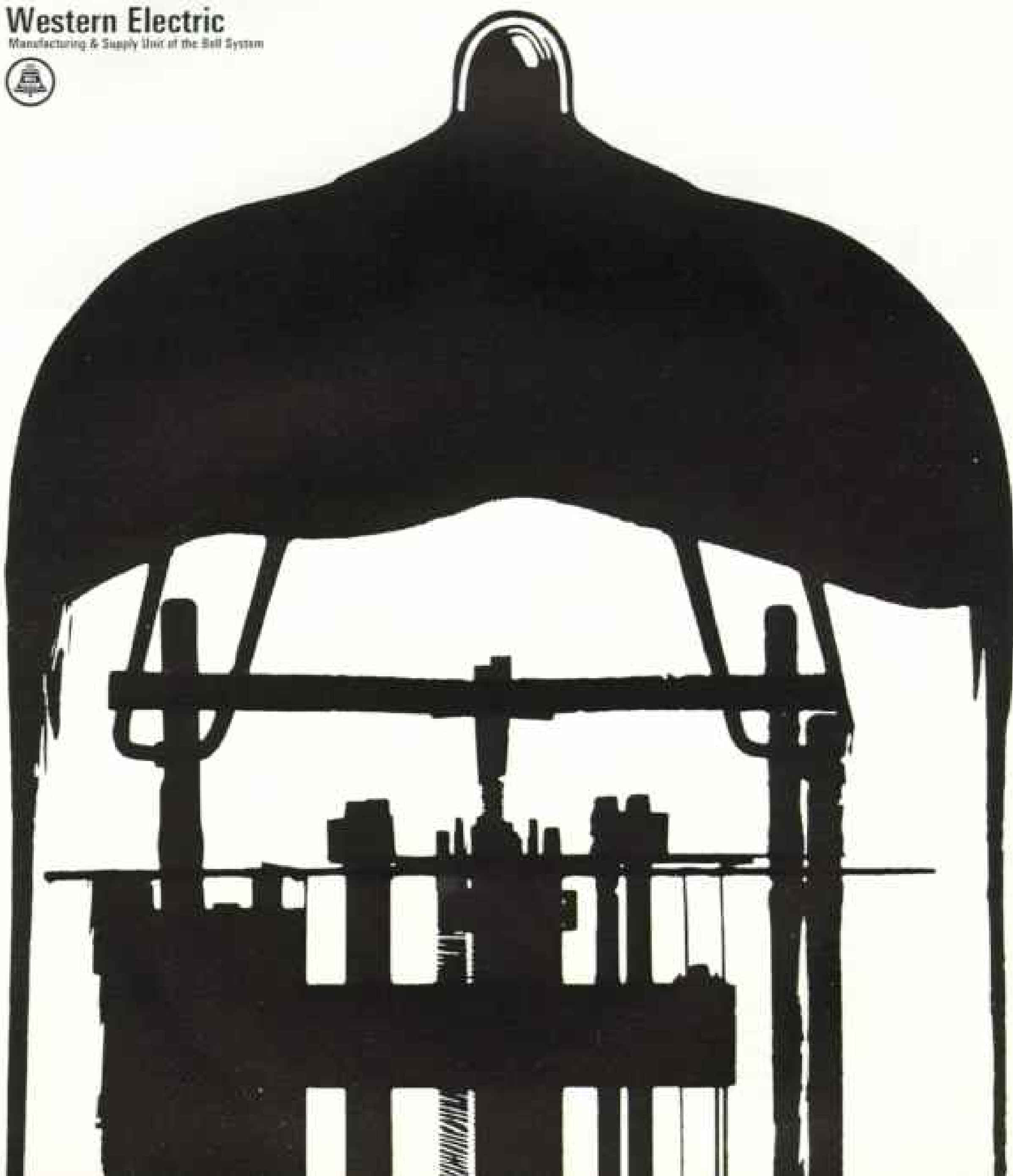
## WHY IS THE WORLD'S PUREST NICKEL AT THE BOTTOM OF THE OCEAN?

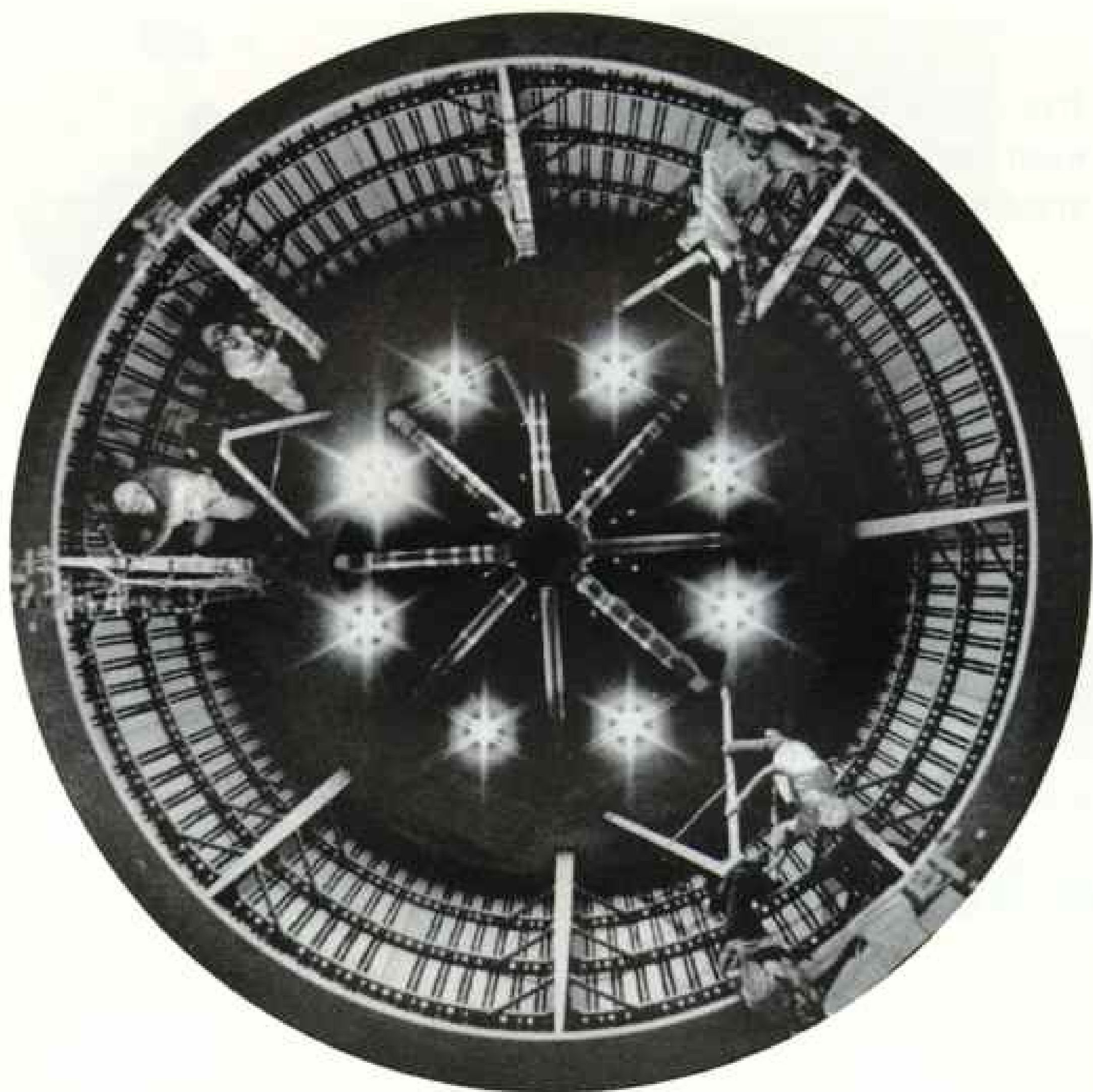
The ocean depths are forbidding and inaccessible. That's why the communications equipment Western Electric makes for the Bell System's underseas voiceways has to be able to work a minimum of 20 years without maintenance. Every inch must be as nearly perfect as it is humanly possible to make it. □ As an example, look at the electron tubes in the highly complex amplifiers that boost your voice signal every 20 miles along the way. All electron tubes, even of the highest quality, are subject to burn-out because of impurities in the nickel used to make cathodes. So how do you make a tube that you are reasonably sure will work for 20 years? Keep the impurities down below 50 parts in a million — about equal to a teaspoon of pepper in a barrel of salt. That's a challenge even in the laboratory. And Western Electric was called on to do it on a production basis. □ Solving difficult manufacturing problems, however, is one of the important skills Western Electric people have developed over the 83 years we have been part of the Bell System. It is a skill that helps turn the communications developments of Bell Laboratories into the reliable products that bring you the best, most convenient communications service in the world.



## Western Electric

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This structures laboratory is only one of 11 buildings in the

Douglas Space Systems Center, which is very probably the most advanced company-owned space complex in the world. It incorporates the finest and most modern equipment including a space simulation chamber 30 feet in diameter capable of housing a complete manned spacecraft.

Here, Douglas is building the S-IVB, the *Saturn* stage which will power three *Apollo* astronauts from

earth orbit to moon orbit. Also being developed are manned orbiting space laboratory designs, and work is progressing on other orbiting and planetary programs relating to the advancement of U.S. space supremacy.

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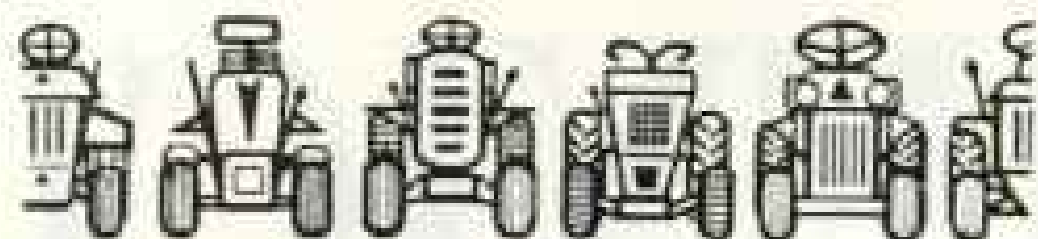
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*Attachments available: Reel or rotary mower; 3-gang trailing mower; lawn roller; dump cart; snow caster; snow/grader blade and others.*



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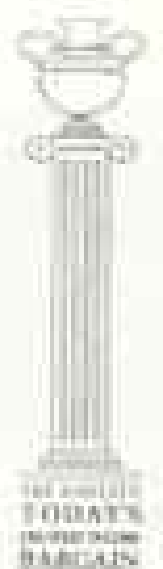
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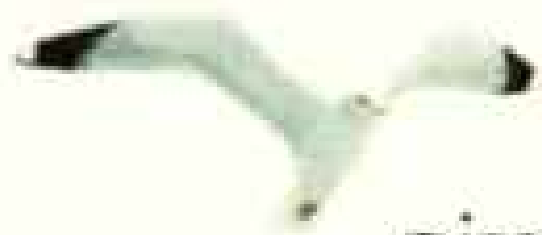
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Ever since their discovery, these seas and basking islands have captured the world's imagination and Matson's cruise through them takes you to ten of the world's most enchanting ports of call. The gracious liners, MARIPOSA and MONTEREY—exclusively First Class—have been especially designed for this, the fairest weather route in all the world. Both ships are completely air-conditioned and gyro-stabilized. Ship interiors emphasize quiet elegance and Polynesian charm. Staterooms are spacious and decorated for eye-pleasing livability. Each has a private bath.

For 42 days all of Matson's superlatives insure your pleasure and comfort. The cuisine is delectable. The wine list bears proud vintages. The service is delightfully perceptive. A limited passenger list assures pleasant companionships with opportunity for privacy when you wish. There is room for play . . . time for entertainment . . . relaxation takes almost any form you wish.

Only Matson offers this cruise experience with pleasures of such dimension. To select your stateroom and sailing date, see your travel agent or write Matson Lines at 215 Market Street, San Francisco, California 94105



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**M**AN, the restless builder, constantly shapes and changes the face of his planet. Tragically, there are times when he must obliterate a page of history under the heavy footfall of his progress.

So it must be with many of the ancient sites and monuments of Egyptian Nubia above the gigantic new Aswan High Dam on the River Nile. Much of Nubia will be inundated and the impounded waters used to create a fertile land of promise for tomorrow.

Irving and I had brought our ketch *Yankee* to Alexandria to sail her up the Nile before the dam choked off all traffic beyond Aswan. Often during our seven world cruises under sail, our *Yankee* crews had explored little-known bypaths of the sea. Now, in contrast, we would sail one of the world's most traveled waterways—and be among the last to see a storied section of it.

We of the *Yankee* would not miss a thing: stern-wheelers still plying the Nile, camel caravans plodding the sands, chanting laborers on the riverbanks, the ghostly, deserted villages of old Nubia—land that will be no more. At dusk we would savor the pungent aroma of that doomed land—the smoke of cooking fires from a village not yet abandoned, the swirling dust that dries nostrils and cokes throats, even the smell of dung and cattle.

A simple river life is all these villagers know, all they want. Yet soon—tomorrow—the last of them will be moved out by the United Arab Republic to new communities; 3,000-year-old Nubian roots will be wrenched from the riverbank and transplanted to the Egyptian desert.

True, the desert around their new homes has begun to bloom from waters drawn from the Nile, "bringer of nourishment." And Nubians will receive priority in peopling new villages on the lake shores. But the old village ties and ways will be cut, snarled, changed forever.

*Yankee's* crew would be reluctant to duck below decks to eat or sleep, for what we would miss today, we would never see tomorrow.

#### Where the Age of Sail Still Lives

We would sail the fertile Nile Delta through Lower Egypt to Cairo, then 600 miles up the river to Aswan before reaching Nubia. Along the way we would visit awesome pyramids and buried tombs of the Pharaohs. Best of all, we would see history come alive through the very pulsebeat of this antique land: the sights and sounds of its life-giving river.

Eager to slip out of Alexandria and begin



May  
1965

# NATIONAL GEOGRAPHIC

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## *Yankee* Cruises the Storied Nile


By IRVING and ELECTA  
JOHNSON

*Illustrations by*  
National Geographic Photographer  
WINFIELD PARKS



Under full sail, *Yankee* glides past cliffs walling the Nile near Qasr Ibrim.



A large felucca sailboat is the central focus, its massive white sail billowing in the wind. The sail is supported by a tall, slender mast. The boat is on a body of water, with another smaller felucca visible in the background. The sky is a pale, clear blue. In the distance, there are green hills and some palm trees. The overall scene is peaceful and captures the traditional maritime culture of the Nile Delta.

**TOWERING CANVAS** catches a following breeze. With gunwales awash, heavily laden naggars—popularly called feluccas—ply the Beheira Canal, part of the Nile Delta's maze of waterways.

ESDACHROME BY FRANK SCHREIDER  
NATIONAL GEOGRAPHIC STAFF © N.G.S.

our voyage, we stowed the ship stores, put official papers in order, and placed charts and advice from Egyptian river pilots at the skipper's elbow.

Our first dawn on the Nile unveiled unforgettable beauty; armadas of graceful one-masted cargo craft called feluccas (correctly, naggars). We never tired of watching them, majestic moths spreading their wings. Great lateen sails curved upward like scimitars 130 feet in the air.

The feluccas coasting downriver swept past us with their brightly painted bows and nimble crews—strangers to the adage, "One hand for yourself and one for the ship"—scrambling aloft to furl sail. By midmorning the feluccas always outnumbered the tugs and

barges, for on the Nile it is still the Age of Sail.

"Egypt . . . is the gift of the river . . ." wrote Herodotus in 450 B.C. The centuries have made little change; we saw the river's bounty on all sides. Brown banks with green tracery of date palms, rich fields stretching away to hostile desert—all were a legacy of the ageless cycle of life-giving flood and subsidence.

We had planned *Yankee's* arrival carefully to reach the Delta in October, when the river had just passed its annual high-water mark and the season had passed its severe heat. Egypt's winters run to sunny days, cool nights, and—above the Delta—no rain.

Our first day's journey was pleasant enough. Thinking back to Alexandria, I wondered if Stephanos Couvaris, a seasoned river pilot,





**Balanced burden,** an olive-oil can filled with water rides on a doughnut-shaped head pillow covered with black cloth. This Cairo woman wears the traditional dark dress, but bright cotton dresses in Western style appear frequently.

**Masts lowered,** *Yankee* slips into a lock at the Delta Barrages, man-made barriers to divert Nile waters into canals for irrigation. Craft's aluminum ladder, rigged as a derrick, will raise the spurs again. This Barrage, built in 1959, replaces one begun in the 1830's by Mohammed Ali, Pasha of Egypt. The original Barrage now carries highway traffic.

had exaggerated the Nile's changeable nature.

"It's 200 miles to Cairo," he had told Irving, as he rapidly drew a rough chart. "It looks easy enough, doesn't it? A good deep channel with a bridge now and then, a lock or two, and you're in Cairo before you know it."

He grinned. "Only you aren't, because this is the Nile, the world's longest—and craziest—river. To begin with, there's the river traffic—unlike any you've ever seen. But you'll find Egyptian barge pilots helpful. They're always ready to pull you out of the water, after they've accidentally stove a hole in you.

"Then there's the night travel. Most drawbridges open only after dark, and you have to move when you can. But don't expect many lights—Egyptians don't go in for frills.

"Too bad the flood is past. Now you must

take the 'emotional route,' by canal, after entering the Delta through the Rosetta Mouth."

He put out his hand. "Bon voyage, or as Egyptians say, '*Inshallah*'—As Allah wills."

It was hardly a reassuring start for a voyage of a thousand miles up a strange river into Africa (see Atlas Supplement Map, **Nile Valley, Land of the Pharaohs**, distributed to members with this issue).

To be sure, *Yankee* was as ready as any boat could be. She was built to our design, with a hull of reinforced steel drawing only 4½ feet of water with centerboards raised. Her 16-foot beam and fold-down masts fitted her for locks and bridges, and her ketch rig and sturdy diesel made her easy handling for two.

Moreover, *Yankee* had been seasoned the year before on a 2,500-mile maiden voyage

**Cerise splashes** of dye mark ownership of sheep bound for slaughter in a bazaar of Cairo. Raised in the semidesert along the Mediterranean, these animals come to Cairo for market. Lack of grassland compels the United Arab Republic to import much of its meat.

**Gifts of the Nile:** Delectable fruits and vegetables, displayed in one of Cairo's many outdoor produce stands, draw a customer. Mrs. Johnson filled *Yankee's* larder with fresh vegetables. The crops grow in the rich soil deposited by the river along its banks.

GREENWICH LEFT AND PHOTOGRAPHERS © N.S.A.



through western Europe's intricate rivers and winding canals.\*

Our approach to the unknown river over the bar at the Rosetta Mouth took us into the westward channel of the Nile, where we first thrilled to the sight of the feluccas. But after this alluring introduction, *Yankee* had to leave the river for the Beheira Canal. Lowering water levels denied us the use of the Nile as far as Cairo. The 200-mile passage was an experience in weird and irrational navigation. Since bridges opened mostly at night, we often progressed in total darkness. Because lights were not in fashion, *Yankee* maintained a blackout to preserve our night vision and to keep from blinding felucca skippers.

Bridges and locks proved nightmares, blocking traffic for hours. When a bridge fi-

nally opened, the effect was of dynamite on a log jam, but with a difference: As the span lifted, everything rushed through—to meet headlong with a jam coming the other way. In the blackness of the river the result was bedlam. Only our experience with *Yankee* in Europe's waterways saved her from the shortest voyage on record.

There were a few welcome open stretches in daytime when the ship could make some mileage under power. Irving stayed at the helm, alert for the unpredictable. Now and then he called his crew—old friends Dr. Victor Nelson and his wife Mildred, and myself—to stand by with boathooks and fenders when feluccas threatened to close in on us.

\*See "Inside Europe Aboard *Yankee*," by Irving and Electa Johnson, NATIONAL GEOGRAPHIC, August, 1964.





**Gateway to ancient wonders,** Cairo lifts modern towers along the banks of the Nile. Built A.D. 969 near the site of the Roman fortress of Babylon, El Qahira, as Egyptians call their capital, became a center of Moslem culture in the Middle Ages under its Fatimid, Ayyubid, and Mameluke rulers. Their many mosques gave Cairo the name "city of a thousand minarets." Saladin, foe of the Crusaders, built his great citadel here in the 12th century. Today this trade and manufacturing center, standing at the apex of the Nile Delta, is Africa's largest city, with a population of 3,500,000. Through the metrop-



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olis sails *Yaukee* (center), past Al Tahrir Bridge and Gezira Island to starboard. Dead ahead lies the Island of Roda (bottom, left) where, legend says, Pharaoh's daughter found the infant Moses in the bulrushes. Slender 35-story apartment building dominates tree-studded Garden City, a fashionable residential district. From Cairo, Captain and Mrs. Irving Johnson headed upriver into the Egypt of antiquity, where many monuments face doom because of the new Aswan High Dam. In their seagoing ketch with unique features for inland waters, the authors sailed a thousand miles, to the border of Sudan.

From the summit at sunset: A guide rests atop the Great Pyramid at Giza, raised 4,500 years ago as a tomb for Pharaoh Cheops (Khufu). Through the ages countless visitors have left names and initials in the stones. Monument of Chephren—a son of Cheops—stands at center, silhouetted by the sun. "O Living Disk, who didst live from the beginning," wrote Pharaoh Akhenaten in his "Hymn to the Sun," "Eyes are on thy beauty until thou settest. All labour is set aside when thou settest in the west..."

"I made it!" gasps Mrs. Gilbert M. Grosvenor with one tier to go on an hour-long climb up the 450-foot Great Pyramid. She found the descent, with its awesome downward view, even more harrowing. Automobile below her assumes antlike proportions.



But *Yankee* somehow always dodged disaster.

Now we knew why Couvaris called this the "emotional route."

Some 40 miles into the Delta, we called at Damanhur, site of a provincial capital of ancient Egypt. Over the ages, the relentless Nile has entombed the city beneath Delta silt, and now a cotton port rises above the grave.

*Yankee* tied up beside a wharf where stevedores tumbled half-ton bales of cotton onto waiting barges below. The impact of the bales raised a blizzard of lint, and *Yankee* got a thorough coating. When at last we cast off and turned her upriver, she looked something like a wedding cake.

It took us a full week to negotiate the Beheira Canal to Cairo. At the last lock, I spied a young man festooned with cameras snapping our picture from shore.

"Hi, *Yankee*," the walking camera shop called. "Any room for the GEOGRAPHIC?"

And so, by prearrangement, we met Winfield Parks, the NATIONAL GEOGRAPHIC staff photographer who was to double expertly in the coming months as a *Yankee* hand—when he wasn't leaping ashore for a picture.

#### Skyscrapers and Minarets Vie in Cairo

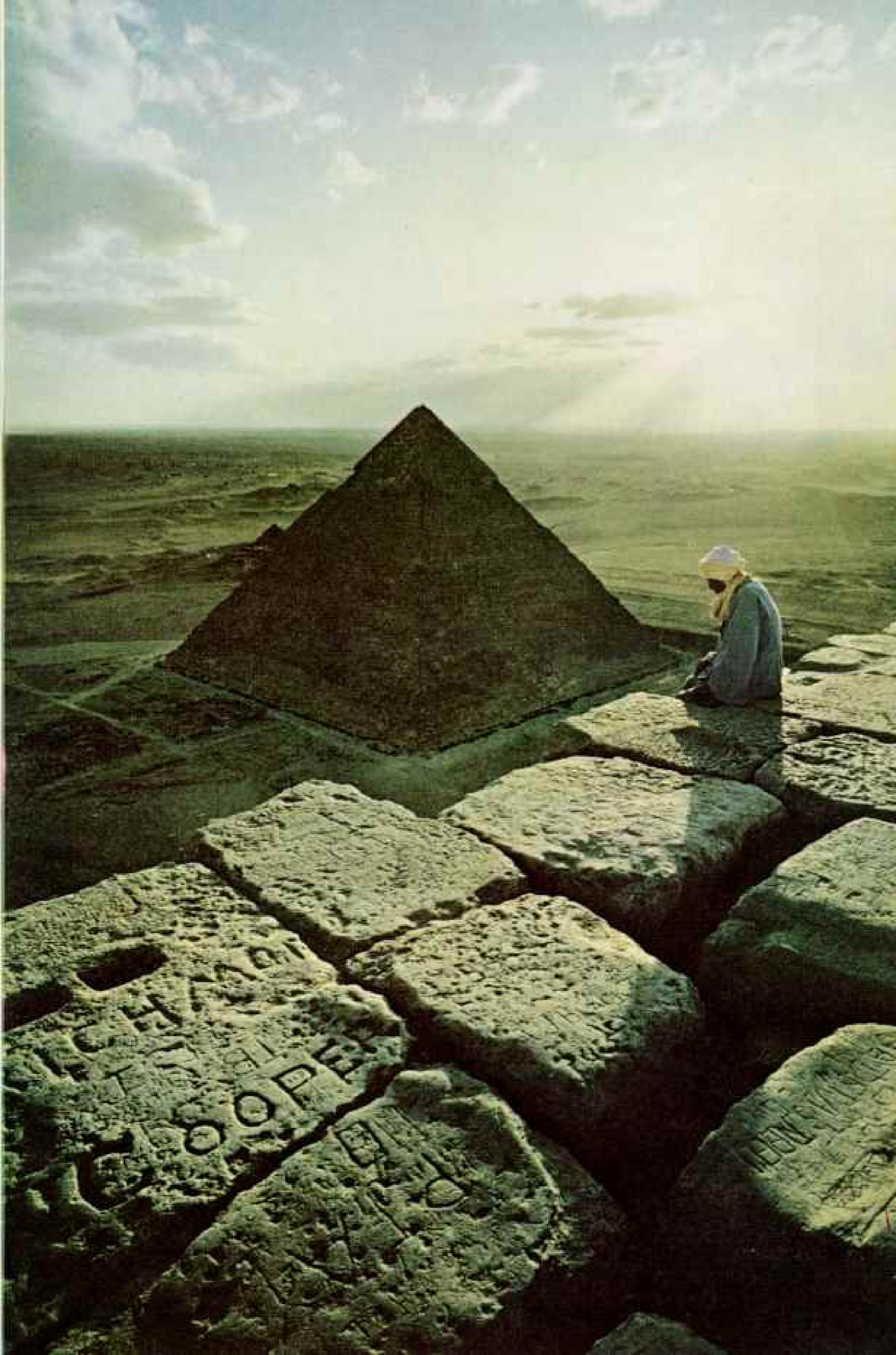
In early evening, Cairo's lights rose dead ahead. Under power and with masts lowered, we slid gingerly beneath a final bridge. Cairo's midtown blaze revealed tall buildings and pale minarets piercing the dark sky. On the east bank, a rooftop sign—"Shepherd's"—proclaimed the world-famous hotel. The Saladin Mosque gleamed in floodlit splendor. At the Cairo Yacht Club on the west bank, helpful hands caught our lines, and *Yankee* eased into her first true berth on the Nile.

Years of sailing have not dimmed our special pleasure at arriving in a port by night and rediscovering it by day. At sunrise, the Moqattam Hills, a source of building stone in ancient times, looked down serenely on Saladin's Citadel.

Our first stop ashore next morning was the bazaar of Khaan el-Khaliili, almost a medieval city in itself. Roofed mazes of alleyways led us under screened balconies past innumerable tiny shops. Here children hammered designs into brass trays; country women—shrouded in flowing black *malaayas* from their heads to the dust beneath their feet—longingly examined displays of thin gold ornaments, the female gauge of wealth.

Eager merchants spread acres of carpets, or hailed the beauties of fine ivory-and-pearl-shell inlays. Other, more mobile, salesmen









pursued us through the bazaar with bargains in "genuine antiquities." A few enterprising barkers even tried to fit us under way with Arab headdress. Despite the sales talks, real bargains were rare. Irving summed it up: "Old World charm at New World prices."

In the midst of such teeming life, death added a somber note: a band of sheep with the owner's cerise marks on their flanks, headed for the slaughterhouse (page 587).

#### Camel Justifies Nautical Nickname

Death of a nobler sort rules the west bank of the Nile. There stand the great tombs and monuments of Egypt's past (preceding pages). Where the sun sank every day into unknown

darkness, men's souls would naturally journey at the end of life's day.

"I like the idea of the sun traversing the heavens by day in a boat, then floating at night through the underworld," Irving said. "At least there was a boat in their afterlife."

The greatest of the monuments and tombs, of course, are the Pyramids of Giza. Limousines whisked us to within a few hundred yards of the vast piles, and camels carried us the rest of the way. A friend had recommended a camel called "Coca-Cola," and we made the mistake of asking the handlers for it by name. Suddenly every camel in sight became "Coca-Cola." The one I chose actually turned out to be "Canada Dry."



EXACTORONE (BOOTS) AND EXACTORONE BY WORTHELL PHOTO © N.C.A.

A ride on a camel, even a pyramid camel, is worth the inevitable loss of dignity. Irving watched me mount as my steed crouched on the ground with legs folded. The Egyptian handler shouted instructions, and the animal rose in four great separate lurches: "Lean back! Now forward! Now back! Forward!" I learned then why camels are known as "ships of the desert."

The sublime pyramids looked down and made us feel not so much ridiculous as microscopic in time and space. And no wonder: Into the 13 acres of the Great Pyramid's base, one could place the cathedrals of Florence, Milan, and St. Paul's of London, as well as the Basilica of St. Peter's in Rome.

Plowing along behind *Yankee*, a cargo boat hitches a ride against the current. Bulky load of sugar cane blinds the helmsman and sinks the craft low in the water. Good Samaritan *Yankee*, equipped with a diesel engine, often towed native boats when the wind failed.

Nile sailors depend on the prevailing north wind to carry them upstream. Returning to Cairo, they drift with the current, their boats piled high with clay pots, cotton, grain, and other products of Upper Egypt.

"Six feet... five feet." Ahmed Fahmy, sounding with a graduated pole, sings the depths as *Yankee* feels her way across the Nile in search of the channel. Dragging hull builds a frothing bow wave. Shifting sands of the bed of the Nile make river charts unreliable. *Yankee* often followed the lead of local craft, sometimes to Captain Johnson's regret when his boat ran aground.





PHOTOGRAPHS BY BRUCE AND ROSEMARY © N.S.P.



Full lung power evokes wails from a *mizmar*, an ancient form of pipe. Musicians at Beni Suef played for Arabian horses that performed an equine ballet for *Yankee's* crew. Tattoos, in patterns handed down from generation to generation, ward off evil spirits.

Bargain hunter Electa Johnson debates the price of a water pipe, or *shishha*, with a merchant in Asyut and draws a crowd. Ahmed Fahmy (left), an Egyptian friend who served *Yankee* as guide, interpreter, and crew member, offers his advice. Englishmen call the brass pipe a "hubble-bubble."

Open-air barbershop utilizes the running board of a vintage car. Dressed in traditional *galabia*, the flowing cotton garb of Egyptian men, the barber carefully trims a mustache. Dummy model of a rocket called Al Kaher—the Conqueror—in Asyut's square symbolizes the United Arab Republic's advance into the Space Age. The nation has developed another missile, Al Zafer—the Winner.

This great Pyramid of Cheops (Khufu) has stood on the Giza plain 4,500 years. We resolved to climb to its 450-foot summit and asked the barefoot guide how long it would take.

"It is farther than it looks," he answered in perfect English. "For you, perhaps an hour to the top, even longer coming down." He smiled. "You will be tired by then."

And how quickly could he do it? "When I am in training, ten minutes. But I am only second best. An older man in Cairo can do it in seven. He is teaching me, and one day I will be the best."

His prophecy of an hour's climb proved accurate. Though we arrived breathless and dizzy with fatigue, it was worth it to stand at the summit and gaze east toward Cairo, a jeweled miniature in the distance. To the west stretched the beginnings of Africa's vast wastes—the deserts that separated the ancient realms of the living and the dead.





EXTENDING © NATIONAL GEOGRAPHIC SOCIETY

True to the guide's word, it took us longer coming down, and still we had seen only part of the pyramid—the outside.

The burial chamber of the Pharaoh Cheops lies far inside and high above ground level. Through dim, narrow corridors not quite four feet high, we climbed, bent almost double. The massive, beautifully precise Tura limestone joints recalled the description by British Egyptologist Sir Flinders Petrie—"equal to optician's work of the present day, but on a scale of acres instead of feet..." Truly, no people have ever been so preoccupied with—or so thoroughly prepared for—an existence after death.

Inside the King's Chamber, at one end, stood the huge granite sarcophagus, all one piece except for the lid. The sarcophagus will never be moved out; it has been discovered to be one inch wider than the entrance corridor. Ingenious architects had protected it by building the pyramid over it. As if to prove their point, the lid has long since vanished!

All the way to the chamber, we had found the air heavy and stagnant. Now I suddenly felt a draft of fresh air. "Feel that?" I asked

the others. "There must be a ventilator shaft to the outside." The builders clearly had thought of everything—even air vents.

Back in Cairo, we turned to *Yankee's* needs. We had neither an accurate chart of the Nile beyond Cairo nor written permission to take *Yankee* there. In the end our good friend Dr. Khalil Mazhar, Professor at the Medical School of Cairo University and Commodore of the Yacht Club, solved the navigation problem. "Take my 1929 Baedeker," he said, offering us the treasured volume. "Though the maps are old, they should be of some help."

#### Dinghy Becomes a Floating Larder

The written permission problem solved itself. One day we had a visitor aboard, Deputy Prime Minister for Culture and National Guidance, Dr. Abdel Kader Hatem.

Dr. Hatem took in every detail of the home so familiar to us: The light from five windows across our stern and from a Plexiglas bubble hatch overhead; our big thwartship bunk; dining table with built-in benches; lockers for gear and provisions; the galley; and the forward half of the ship with guest quarters.





Like a mirage, fishermen work the river in the golden mists of early morning. Men in the stern of each boat hold the ends of a net, hoping for a catch to sell in a nearby village; their partners row. Pyramids of straw spike the horizon.

Dawn brings astonishment to a *fellah*—Arabic for farm worker—who awakes to find *Yankee* moored at his door. A crewman washes the deck as the newly risen sun glints across the river. Water buffalo and feeding cow give milk for butter and cheese and pull the plow to till the fields.

PHOTOGRAPHS © NATIONAL GEOGRAPHIC SOCIETY



At length we posed for pictures by Egyptian news photographers with our distinguished guest. The shot published of Dr. Hatem with Irving promised to be a better passport for *Yankee* than any official paper.

Our greatest stroke of luck was in finding Ahmed Fahmy, a Cairo bachelor in his 40's who joined us originally as a guide and interpreter, but who ended up almost a member of our family. Ahmed had studied in England, at Cambridge, played championship cricket, traveled widely, and even acted briefly in movies. He liked Americans, and had friends all up and down the Nile.

For food, *Yankee's* lockers were crammed with American canned goods, but when sailing day came, I had the refrigerator, vegetable bin, even the dinghy, filled with fresh stores from Cairo's markets (page 587).

As ready hands cast off *Yankee's* lines at the Cairo Yacht Club, I noticed a good bit of argument among the bystanders. Later I asked Ahmed what it was all about, and he grinned: "They were taking odds whether they would ever see us again."

#### Twilight Touches the Nile With Magic

It felt good to be out on the river in the company of the graceful feluccas. Under way, we developed a routine: At lunchtime we often put the bow into the bank for an hour's stop; at night we sometimes anchored in the stream, sometimes tied up to a barge, and sometimes carried our anchor into a farmer's field, placing the flukes so as not to disturb the crop.

Fortunately, there would be few locks or bridges ahead, few unexpected waits.

"Why does no one ever mention Egypt's scenic beauty?" Irving asked one morning. "All the emphasis is on the ancient marvels, none on the natural ones."

Indeed, we traveled a lovely world of winding river, small fields of vibrant green, dark patches of plowed soil where white egrets picked their way, straight sturdy date palms crowned with plumes of frond, and villages of mud-brick houses a deep taupe in color. These last blended into the scene as if they, too, had grown there.

We looked forward to the late afternoon, not because the days were too hot, but because of the luminosity that worked its magic on end-of-the-day scenes. Where the banks reached our eye level, the waning light silhouetted activity on shore. Here a gangling camel loped after his long-gowned driver; there a turbaned figure sat way aft on a sturdy little donkey, the rider's legs too long for his mount. A little girl led the family water buffalo down to the river, and three



Green lifeline of Egypt—the fertile fringe of the Nile. Village of Beni Hasan el Shuruq and its

women in flowing black, balancing great water jugs on their heads, seemed to have stepped from a Bible scene. A kneeling figure, facing east, dropped to the attitude of prayer, head touching the earth.

Then, beyond the silhouettes, sunset turned the clouds to bright spun sugar, and the light slowly died to westward. Moonlight on the river we watched more briefly; the night chill came down early. Yet the sky was incredibly clear, and in the few moments before we went to bed under blankets, we saw stars that Americans only read about.

One of *Yankee's* first calls was the town of

Beni Suef. The energetic young mayor, M. S. Sharkawi, glowed with pride over recent improvements—a broad new waterfront avenue with street lights, a sports stadium, a fine community center.

In the morning the mayor arranged a drive to the Faiyum, site of the largest oasis in Egypt and one of the oldest settlements along the Nile. The Faiyum, a former lake bottom, now forms a depression in the Western Desert, shaped like a round leaf with its stem reaching eastward to the Nile. Along this stem in ancient times the Nile used to flood the whole area. Then engineers of the XIIIth Dynasty,



PHOTOGRAPH BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WINFIELD HARRIS © N.G.S.

domed tombs in foreground stand on the desert, leaving every inch of arable land for crops.

4,000 years ago, built retaining walls and gates to hold the floodwaters and to release them gradually. Modern dams on the Nile do the same thing, only with better control.

#### Farmer's Sailing Advice a Last Resort

By now we had evolved our own system of river navigation. Irving and I know from years of experience how the deepwater channel of a river follows an irregular course rather than a line midway between banks. We have learned to curve away from shallows that build up downriver from jutting points, and to watch for danger signals on the surface.

Sounding is necessary, too, however. When we crossed from one bank to the other, or when a warning vibration from the propeller told of shoaling water, Irving would sing out, "Soundings!" Win Parks and Ahmed would go into action on either side with calibrated poles, calling back the depths (page 593).

"Six feet . . . six feet . . . six and a half. Six . . . five and a half." This last depth was close to our 4½-foot draft. Irving would slow down.

"Five and a half . . . five and a half. Five!"

Now the hull was dragging water in a wave piling high at the quarter. Sometimes we would back her down and try a different spot.





Sometimes we would ground, but that was not serious—the bottom was sand, our keel was sturdy, and the current usually helped the engine back us off.

Searching for the channel, we all kept watch to see where barges or feluccas went. We noticed their seamen dipping long, thin sounding sticks almost incessantly. Whenever we hailed them, directions for a fellow sailor were willingly given.

A last resort was a farmer on the bank. But farmers' information is the poorest a sailor can get, and it often put us aground.

Every day we felt increasingly that we belonged to the Nile. True, *Yankee* looked quite unlike anything else afloat on the river. Her bright-red boot-top at the water line, shining white hull topped with broad blue stripe, saucy clipper bow, varnished masts, and—when we had room to sail—the startling red-and-white-striped genoa jib were of another world from the barges or

**Agile as monkeys**, sure-footed sailors scamper up the yards of feluccas. They grip the hems of their galabias in their teeth to avoid tripping as they race up and down to furl the large lateen sail. To catch the slightest breath of air, the yards may stretch the mainsail 130 feet aloft, more than twice the height of the mast. Craft at left flies the colors of the United Arab Republic.

**Twilight on the Nile**, and *Yankee* finds safe harbor at the village of Matai. In the captain's cabin, Irving and Electa Johnson plan the itinerary for the next day, with histories and guidebooks for reference. All hands brushed up on Egyptian history at night before visiting tombs and temples next day.

"We never ceased to marvel," Captain Johnson said, "that we could awaken in the morning in our floating American home and step ashore into the splendor of ancient Egypt."

PHOTOGRAPH BY GILBERT W. TRISTRAM © S.A.S.

feluccas. But we were happy to find that *Yankee* inspired their affection. They called her *Amusa*—bride or doll.

El Minya was our next sizable port of call. Michael Adly, a local archeologist, guided us through Tuna el Gabal, a necropolis 2,300 years old, dating from Egypt's Ptolemaic Period. Eight years after Alexander the Great had left Egypt, word came of his death; his empire was divided. Egypt went to one of his generals, Ptolemy, whose name denotes the three centuries of Greek supremacy.

#### Animal Worship Leaves Strange Legacy

"Come look at Isidora's tomb," Mike said, indicating one of the smaller funeral houses. "Isidora was the daughter of a high priest and had fallen in love with a commoner. One night she stole out to meet him and was drowned in the Nile. Her father raged, but the people forced him to make her a fine funerary bed."

Up the narrow stone stairs and inside the tomb, we found Isidora's mummy. The sight was staggering: Linen wrappings had long since disappeared, but the body was amazingly preserved. The brown flesh had endured,

though it was very dried out, and there were the teeth, toes, and fingers—most of Isidora.

Tuna el Gabal had other, more bizarre, relics. In a vast subterranean network of ancient streets that had been excavated, Mike showed us hundreds of mummies—not humans, but ibises and baboons. We saw several beautifully preserved specimens in little stone, bronze, or pottery sarcophagi set in wall niches. Animal worshipers in the Ptolemaic Period had left this strange testament to their cult.

Upriver once more, we came to Tell el Amarna—in ancient times Akhetaten, the 14th-century dream city of the heretic ruler, Akhenaten.\* Opinions still vary on this young Pharaoh. Many condemn his neglect of earthly responsibilities toward the hard-won empire of his fathers, which had reached to the banks of the Euphrates. Others see Akhenaten as a courageous visionary who closed the powerful temples to Egypt's numberless deities and who offered the people a single, beneficent god—Aten, the life-giving Sun. Indeed, a monotheistic concept was daring for the times.

Determined to make a fresh start with his

\*See "Tutankhamun's Golden Trove," by Christiane Desroches Noblecourt, *GEOGRAPHIC*, October, 1963.



new religion, Akhenaten moved his court 240 miles north of opulent Thebes, the ancient capital, now known as Luxor. With his beautiful wife Nefertiti he founded Akhetaten—"Great in loveliness, mistress of pleasant ceremonies, rich in possessions..." as the old texts describe it.

Riding into the desert on little gray donkeys, however, we could barely discern the outlines that indicated the vanished city. Akhenaten's dream lasted only as long as its creator. The Pharaoh's son-in-law, Tutankhamun, who may also have been his younger brother, returned to Thebes for most of his youthful reign. But for those to whom Akhenaten was the greatest figure of ancient Egypt, a light still shines from his ruined capital.

#### Laden Barges Converge on Yankee

South of Tell el Amarna, we came to the most difficult navigation of all.

"Now is the worst time of year," an old felucca captain explained. "With the flood season nearly gone, the river has not yet dug new

channels. We who spend our lives here don't know where the deep water lies."

The following day proved his point. The excitement began early, just as we pulled in our anchor from a farmer's patch of beans. Three loaded diesel barges were sounding their way downstream, so Irving steered toward them, aiming for what everyone thought must be the channel.

Suddenly the leading barge struck a bar. The swift current caught her stern, and with one great swish gave her a 180-degree turn. She was now heading upstream, two more barges were coming down, and Irving was going too fast to stop. Holding our breath we shot safely between the barges, scraping the bottom but never quite stopping.

Win's reaction was purely professional: "Just my luck not to be ashore," he said sorrowfully. "What a picture!"

At Asyut, trade and industrial center of Upper Egypt, Ahmed and I went shopping in an antediluvian horse and carriage. We threaded our way among throngs of women



Gallery of kings in the Temple of Sethos I at Abydos displays the cartouches, or names, of 76 Pharaohs. They range from Menes, first to unite Upper and Lower Egypt, to Sethos, who lived 3,300 years ago. The Johnsons and crew member Mrs. Victor Nelson (in red) hear a reading of the ancient roster.

Massive columns dwarf visitors in the Temple of Dandara, one of the best preserved in Egypt. Mutilated heads of the goddess Hathor cap the 24 pillars supporting the Great Hypostyle Hall. Ptolemaic Pharaohs constructed the edifice in the first century B.C.







**Commuter buses**—Egyptian style—haul farmers from fields to villages on the watery highway that winds nearly a thousand miles, the length of their country. In gratitude to the river, source of land and life, the ancients sang, "Praise to thee, O Nile, that issueth forth from the earth and comest to nourish the dwellers in Egypt." Actually, they might have put in a good word for Ethiopia, since much of the fertile soil deposited by the Nile at floodtime originates there.

**Timeless tableau** at day's end: Women of Qena, draped in traditional *malaayas*, come to the Nile to fill their jars. Qena manufactures clay pots, or *ballas*, in shapes unchanged from Biblical days.

robed in black—only a few of them veiled—urchins beyond count, horse cabs, donkeys, camels, and hundreds of hopeful travelers sitting with their bundles on the railroad platform. A three-story dummy rocket in the station square—a government testimonial to preparedness—contrasted sharply with the sleepy grocery shops, dusty stationers', cluttered hardware stores, and an open-air barber shop—simply the running board of an antiquated touring car (page 394).

From displays at the market, Ahmed and I bought a carriage-load of food—oranges, bananas, grapefruit, carrots, beans, peas, cucumbers, eggs. Our most popular purchase for *Yankee's* larder was "camel's foot," which is not to say we had taken to eating Egypt's local transportation. We had merely developed a liking for the delicious native bread, whose



tan, round look and squashy quality caused us to coin the obvious nickname.

One morning we motored from Asyut out into the desert with a veteran caravaner as guide. Along the hard-top road, we skimmed past beautiful dunes, rising like tawny drifts of new-fallen snow and interrupted here and there by gray-white outcroppings of limestone. The rock had a patina like that of high-gloss paint—the result of ageless scouring by sand and by dust as fine as jeweler's rouge.

As we drove, our companion described a caravan trek for us: "When we get into the desert, the camels are kept in line. Otherwise, they take their own way. But if they sense danger or water ahead, they close formation. We seldom ride. When one loves the desert, one can walk on and on, almost in a trance."

How long can a camel go without water?

"Who can say? I've heard about 17 days. Only a camel could tell us for sure."

Our guide's deference to the camel reflected man's age-old grudging respect for those willful beasts. Roman traveler Pliny the Elder believed that camels trained to a certain load would bear not a straw more.

"On caravan," our guide went on, "custom calls for a good Moslem to bring his shroud, in case he should die in the desert. When he prays, he makes ablutions with sand instead of water."

#### Mercy Action Brings Sweet Reward

As we prepared to leave Asyut, Win Parks noticed an old man with a blood-encrusted bandage on one finger. Vic Nelson's professional instincts emerged. Under the bandage he found only the badly festering stump of the

EXTACHROME (LEFT) AND KODACHROME (R) NATIONAL GEOGRAPHIC SOCIETY



finger. The old man smiled as if in apology. "Inshallah—As Allah wills."

Vic expertly cleaned and dressed the stump, and we gave the old man what coins we had with us. Half an hour later as we began casting off *Yankee's* lines, we heard a shout and saw our friend running toward us along the bank. He carried a huge bundle of sugar cane—all that our coins could buy in the market. Proudly, smiling and ducking his head, he polished each stalk as he presented it.

#### Strangers Ease *Yankee's* Sorrow at National Tragedy

Thanksgiving's approach brought unexpected sorrow. One evening beyond Asyut, as we lay moored against the bank, a kindly Egyptian in Western dress beckoned Ahmed aside.

"I have had news for *Arunsa*," he said, nodding toward *Yankee*. "It is their President, Mr. Kennedy—dead by an assassin." He gestured helplessly. "Please, I cannot tell them."

Ahmed did as he was bidden, almost unable himself to talk. We sat quietly for a long time. During the following weeks, strangers constantly sought to comfort us; some in painfully rehearsed English, others with a wordless shake of the hand. Never in all our travels have we felt closer to another people than in those moments of unlooked-for kindness.

One morning, 350 miles and three weeks out of Cairo, we reached Nag Hammadi Bridge and joined clusters of feluccas waiting for the span to open. As it did, a file of feluccas with immense loads of straw and cane went scudding upriver, looking like squared haystacks with sails.

Plainly, the helmsman at the stern was blind to what lay ahead, so each captain shouted orders from atop the haystack.



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"Half sunk, a shattered visage lies. . ." wrote Percy Bysshe Shelley of the colossus of Ramesses II at the Ramesseum in Thebes. Tumbled to earth ages ago, the shattered statue once measured 57 feet high and weighed 1,000 tons.

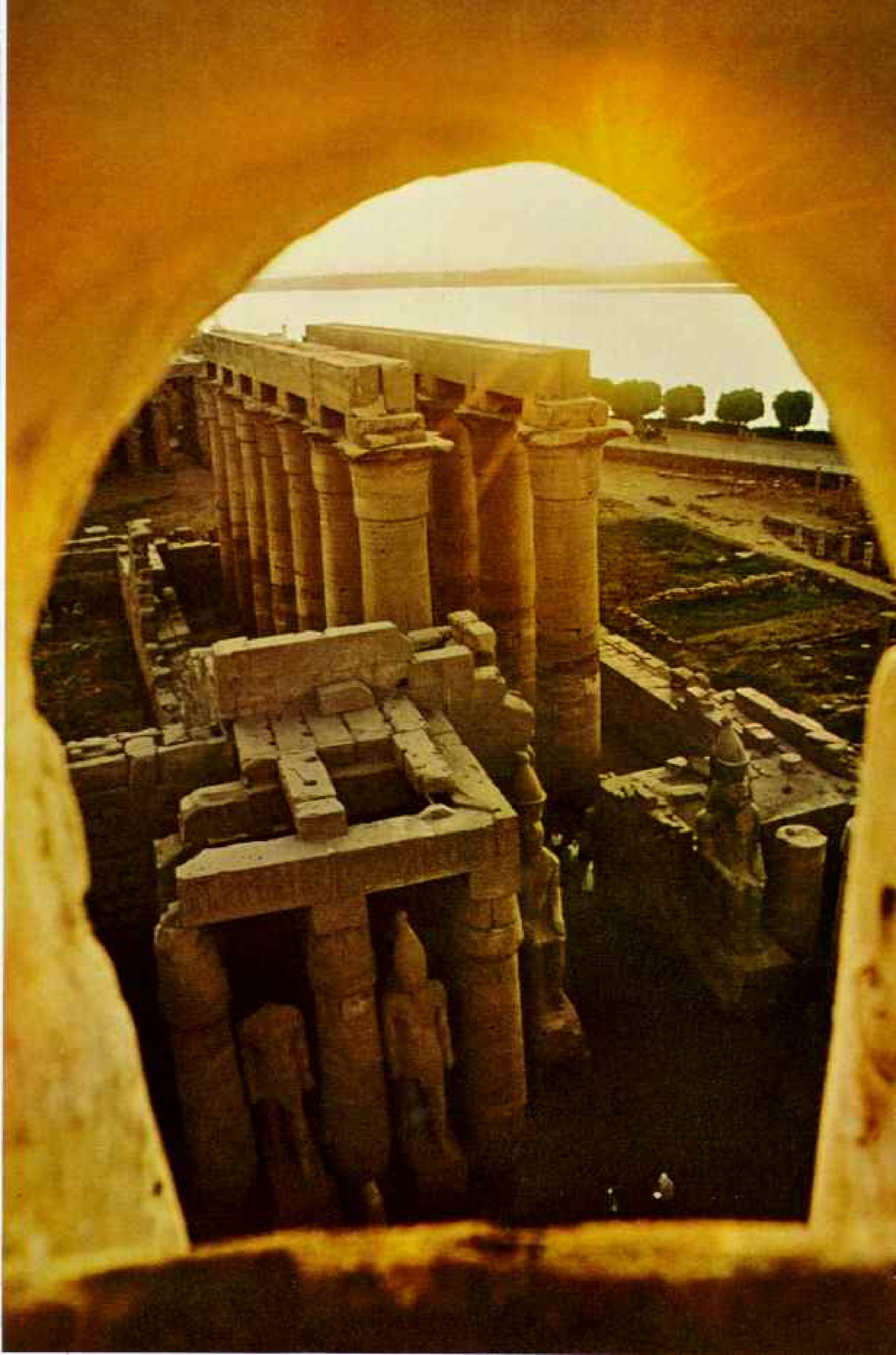
Perched high on a cliff, the author photographs the temple of Queen Hatshepsut at Deir el Bahri. A powerful female Pharaoh, she announced her right to the throne by claiming divine birth, then reared this glory of colonnades, terraces, and promenades to house her tomb and assure her veneration.











*Yankee* hustled up behind the last two “stacks” and found them fighting to gain priority. Both crews now stood on top of the straw, shrieking insults. Then came the collision, an anticlimax, soft and quiet, haystack to haystack. That seemed to settle something. As the feluccas parted, the apparent winner streaked for the span opening.

#### Race Takes Incredible Turn

But there was to be no winner. “The bridge tender’s closing the bridge,” Irving shouted in a tone of disbelief. “They haven’t got a chance of stopping in this wind.”

Under the lash of the wind, the high load of the first boat swept it bridgeward with its shouting, waving crew. We not only heard, but seemed to feel, the sickening crunch of wood against the half-closed bridge as the boat sliced through its own fender of straw. There the victim stuck.

“We can pull him away,” Irving called to us. “Get a towline ready.”

We motored close, and the crew made fast our line. Stern foremost, the felucca was an awkward tow, but somehow we got him to shore. The second felucca, too, was blown against the bridge, and we yanked him away as well. Apart from their gratitude, it was a satisfaction to undo a little of the bridge tender’s astonishing action.

Now the Nile took a course due east, making its farthest reach toward the Red Sea.

Here, at Qena, we hired donkeys for a short ride to the ancient Temple of Dandara (page 603). Without Ahmed to run interference, we would never have gotten past the phalanx of eight- and ten-year-old donkey

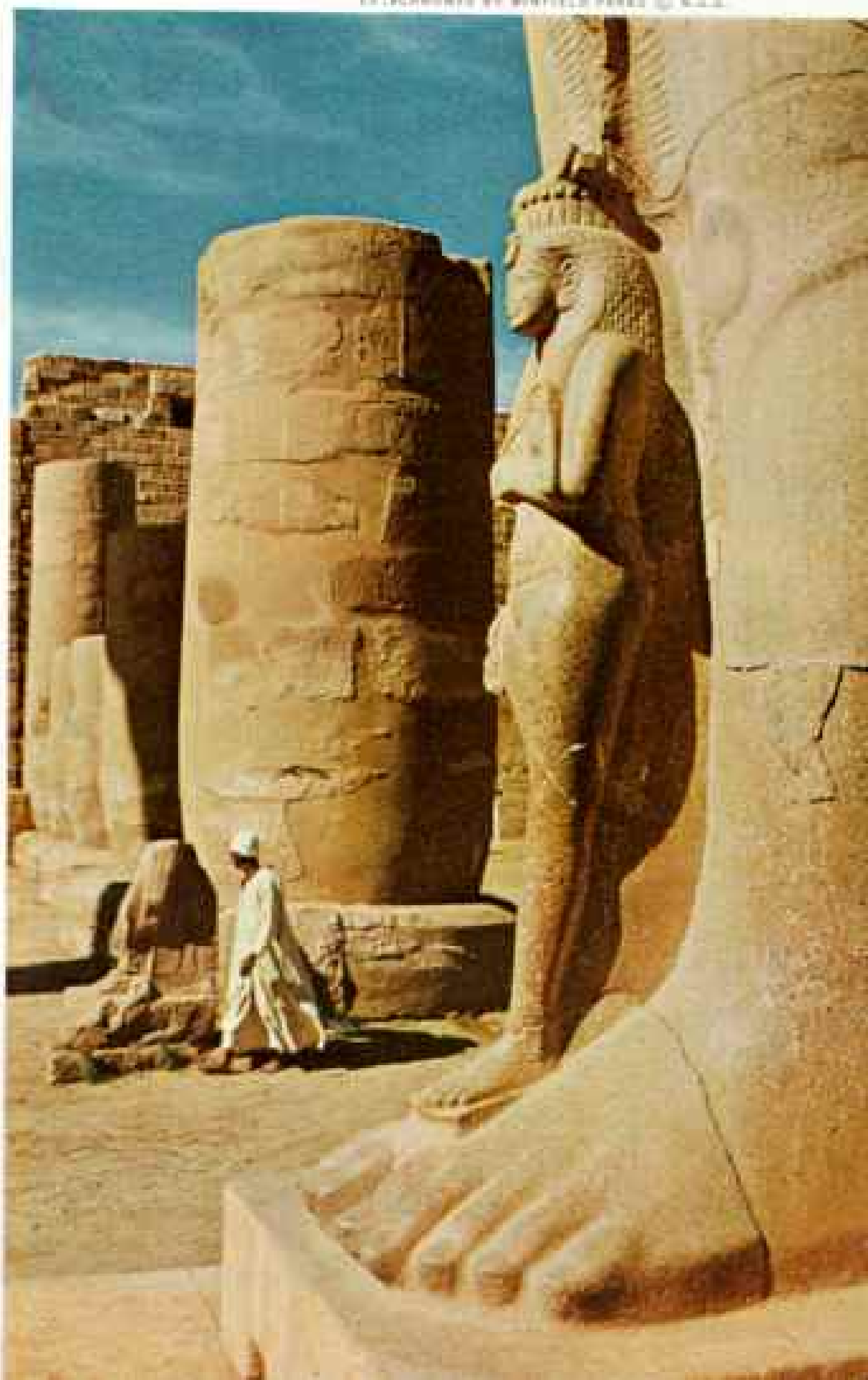
Monumental majesty of Luxor recalls the golden age of Egypt’s power under Amenophis III in the 14th century B.C. A staff of 2,623 slaves once served the 853-foot-long temple. The great colonnade, seen through a window of the Mosque of Abu’l Haggag, has provided a landmark for Nile voyagers through the centuries. The medieval mosque fills a corner of the forecourt of Ramesses II.



Sunlight plays upon paintings in the 3,000-year-old tomb of Menna, a nobleman. Silvery foil catches beams reflected from a mirror just outside the tomb.

Colossi and columns at Karnak reduce man to Lilliputian size. The conceptions of Egyptian architects “are those of men a hundred feet high . . .” wrote French Egyptologist Jean-François Champollion.

ESTABLISHED BY WINFIELD PARKE © N.E.E.





**Speedy hydrofoil *Cleopatra***, one of three such boats named for queens of Egypt, skims the Nile between Aswan and Abu Simbel. Planing the water on metal foils at 35 knots, the boats make the round trip in 12 hours. Palm trees rise from the river's flood.

**Egyptian Huck Finn** cavorts on the Nile in a tin boat fashioned from discarded gasoline cans. Like his American counterpart in Mark Twain's novel, this youngster claims the river as his personal playground. He paddles with pieces of metal tied to his hands.





handlers who almost mobbed us in their business zeal.

As a navigator, Irving was fascinated by the temple's version of the heavens, carved on the stone ceiling of the great hall. There above us, Nut, goddess of the sky, spanned the heavens with her body. Ancients believed she swallowed the sun at night and gave birth to it each dawn. Though the idea was fanciful, one felt great respect for those early astronomers who had conceived the unit of a year based on the 24-hour day and on the rising of Sirius, the Dog Star.

Outside, on the temple wall, we inspected one of the few known representations of Cleopatra, shown here with Caesarion, the son she bore Caesar. It was disappointingly conventional and did not suggest the

fabled beauty of that ancient *femme fatale*.

Ever since Cairo, we had marveled at one particular cargo floating past us daily. Mounds of cream or gray-pink water jars lay stacked as neatly as supermarket displays; ten feet high on felucca decks. Other pots hung precariously overside in great rope nets that often touched the water.

We finally found the source of the *ballas*—Arabic for this type of pot. It was the town of El Ballas—in our translation, "Potsville."

With a villager as guide, we set out on a two-mile hike from the river toward the pot-colored heights that provided the clay.

In the huts where the work was being done, we watched one potter whose slender fingers at the foot-powered wheel miraculously shaped the clay into graceful forms. With incredible speed and skill, he produced a perfect pot every two minutes.

Truly this was Potsville—throughout the village, broken jars of all sizes were built into walls rather than being cast aside. Beyond the huts, large dark mounds—the firing kilns—erupted thick black smoke and cast a strange, infernal glow on stokers who fed the flames with dried cornstalks.

#### Victor's Ship Displays Grisly Trophy

*Yankee* had sailed 450 miles south from Cairo, and now she re-entered the world of the tourist briefly at Luxor—ancient Thebes. It was to the waterfront of Thebes that conquering Pharaohs returned from Asiatic and Nubian campaigns with thousands of captives. In one instance the defeated leader hung lifeless and head downward from the bow of the emperor's vessel.

Here at Luxor, Mildred and Victor Nelson left us to complete their journey in one of the picturesque paddle-wheelers that travel this part of the Nile. Happily, their places were filled by Gil Grosvenor, a NATIONAL GEOGRAPHIC Assistant Editor, and his wife Donna. Ted Zacher, who once sailed around the world with us, made a third addition.

In the god Amun's greatest temple at El Karnak, not far outside Luxor, we wandered for hours amid almost unbelievable grandeur (pages 608-9). On bicycles rented for the occasion, we set out well before dawn, pedaling down the broad avenue of sphinxes in the knife-edged cold of an Egyptian winter morning. We entered Karnak's great stone gates and climbed the 142-foot-high entrance pylon to watch the sunrise.

Faint fingers of light grew out of the east and brushed the distant mountains to pink





above the pale sands. Sunlight tipped a nearby obelisk, and then dawn crept in among Karnak's columns like a gentle tide among giant pilings. By the time we clambered down, sunlight had filled the temple, and we ate our breakfast in the warmth of the new day.

In the late morning, the Grosvenors and Ted went off in search of Karnak's famous stone carving of the sacred scarab of fertility. Legend maintains that all young married women who want children have only to run around the scarab seven times and shortly will find themselves expecting. When the three returned, Donna seemed a bit winded, and I asked what she'd been doing.

"Running around the scarab," she replied, laughing. "Between Ted's taking movies and Gil's taking stills, I made about thirty round

trips. I'm sure of quadruplets, at least!"

In the huge necropolis, the Valley of the Kings, we sometimes spent whole mornings descending hundreds of feet into tombs whose remoteness had failed to discourage thieves. The plundering of these tombs often began so soon after burial that they surely were "inside jobs."

Tutankhamun's tomb is the only one at Luxor that archeologists have found largely intact. In 1922 its treasures were reported to the world.\* The unbelievable wealth of gold and jewelry in the tomb of a teen-age Pharaoh gave some idea of the incredible riches stolen from tombs of older, greater kings.

The Pharaoh's tombs were equipped with

\*See "At the Tomb of Tutankhamun," by Maynard Owen Williams, NATIONAL GEOGRAPHIC, May, 1923.



Egypt builds again on the scale of the Pharaohs: the Sadd el Aali, or High Dam, at Aswan. It will contain enough material to erect 17 Great Pyramids and will increase Egypt's irrigated land by 1,700,000 acres.

Blasted out of solid granite, this diversion canal will carry the waters of the Nile. Where the High Dam will cross the canal, rock blocks the channel, but spillway tunnels, seen behind a facing of concrete-and-steel construction, will let water through and control its flow (painting, next page). A workman replaces his shoes following a respite; another (above) toils through December temperatures that reach as high as 90° F. Clouds of powdered rock diffuse powerful lights during the night shift (below).

EXTACHROME (BELOW) AND HODACHROME BY WYFIELD PARKER © N.A.A.



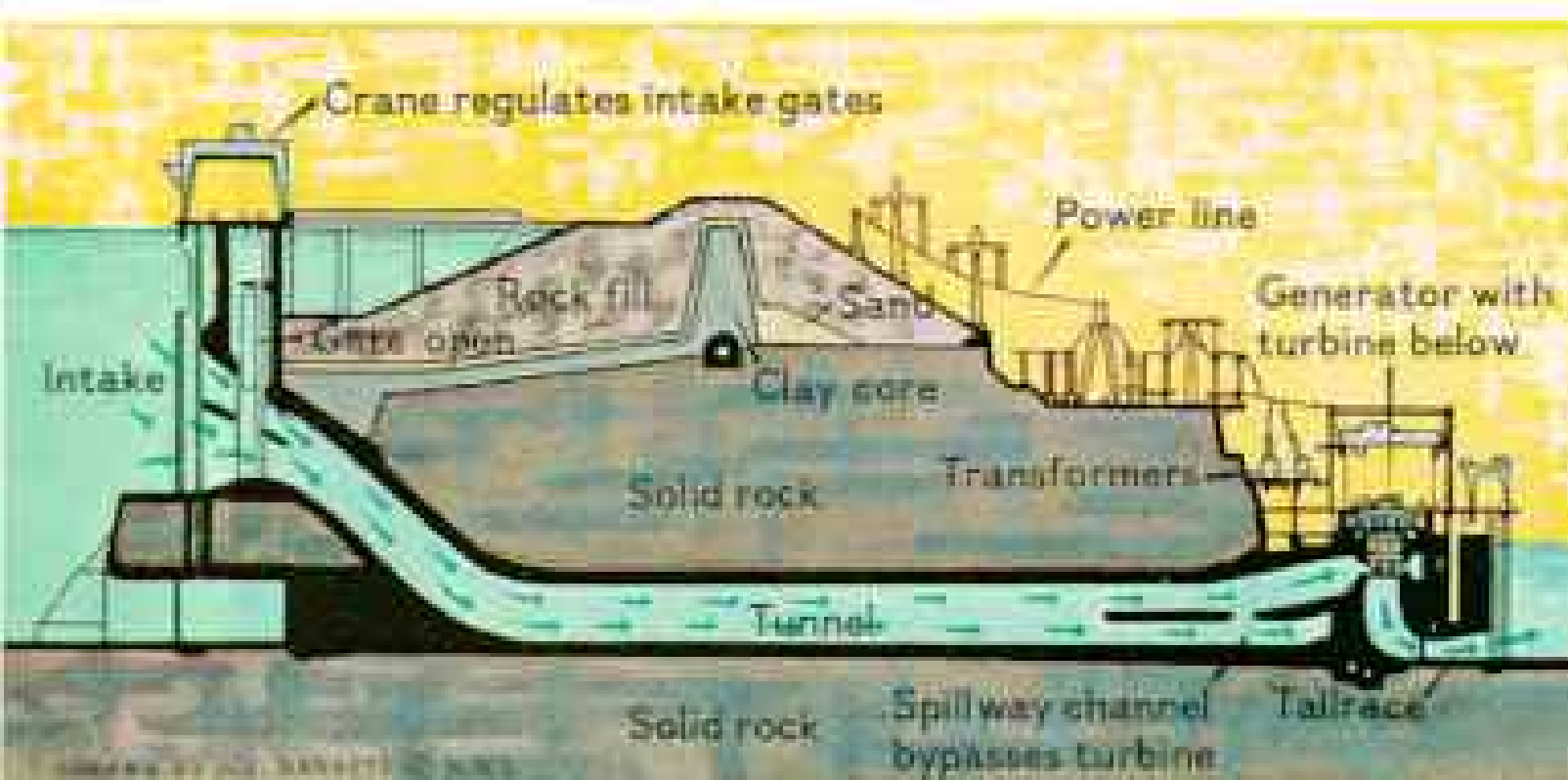


## DAM DIMENSIONS

Length	11,811 feet
Height above river bed	364 feet
Base width	3,215 feet
Crest width	131 feet

Nile flows north

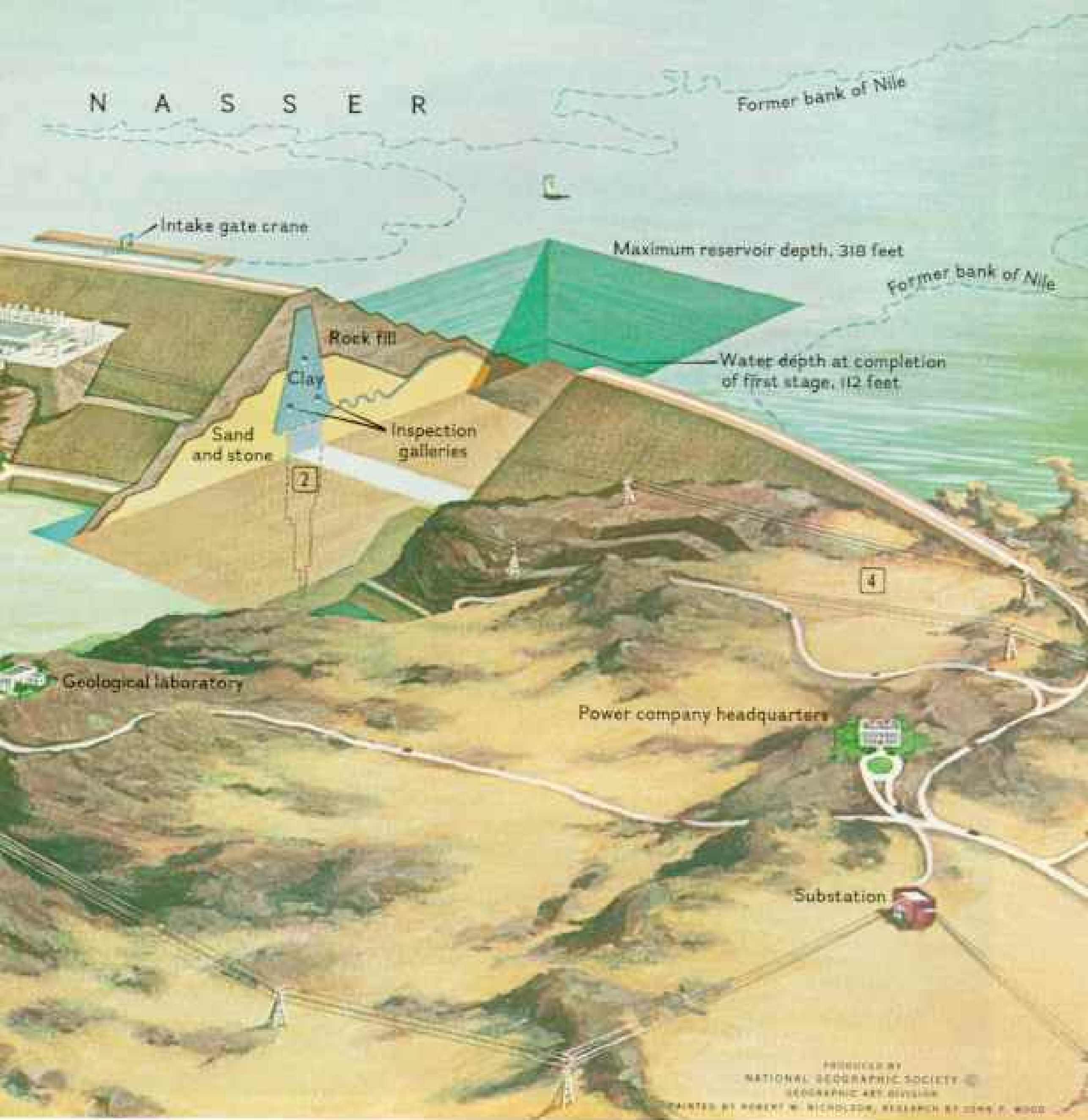
## High Dam at Aswan: Egypt's



THROUGH THE AGES, men have deplored the caprice of the Nile. "If he is sluggish the nostrils are stopped up," complained the ancients, "and all men are brought low. The offerings of the gods are diminished, and millions perish from among mankind."

But no more. The dream of Pharaohs to regulate the Nile's annual rise and fall will become reality when the United Arab Republic completes the world's tenth largest rock-fill dam—the Sadd el Auli at





## 20th-century colossus

Aswan. This painting by NATIONAL GEOGRAPHIC staff artist Robert W. Nicholson depicts how the High Dam should look by 1970.

The Sadd el Aali takes form in two stages. From 1957 through 1964 earthmoving machinery and laborers bearing baskets of sand built upstream and downstream coffer dams (not shown). Engineers blasted a diversion channel (1) through solid rock east of the river, leaving a core along the dam's axis (diagram opposite). Six tunnels bored through the core carry Nile waters; 230-ton gates control the flow.

The second stage of construction will include sinking a mortar curtain (2) to bedrock to prevent

water seepage, then rearing the huge pyramidal dam to its full 364-foot height. Twelve turboelectric generators in the station (3) will ultimately produce ten billion kilowatt-hours annually, and power lines (4) will link generators with Cairo. Maintenance structures (5) and homes for personnel stand on the bluff above the Nile. Pier (6) includes rail terminal and docks for lake shipping.

Blue expanse of Lake Nasser will average six miles wide and extend 310 miles, with 30 percent of its length in neighboring Sudan. Engulfing many ancient wonders, the lake promises a modern miracle: vast sweeps of desert turned green and bountiful by reservoir waters.





electric lights, but light of a different sort was provided for us in parts of the nobles' tombs. Perhaps a similar technique was used by the artists who decorated the chambers. Our guide would prop a large mirror in the sand near the door of a tomb to reflect sunlight into the interior. Then the tomb guardian would precede us with a large piece of framed silvery foil. Holding the foil to catch the sun's rays from the mirror, he would cast a surprising glow on the murals (page 609).

Leaving Luxor, we steered upriver once more. As we neared the town and temple of Idfu, a large sandbar appeared off our starboard bow. A local ferry captain assured Ahmed that he could show us a landing just upstream. Instead, he promptly put us aground.

"We're completely stuck," Irving announced, and he shut off the engine. "Ahmed, ask the captain if there's a tug available to pull us off."

Of course the answer was no. The river was falling and so was night. We had to get *Yankee* off now.

#### Old Sailors' Chant Frees *Yankee*

With the dinghy, we carried anchors out to deepwater and hove in on strong lines with our electric winch. She wouldn't move, so we tried another trick.

We rigged a five-part dacron tackle to the larger anchor line. "Now everybody heave together on the word," Irving announced. Muscles strained on the second syllable of the



**Cloud of sail** carries the boat of the Begum Aga Khan, widow of the Aga Khan III, past her villa and her husband's mausoleum at Aswan. During a summer visit to her native France, the Begum (below) ordered the sail, sketching its design for the sailmaker. A winter resident of Aswan, she invited the Johnsons and their guests to tea at her villa, Nur el-Salaam, or Light of Peace.

Her husband, leader of the Ismaili Community, or sect, of Islam, planned his tomb to dominate a desert height. Thousands of Ismailis from 17 countries attended the entombment in 1959. The Aga Khan claimed direct descent from Fatima, daughter of Mohammed. The Fatimid Caliphs ruled Egypt from A.D. 969 to 1171.



PHOTOGRAPHS BY SILBERT W. GROSSMAN © A.S.S.

old sailing ship call, "Haa-HEE." Pulling in unison got results, though the motor helped, too. Painfully, we pulled *Yankee* free. We sat down to a late dinner with raw hands, but no little satisfaction.

At last we came to the site of the old Aswan Dam. Five miles upriver the new High Dam is being built with Soviet aid (pages 612-15). Completion of the old dam in the early 1900's greatly lessened the perils of navigating the First Cataract, though a rock-studded stretch of water remains.

By 2300 B.C. Egyptian engineers had cleared channels through the heretofore impenetrable First Cataract, opening a gateway to the south and all the treasures of black Africa—slaves, ivory, ebony, incense, ostrich

feathers, pygmies for Pharaoh's amusement.

But Aswan and the First Cataract mark more than a change in land and resources. There is a change, too, in language, culture, and physical characteristics of the people, for it is here that Nubia begins. Nubians are famous for their honesty and cleanliness. In appearance, their darker skins set them apart from most other Egyptians.

#### Man-made Flood Displaces Nubians

Unfortunately the Nile Valley has never treated Nubia kindly. South of Aswan, the desert closes in on the river, narrowing the space for cultivation to a matter of yards in width. Now, man's hand joins with nature to deal Egyptian Nubia a final blow: After

Aswan High Dam is completed, the Nile will ultimately back up 310 miles to the south, drowning all Egyptian Nubia and part of Sudanese Nubia as well.\*

Nubians have known displacement before. The first dam at Aswan was completed in 1902, to control the Nile floods and reserve water until needs of the dry season called for its measured release through irrigation channels. For the great benefit to Egypt's millions, the Nubians—who were few by comparison—had to sacrifice their homes to the rising waters.

When the dam was heightened in 1912, Nubians moved once more, and again in 1933. The new High Dam will raise the river 200 feet, creating a lake upriver the size of Delaware. This time there is no moving above the waters. The people must leave Nubia.

At the First Cataract, *Yankee* found a choice berth below the rapids, and we, in a non-Christian locale, celebrated Christmas. I had found a turkey in the market. Irving

contributed an expendable chart to be cut into Christmas place mats. Ted Zacher miraculously produced a Christmas tree of evergreens from the bank, and we festooned it with red-paper cutouts of camels and Egyptian goddesses (below).

#### Ahmed Commands the River to Rise

On Christmas night *Yankee* went aground—not through any fault of Irving's but because the Nile simply deserted us. As we lay at anchor, the river level gently subsided and left us firmly stranded on a rock.

The reason for our flood-in-reverse was the old Aswan Dam upriver. The engineers for some reason had closed the sluice gates and blocked off the normal flow. But what to do about *Yankee*?

It was then that Ahmed had his inspiration. Demanding to be put ashore in the dinghy, he disappeared.

\*See "Threatened Treasures of the Nile," by Georg Gerster, NATIONAL GEOGRAPHIC, October, 1963.



Christmas in Egypt sees a traditional turkey on *Yankee's* festive board. Ted Zacher (right) found the greenery and trimmed it with homemade decorations. NATIONAL GEOGRAPHIC photographer Win Parks's Christmas card to the crew, on the shelf behind Mr. Zacher, consists of a booklet of day-by-day sketches of the voyage.

Source of splendor: Aswan granite. *Yankee* ties up where workmen once quarried stone for Pharaoh's temples. Seam of small holes on the rock marks an unfinished cut; into such pits masons inserted wooden wedges and soaked them with water, causing expansion that split the stone. Captain Johnson dangles a foot in a natural pothole.







## Nubia: lost forever

**T**O PAY THE PRICE of progress, Nubians must pack up their belongings and leave the land of their ancestors for new villages, some out of sight of their beloved Nile. Egyptian Nubia, extending from Aswan to the Sudanese frontier, will be changed forever with completion of the new dam. *Yankee* on its voyage upriver visited a deserted village (right), soon to be inundated by Lake Nasser, one of the largest man-made lakes in the world. Only the cry of a few abandoned animals broke the hush of the ghost town.

Awaiting transportation to a new village in the Kom Ombo district, a Nubian (below) says goodbye to his dog, because the ferry has room only for people, their necessary household goods, and farm animals. Children, unhampered by the ties of tradition, romp the streets of the new village of Dabud (below, right). Already the desert turns green as pumps and canals lift water from the Nile to wet the surrounding cane fields.











Sailing through the desert, *Yankee* prowls a byway of the Nile that wanders into nowhere. Here rippling waters end in wavy dunes. A shepherd and his meager flock have speckled the sands of the far shore with footprints.

Mighty Pharaoh in stone smiles on visitors to the rock Temple of Garf Husein. Archeologists recently cleaned this statue of Ramesses II, who had his countenance carved in temples from the Delta to the Sudan. Dedicated to Ptah, chief god of Memphis, "father of the mighty fathers, father of the beginnings, he who created the sun egg and the moon egg," the temple will soon disappear under Lake Nasser. Some small reliefs may be saved.



REBACHENIS © S.A.L.

In half an hour he was back aboard *Yankee*, all smiles. "The Nile will rise again," he announced loftily. "I, Ahmed, have commanded it."

By now Ahmed was a close friend, and we all pounced on him. Finally he broke down.

"I just found a telephone, called the dam and told them *Aruusa* was stranded," he said, grinning. "I happened to mention our friend Dr. Hatem, the Minister of Culture in Cairo, and they were very understanding."

Sure enough, in a few hours, the Nile obeyed Ahmed's command, and *Yankee* rode gently at anchor once more.

The day after the stranding, we made a trial run through the Cataract with Ahmed's friend Osman Ghaleb, captain of the paddle-wheeler *Delta*. Presently Osman asked me for a piece of bread, some salt, and water.

"We always throw it overboard at this point," he explained, "as a gift to the Sheik of the Cataract."

If there is a Sheik of the Cataract, he must have enjoyed watching us. *Yankee* herself seemed to have the time of her life, and in Irving's hands she gave us a real bronco ride through the swift water.

#### Red Rose Honors Memory of Aga Khan

We were about to call it a day when Osman surprised us again.

"Would you like to call on a friend of mine, the Begum Aga Khan?" he asked. "She has a villa beyond Elephantine Island there."

At Osman's direction, we steered for the island and on to a large house on a bluff. As we drew near, we saw a figure in white waving to *Yankee*. In a few minutes we were having tea on the Begum's terrace.

The Begum, a tall, beautiful Frenchwoman, held a royal place in the world during the life of her husband, the





Racing time, archeologists try to unravel the mysteries of Gebel Adda before the inundation.

Aga Khan III, Imam of the Ismaili Community, a Moslem sect. At his death, she supervised construction of the stately mausoleum that stands high above her winter home (pages 616-17). Each morning, we had been told, she climbs the hill and places a single red rose at her husband's shrine.

#### Begum Performs Navigation Feat

Time passed delightfully on the terrace, but finally darkness fell. "May we stay at anchor where we are?" Irving asked the Begum.

"Of course," she answered, "but if you want to get back to Aswan tonight, I will pilot you. I have been through the Cataract many times at night, and I know every rock."

Soon afterward Irving was at the wheel, following orders delivered with a charming French accent. *Yankee's* volunteer pilot did a perfect job, and we reached our anchorage without trouble.

Next morning the chief Egyptian engineer for the Aswan High Dam gave us some construction figures. "We are now building the rock-and-earth base for the dam," he said. "This project requires moving 54,400,000 cubic yards of material, and the finished dam will stretch 11,811 feet—more than two miles—across the river, and rise to a height of 364 feet above the riverbed. During the eight years from the start of construction to completion of the dam—the base, the actual dam above it, and all—men working in three shifts around the clock will have put in more uninterrupted man-hours on a single project than ever before in history."

"It sounds like a Pharaoh's order for a pyramid," I remarked, and our host smiled.

"Quite right. Our High Dam may not be the intricate job of fitting stone that the pyramids were, but in volume it will be 17 times the size of the largest one."



REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHER WILFELD PAGES © N.G.S.

Domed tombs of early Christians dot the desert.

"How does Egypt gain?" Win Parks asked.

"By an increase of 30 percent in our irrigated land—that is, 1,700,000 new acres," the engineer said. "Plus 10,000,000,000 new kilowatt-hours of electricity a year."

In the diversion tunnels that will detour the Nile around the construction site, we saw work crews carrying away loads of rock and rubble in baskets almost exactly like those the Pharaoh's workmen had used. Other men, in startling contrast, operated the latest earth-moving machinery.

Modern machinery aside, the High Dam construction crews enjoy one advantage denied most other Arab workmen. We prepared to leave Aswan at the start of Ramadan, the Moslem season of fasting and prayer, when the faithful take no food between dawn and sunset. Such is the High Dam's importance to the United Arab Republic that no disapproval attaches to workmen who eat a noon meal



Singing fills the desert air as Gebel Adda workmen cart sifted sand from the dig. The American Research Center and National Geographic Society support the excavation of this fortified town, an early Christian community.

in order to keep the job going at full speed.

*Fankee* now turned her bow once more into the Cataract channel, climbing in a series of locks to the waters behind the old Aswan Dam. Beyond we entered Nubia.

#### Silent Village Awaits Oblivion

Here we began to see abandoned villages, doomed by the new dam to lie hundreds of feet beneath the Nile. Although the man-made flood is months or years in the future, the Government of the U.A.R. has already begun resettling thousands of Nubian families.

At one riverbank village, we edged in toward the deserted huts and ran our mooring line in through a window and out the door.

There was a haunted quality to the silent streets and buildings; they had already become ghost towns (pages 620-21). In most houses, not a movable possession remained. In others, the owners must have been in



EXTRAORDINARY FEELING AND KOSCHIRIBES NATIONAL GEOGRAPHIC SOCIETY

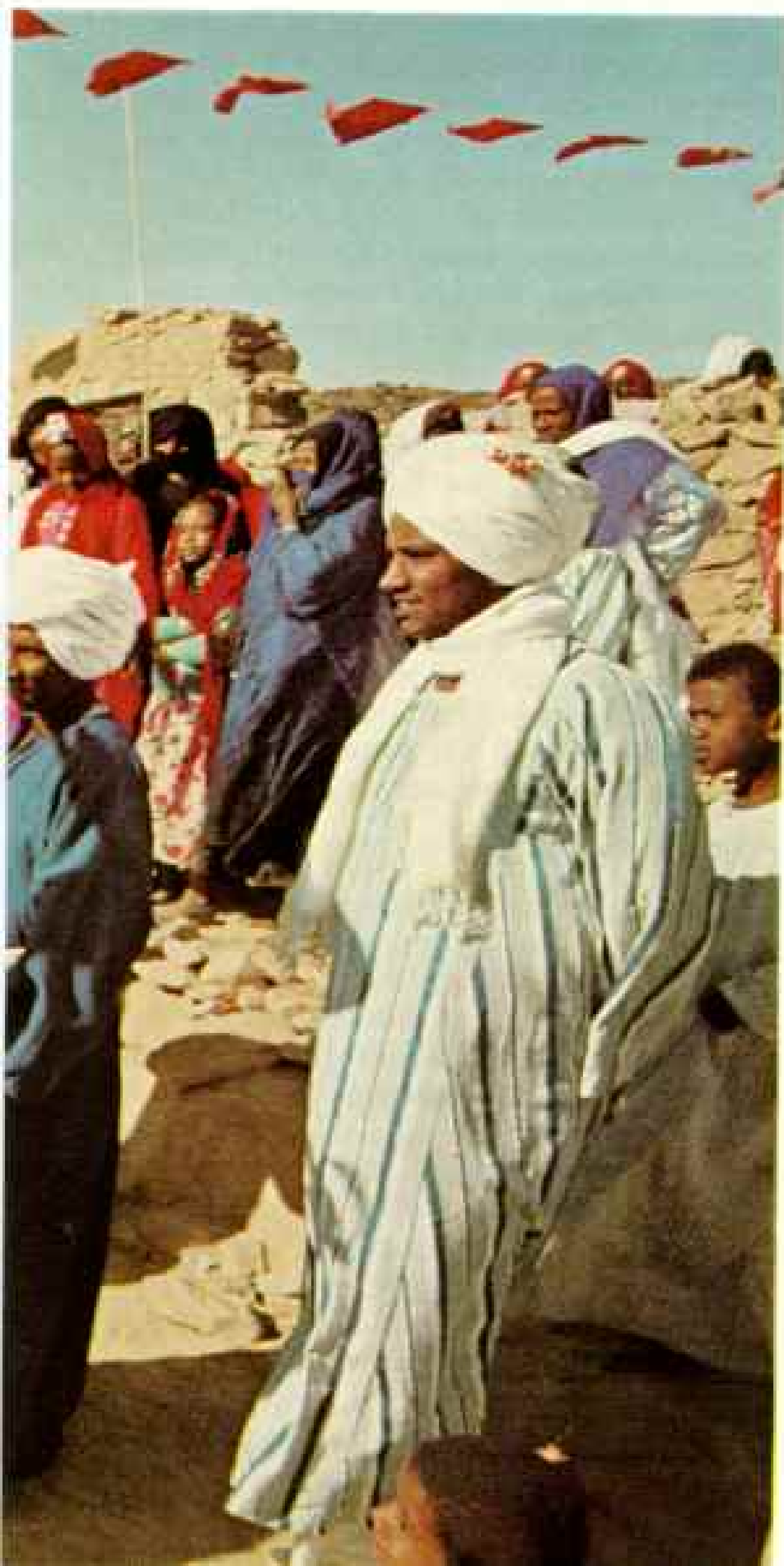
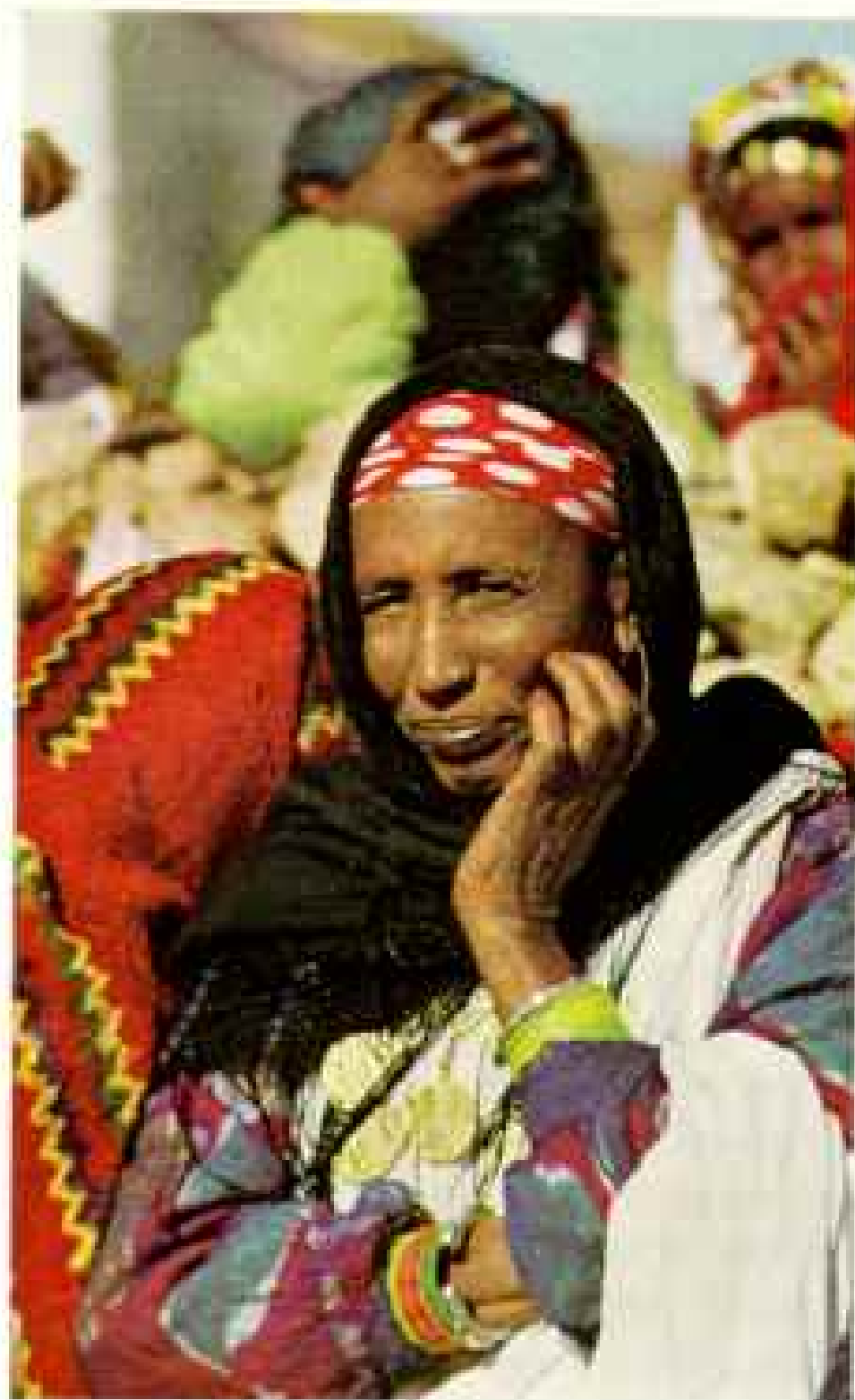
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## El Umbarakab's final festival

DRESSED in all their finery, Nubians of El Umbarakab celebrate a *mulid*—anniversary of a Moslem saint. These villagers honor their local saint, a sheik, at his tomb. To beating drums and jangling tambourines, a dancer (below), his shield held high, gyrates for his friends. When he tires, another takes his place. The women, many with tattooed lips (right), discard somber everyday dress for startling reds, golds, and greens. They come to watch, not to participate. Following the festivities, the sacred green cloth from the sheik's tomb was cleansed in the Nile. *Yankee* lent a hand, towing a decorated boat (left) with its precious cargo to the appointed washing place. Like other Nubians, the citizens of El Umbarakab must move to a new village in the Kom Ombo region. There they will build another tomb for their sheik.



a hurry or distracted, for they abandoned items few poor families can spare: cooking pots, water jars, occasional bits of clothing. From the rafters overhead, rope hammocks used for storing extra jars swung empty in the breeze.

In one house we found a pathetic remainder, a child's collection of shells neatly arranged in a box. It was a forlorn sight, somehow reminiscent of another silent town we knew, Pompeii.

Farther upriver, we passed villages still in the midst of moving and others with only piles of chests and boxes waiting on the bank for a barge or felucca. Once we passed six men guarding a flock of sheep—the last of one village's refugees.

Weeks before, downstream from Aswan, we had visited the resettlement village of Dabud, one of the government-built communities for displaced Nubians. We had found it neat and comfortable but distressingly monotonous: uniform block-size living compounds separated by streets at exact right angles, and with not a shade tree to be seen.

Some of Dabud's residents had sailed formerly as crew members aboard ocean-going ships, and a few had been to the United States west coast. With official Egyptian guides standing uncomfortably close, we asked the villagers how they liked their new



home. There was a second's pause, and then one said gravely, "Your San Francisco is a beautiful city."

It was at Qasr Ibrim, the site of an old Roman fort, that our Nile expedition nearly came to an end. The dark outline of fortifications extending high above a cliff proved an irresistible come-on to *Yankee's* company. So in we turned, and up we climbed.

#### Thunder of Rock Raises Alarm

Irving disappeared toward the topmost wall of the old fort, rising above a 300-foot bluff over the river, to take movie films of *Yankee* far below. I was inspecting a lower wall and the others were somewhere behind me, when I heard a sudden thundering of rock above me.

I guessed what had happened. The ancient wall had given way, and Irving had fallen in the crash of stones. I ran toward the sound and found my husband lying face down in the dirt, jagged rocks from the wall piled over him like a cairn.

"Help!" I shouted as I struggled to pull the rocks off his back and head. By the time I yelled again, the others were there. Irving groaned, a welcome sound. Blood was streaming down his face through the dust of the ages. We moved him as little as possible, just enough to place his head in my lap and let us see how badly he was hurt (opposite).

The look on the others' faces was hardly reassuring. Gil raced down the hill for bandages, medicine, and water. Donna and I cleaned the worst gashes as best we could. In places the rocks had cut right to the skull, and we knew we must get him to a doctor.

My heart sank—the nearest one was probably at Gebel Adda, an archeological site a day's run upriver, where Americans were working. And then suddenly Ahmed was shouting from the river below, where he had been questioning some passing Nubians.

Incredibly, there was a small Egyptian hospital just across the river, the only one in 200 miles of Nubia. If we could get Irving to it, we should be able to get help.

It seemed hours before the Egyptian doctor arrived. There was a bad moment getting the stretcher aboard *Yankee* over a jury-rigged gangplank with poor footing and jagged rocks below. Then, with her skipper lying very quiet on the foredeck, *Yankee* served as his ambulance across the Nile.

The desert hospital was primitive and un-

washed. Sterilizing instruments meant putting them in water in a pan made from a gallon tin, black with soot on the outside, and bringing the water to a boil over an old primus stove on the hospital porch crowded with waiting patients. Ahmed stood by through the operation while I paced the hall. The sooty pan made many trips back and forth past me.

There was no skull fracture, so 16 stitches, antibiotics, glucose, and Irving's constitution would pull him through if nothing went wrong. He wore a turban of bandages worthy of any Arab, and other bandages blossomed all over him.

Comic relief—comic only as I look back on it—was provided by the local policeman who appeared at the hospital and questioned each member of our crew:

Was *Yankee* a happy ship? Did the crew like its skipper? What about the wife, did she often quarrel with him? And where—the constable was all elephantine cunning—was *she* standing when her husband "fell"?

If I had not been so worried about Irving, I would have sympathized with our budding Sherlock Holmes. His first international case of attempted murder, and the foreigners were obstructing justice!

Finally we carried Irving aboard *Yankee* with strict orders from the doctor that he rest a full five days. Gil and Ted, veteran sailors, took over and conned *Yankee* expertly upriver.

Irving was glad to be back in his own bunk—at first. But in a day and a half he was sticking that turbaned head out the hatch, complimenting Gil and Ted on their navigation, already taking command again. We tried to tell him he was still our patient, but he felt that he was once more our skipper.

#### Archeologists Race the Rising Waters

"Strange that we've seen hardly any archeologists' digs," Donna said, looking over the empty Nubian landscape.

We knew that Egypt has encouraged experts to come to Nubia before the Aswan High Dam drowns its wonders forever.

The short time left for so much inquiry had rung emergency alarms in the back rooms of museums in the United States, Brazil, India, France, Russia, Australia, and, of course, the U.A.R.—in all, 28 nations representing six continents. Archeologists from many of these lands work side by side in Nubia today.

Donna's question, and our own curiosity, were answered at the American excavations

Misfortune strikes at Qasr Ibrim. While photographing an old Roman fort atop a 300-foot bluff, Irving Johnson tumbled 12 feet when part of the wall on which he stood collapsed. Mrs. Johnson, blouse spattered with blood, cradles her husband's head in her lap. Donna Grosvenor wets a cloth to clean the gravel from Captain Johnson's face. Rocks in the foreground came crashing down with the author; many landed on him. Fortunately, the only hospital within miles lay just across the river at Ineiba, and the skipper was rushed there for treatment.



Swathed in bandages, the *Yankee's* captain recuperates in the Ineiba hospital. He broke no bones, but his gashed head required 16 stitches. Here Mrs. Johnson and local officials, including a uniformed policeman, listen to the author's account of his fall. Investigating every possibility, the police asked about the domestic relations of the Johnsons—perhaps the captain's fall was not an accident? They left assured that all was well.

REARRANGED BY NATIONAL GEOGRAPHIC SOCIETY





in Gebel Adda, where archeologists, supported by the American Research Center at Cairo and the National Geographic Society, are uncovering a post-Pharaonic community (pages 624-5). Gebel Adda's architectural and human remains may help to solve some of the riddles of Egyptian culture and anthropology.

"Gebel Adda is an unusually exciting site," Nicholas B. Millet, the team director, told us as we toured the excavations.

"For one thing, Gebel Adda was a sizable city by ancient standards, and for another, its population appears to have remained remarkably stable down through the ages—no one yet knows quite why." He smiled. "But with time, we may learn all that and a great deal more."

Soon we were meeting members of Mr. Millet's team, a truly international crew comprising six nationalities: American, Swiss,

British, French, Swedish, and German.

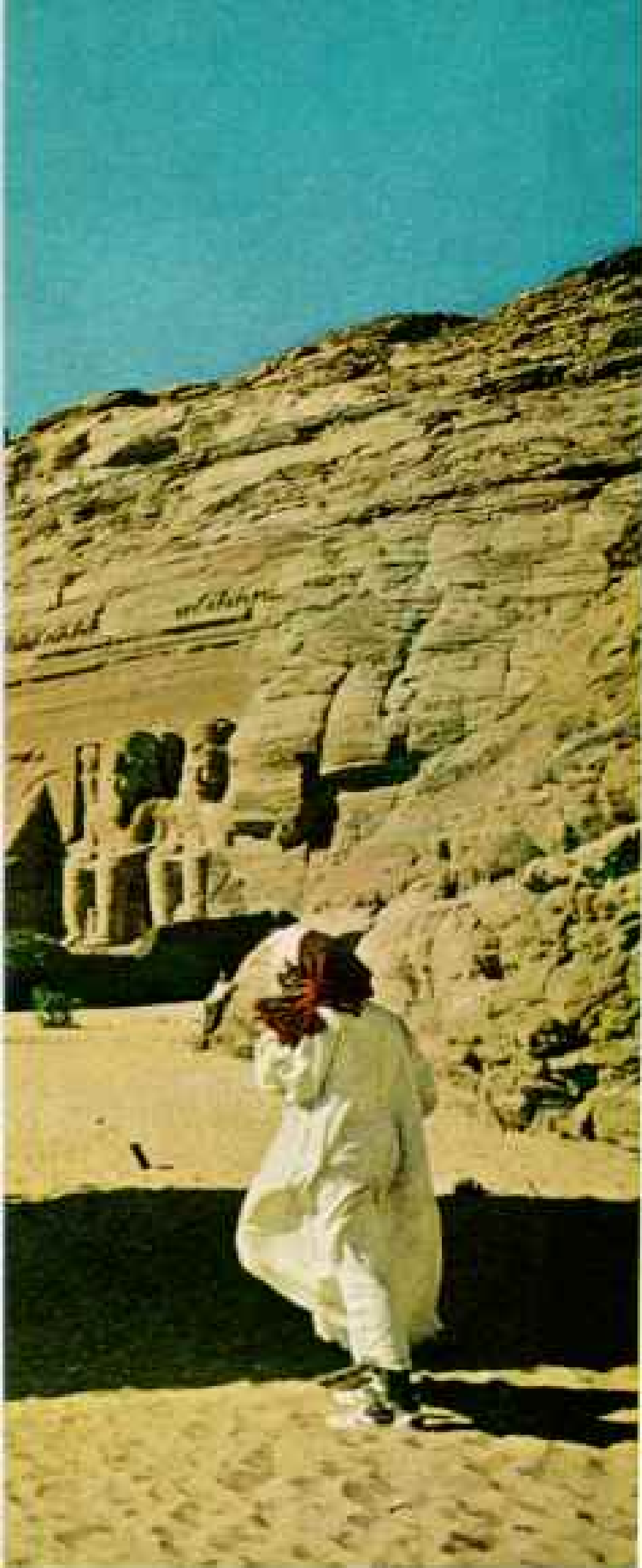
Our new friends showed us one of Gebel Adda's surprises—early Christian graves with bodies so well preserved by the dry desert atmosphere that one could hardly believe they had endured more than 14 centuries. We left Gebel Adda hoping that the Aswan High Dam would give the archeologists enough time to unlock the city's secrets.

#### Colossi to Move Uphill

A brighter—and less watery—future looms for another famous landmark: the 3,200-year-old cliffside wonder of Abu Simbel, the vast and commanding monument that Pharaoh Ramesses II built to preserve his glory.

Nothing we might have read or heard, no photographs or motion pictures, could have prepared us for the thrill of that first sight of the towering stone colossi representing





Ramesses II. Carved from the face of a sheer cliff, the awesome figures are seated beside the entrance to the cavernous temple behind them (above).

Ramesses clearly had his impression on posterity in mind when he built his gigantic memorial. For a time, the High Dam and the rising Nile threatened to upset his plans, but now Pharaoh's immortality is secure. Thanks to donations from many countries, much of Abu Simbel will be preserved for the world's benefit by lifting it above high water. Electric drilling and sawing by the West German firm of Hochtief will cut the massive figures into manageable—but still tremendous—pieces. In six or seven years, the four Rameseses will again command the Nile.

From *Yankee's* decks, we gazed up in awe at the façade of the four colossi, the statues of Pharaoh's family at his knees, and the

Drop landing at Abu Simbel: Irving Johnson sails *Yankee* straight to the sandy shore, swings Donna Grosvenor off the bow. "I didn't even get my sneakers wet," she said.

These gigantic statues of Ramesses II have gazed on the sights of the Nile for 3,200 years. To save them from drowning, an international team of engineers directs cutting the monuments of Ramesses and his queen Nefertari (page 635) into 30-ton blocks for reassembly on the plateau 225 feet above.

At the feet of the Pharaoh, Ted Zacher marvels at the grandly executed statues of Ramesses II lining the south side of the great Hypostyle Hall at Abu Simbel. Wearing the White Crown of Upper Egypt, the figures rise 30 feet. In the foreground a figure of the god of the horizon, Re-Harakhti, strides across the wall.



cornice of sacred baboons above. There is much else to marvel at; inside the temple every statue, every chamber, every column is part of the mother rock; nothing has been brought in. Yet the whole is a proportioned temple rather than a mere cave.

The following evening, the flag of Sudan flew from our crosstrees in place of that of the U.A.R. We had reached Wadi Halfa, Sudan, and the impenetrable Second Cataract.

Here, far from Aswan High Dam, we made friends with a unique casualty of progress. He was an Egyptian barber soon to be resettled from his flood-doomed home in Wadi Halfa. He told us his name over a cup of tea, but it was so unpronounceable we compromised on "Charlie."

Charlie's tale was one of domestic crisis. In good Moslem tradition, he had two wives, each with several children. In Wadi Halfa he had had the good sense to house them on opposite sides of town. The system worked beautifully, with Charlie shuttling between two tranquil households. Then came the High Dam and the program for resettlement.

The government, with more dispatch than genius, plans to uproot Charlie's families and transplant them high above the reaches of expanding Lake Nasser—as next door neighbors. The result promises to be catastrophic. At this point in his story, Charlie shook his head in despair.

"Inshallah," he said, lifting his eyes to heaven. "This, my friends, is progress?"

#### Second Cataract Ends Wondrous Voyage

At Wadi Halfa *Yankee's* journey was ended, a journey that was as marvelous to us as those of the ancient Nile explorers. Those early adventurers had been the first to see this land and to challenge its mighty river. We had been among the last to follow in their wake and see a major section of the Nile before progress overwhelms it. *Yankee's* voyage had given us a ship's log of wonders—some of them enduring, many changing, others soon to be lost forever.

But we had seen them. As an Egyptian might say: "*Al-hamdu lillaah*—Thanks be to Allah." THE END



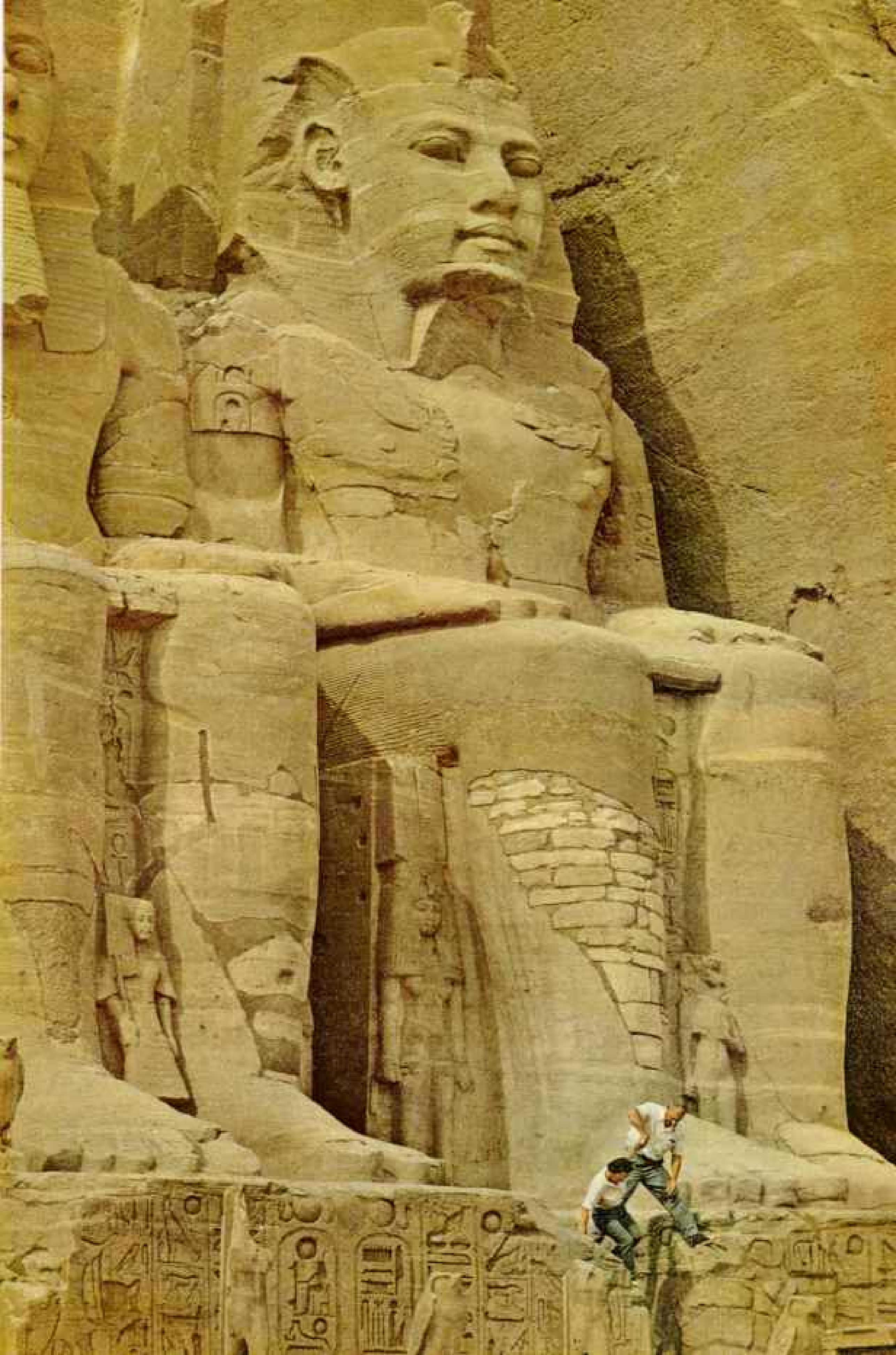
Invincible warrior, Ramesses II tramples a Libyan foe, attacks another. Abu Simbel relief vaunts the vigor of the god-king, who reigned 67 years and regained much of Egypt's empire.

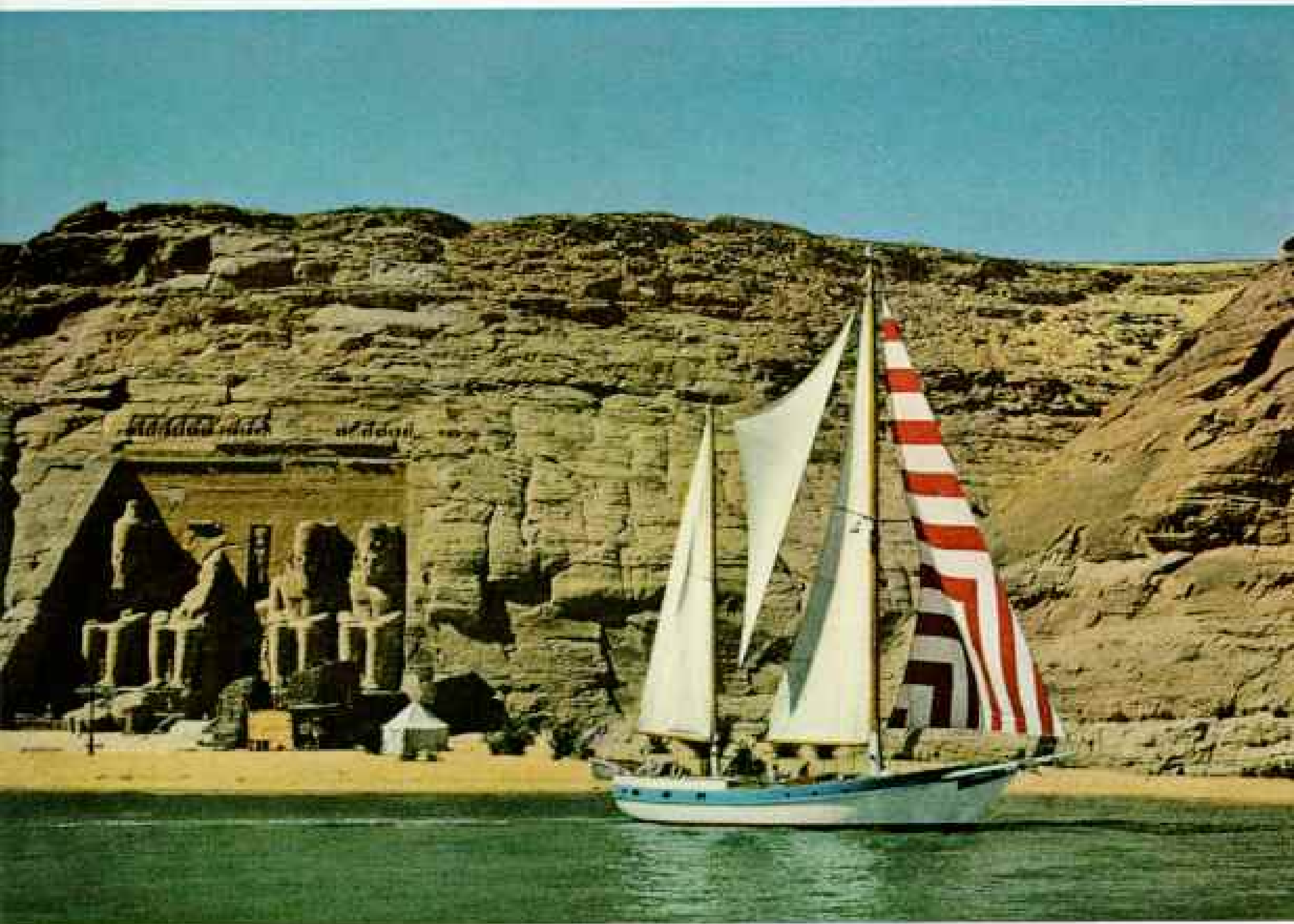
Defiant of the ages, Ramesses II sits enthroned at Abu Simbel. Buried for centuries, the temple revealed but one gigantic head to Giovanni Battista Belzoni, an Italian who began the first excavation in 1817. Not until the 20th century did the temple stand completely revealed, with sand drifts held back by walls at the cliff top.

Beside the legs of Ramesses, patched by modern masons, appear his queen (center) and a son, Prince Ramesses (left), who did not live to reign.

Of all ancient sites in Egypt, Abu Simbel perhaps best captures the imagination of modern man. But the most fitting epitaph is not found here, but on a fallen colossus at Thebes. Diodorus the historian reports the inscription:

*I am Osimandias [Ramesses]  
King of Kings; if any would  
know how great I am, and  
where I lie, let him excel me  
in any of my Works.*





Nile-borne *Yankee* takes a last look at the massive cliff-cut temples of Ramesses II and

## SOCIETY MAPS THE RIVER OF

**A**NCIENT WISE MEN talked of it with wonder: For one moment each year—high noon on June 21, the summer solstice—sunlight shone upon the water of a deep well in Syene on the banks of the Nile.

Some 500 miles north in Alexandria, Eratosthenes, a philosopher of the 3d century B.C., heard of the phenomenon. So he stood a pole upright in Alexandria and at noon on June 21 measured the angle of its shadow,  $7\frac{1}{2}$  degrees—or  $\frac{1}{30}$  of a circle. He knew that, according to Euclid, this equaled the angular distance between Syene and Alexandria; to compute the earth's circumference, he multiplied by 50 the accepted linear distance between the two cities.

Though the philosopher's measurements were imprecise, his concept was sound. The world, Eratosthenes concluded, was approximately 28,000 miles around—an error of only about 12 percent. Thus globular geography was born beside the Nile.

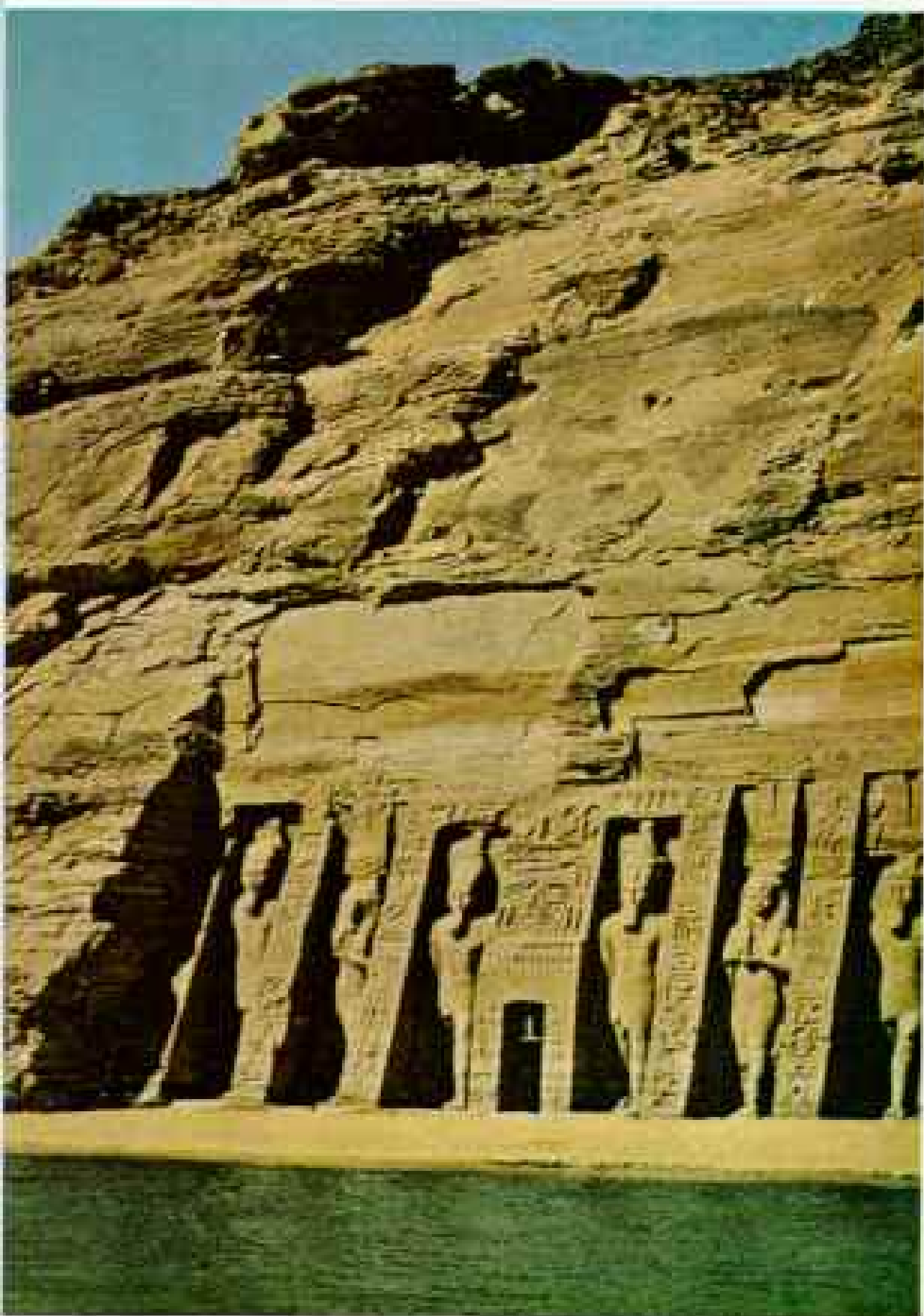
The well has vanished, and ancient Syene now bears another name: Aswan. With its High Dam, the Nileside city again figures in the story of man's progress; both its names appear on the special 11-color supplement map, *Nile Valley, Land of the Pharaohs*,\* distributed to Society members with this issue of their magazine.

### A Chart of Time and the River

The two-panel archeological map, a year and a half in the making, shows 1,850 miles of the world's longest (4,145 miles) river. Notes chronicle Egypt's course through 52 centuries. On the back of the map—together with an index—history ranges from the first known men in the Nile Valley down to the Egyptians of our own time. Society cartographer George

\*Additional copies of the *Nile Valley*—and all other Atlas Series Maps published as supplements to NATIONAL GEOGRAPHIC—may be ordered for 50 cents each, postage prepaid, by writing to Dept. 247, National Geographic Society, Washington, D.C. 20036.





REPRODUCED BY WINFIELD HARRIS © N.A.S.

his Queen Nefertari at Abu Simbel.

## PHARAHOHS

Stuart, experienced in archeology and anthropology, compiled the data and traveled to Egypt to consult scholars in the field.

Nearly every day, discoveries add to our information about ancient Egypt. By 1975 the Aswan High Dam will flood 310 miles of Nile Valley rich in ruins (see "Yankee Cruises the Storied Nile," beginning on page 383). In response to a UNESCO appeal for a "crash" study program, hundreds of sites have been investigated in Nubia alone. In excavations at Gebel Adda, an archeological team, sponsored in part by the National Geographic Society, is studying a community almost continuously inhabited since the 2d century A.D.

The supplement map pinpoints many new finds. At Mendes, in the Nile Delta, archeologists recently unearthed valuable Old Kingdom (2686-2160 B.C.) tombs. Digging into ruins at Qasr Ibrim, excavators turned up early Christian relics, remains of an archbishopric previously unknown to us. An inset

of the Theban area locates a great capital of the ancient world—the city that Homer called "hundred-gated Thebes." Here excavations have revealed a new avenue of sphinxes—detailed on the map—once connecting Luxor with the great temples to the north.

"... The idols of Egypt shall be moved..." wrote an Old Testament prophet (Isaiah 19:1). As if in fulfillment, Kalabsha and Qertassi temples now stand on high ground to the north of their ancient sites where Lake Nasser is rising behind the High Dam. Similarly, the Nubian village of Ballana reappears 147 miles downriver from its old site near Abu Simbel.

### Map Tells of Rosetta Stone

Besides charting Egypt's changing geography, the map notes offer a perspective on Egyptian religion (the worship of Isis continued until the 6th century A.D. on Philae Island), architecture, painting, sculpture, and the mysteries of its language.

An insert summarizes the whole sweep of ancient history from the early nomadic tribes and the obscure first Pharaoh Menes through the wars and splendors of 30 dynasties.

Since Queen Cleopatra's time the Nile has brought nearly 2,000 silty seasonal floods to its valley. Plutarch noted in the 1st century A.D. that the site of Alexandria was once "an island... though it has now been joined to the mainland by a mole." The map depicts the alluvial neck of land where Alexander the Great paced off streets for his city, and "for want of chalk, the soil being black... laid out... lines with flour."

Fascinated by the river from afar, Shakespeare in England wrote of how "the higher Nilus swells" and the "seedsman upon the slime and ooze scatters his grain." The custom persists to this day; cultivated areas, mapped in green, flank the river.

One of countless invaders of Egypt, Napoleon in 1798 pointed to the Pyramids and told his troops, "Soldiers, forty centuries look down upon you." A note marks the place where his men found the Rosetta Stone; it unlocked inscriptions covering some fifty centuries.

An inset shows the Pyramids of Giza and notes that the Sphinx was a natural limestone outcropping quarried for building stone and finally shaped into a figure on the spot.

The map ends at Khartoum, where the Blue Nile and the White Nile flow together—creating the mighty river that nurtured the civilization of Egypt and left to us, in the words of Herodotus, "so many works of unspeakable greatness." THE END



# Shrimp Nursery

SCIENCE EXPLORES  
NEW WAYS TO  
FARM THE SEA

By CLARENCE P. IDYLL, Ph.D.

*Illustrations by National Geographic  
photographer ROBERT F. SISSON*

*STALK-EYED, fan-tailed shrimp huddle in the sand; one tiptoes lightly past his companions. Profitable farming may one day result from research into the mysterious ways of *Penaeus duorarum*, here shown life-size. Commonly called pink shrimp, the species has turned pale gold and brownish in a Florida aquarium.*

★ GOACHROME © N.G.S.

“I WANT to start a shrimp farm.”

As the opening gambit for a conversation, that wasn't bad, but if my companion expected me to be surprised he was disappointed. Many people want to start shrimp farms; this is clear from the fat file of letters in my laboratory at the University of Miami and from the many conversations I have had on the subject.



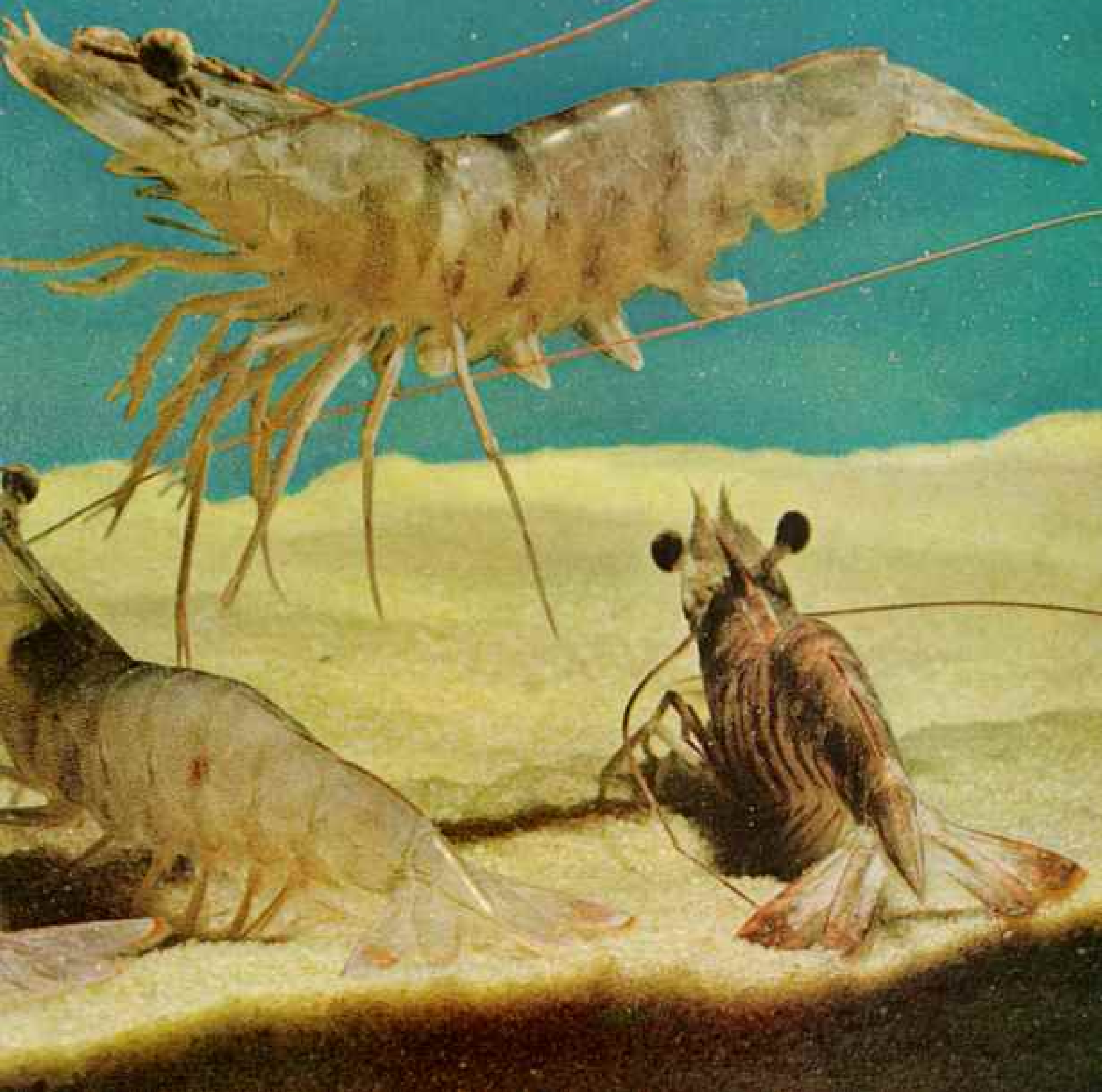
This particular discussion took place in the lobby of a Boston hotel during a fisheries meeting. I told the would-be marine farmer what I knew about the life history of shrimp, and I outlined some of the problems he could expect to encounter. He told me his name but not the name of his company.

That information came at a later meeting, in my office at the university's Institute

of Marine Science, and now I *was* surprised. His firm is one of the industrial giants of the United States, its name a household word. But its activities are about as far removed from shrimp farming as you can imagine.

Why does this big company, together with many others of various sizes and a horde of individuals, want to raise shrimp on a farm?

The answer is that the



supply of shrimp is uneven; often it cannot meet the demand. The same problem plagues the whole seafood industry, depending as it does on catches of wild stocks in the ocean, subject to the vagaries of weather and other unpredictable factors.

#### Shrimp Leads Seafoods in Cash Return

At the Institute of Marine Science we have been interested in shrimp for many years. Just about the time I came to Miami, Florida's shrimp industry took a great leap forward with the discovery in December, 1949, of the Dry Tortugas shrimp beds near Key West.\* Since then the industry has continued to grow. Today in Florida its value exceeds that of all other seafoods combined; over the United States, it brings more dollars to fishermen than tuna or salmon, for years the most valuable products of our seas.

Our interest in shrimp as a valuable natural resource has drawn us into some fascinating bypaths: A strong curiosity, for one thing, about the enormous, brackish estuary that lies mostly in Everglades National Park, where one important shrimp population spends a long phase of its life (map, opposite).

Then there was the biology of the animal itself. Just a few years ago relatively little was known about its complex life cycle and mysterious migrations.

Finally, there was the shimmering prospect of commercial farming—raising the shrimp from egg to adult—which led me some 8,000 miles to study a hard-to-believe enterprise on the shores of Japan's Inland Sea.

Fishermen catch dozens of shrimp species over the world; about ten are important in

\*See "Shrimpets Strike Gold in the Gulf," by Clarence P. Idyll, NATIONAL GEOGRAPHIC, May, 1957.





Asphalt arrow, the Tamiami Trail streaks through a region of wild and haunting beauty—southern Florida's Everglades. This aerial photograph shows new dikes and canals that control the runoff of water in a conservation district some 20 miles northwest of Miami. Everglades National Park officials fear that the levees may lower the water table in the park, part of which lies beyond the highway. Studies now seek to determine how much fresh water the Glades need to maintain their unique profusion of living things, including hordes of pink shrimp that mature in the Everglades estuary after hatching in beds off the Dry Tortugas (diagram, page 653).

100424898 © R.S.S.



the United States. Shrimp range from tiny species caught in Alaska to giants a foot or more long that inhabit the warmer waters to the south and belong to the family Penaeidae. This group, by far the most valuable commercially, includes the brown shrimp of Texas, the white shrimp of Louisiana, and the pink shrimp of south Florida and Campeche, Mexico.

Considering how important the shrimp is, we know remarkably little about it. To fill the gaps in our knowledge about one species, the pink shrimp (*Penaeus duorarum*), we have initiated a vigorous research program at the University of Miami. It was in this connection that I found myself on the edge of the Buttonwood Canal at the tip of the Florida peninsula at 4:30 one dark morning last winter.

"Two minutes to go," I said.

Slowly, Dr. Edwin Iversen and Bernard Yokel of the institute's marine laboratory shoved our skiff away from the bank and paddled toward a white-painted cork float. Attached to it, a big net that we had set earlier stretched completely across the canal (next page). With a boat hook Bernie snagged the net and began pulling in a heavy catch.

#### Stalk Eyes Glow Like Bits of Fire

The flare of a gasoline lantern revealed a colorful haul. A dozen angry blue crabs rattled furiously around a metal tub, snapping wicked claws at our gloved hands. An eel about two feet long slid a sinuous path among the rest of the animals, finding no escape. There were other fishes. But most important, there were shrimp.

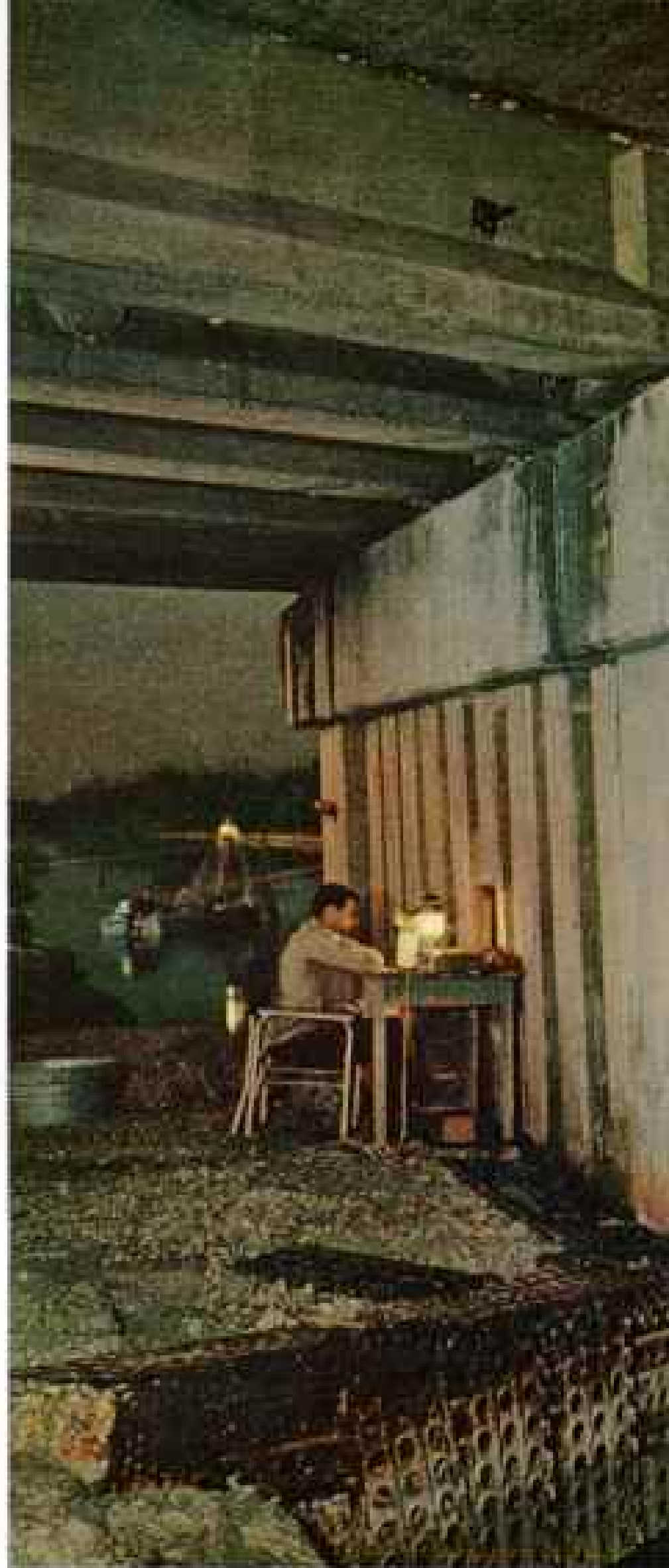
They were beautiful in the white lantern glare, their bodies shining and translucent. Their eyes stood out on stalks, like tiny live coals (page 650).

The Buttonwood Canal in the Everglades National Park

The Author: Dr. Clarence P. Idyll, Professor of Marine Science at the University of Miami, has been absorbed in the study of shrimp for 15 years, most recently under a grant from the National Geographic Society's Committee for Research and Exploration. As part of his study, he journeyed to Japan to inspect that nation's pioneering shrimp farms. He serves as consultant on a shrimp research project for the government of Venezuela. Dr. Idyll also has traveled throughout the Caribbean to establish a fisheries research program for the United Nations. He is the author of a fascinating new book, *Abyss—The Deep Sea and the Creatures That Live in It*, Thomas Y. Crowell Company, New York, 1964. Here, he measures shrimp specimens with calipers for growth data.



Working by lamplight in the dusk, staff members of University of Miami's Institute of Marine Science spread a huge net across Buttonwood Canal, near Flamingo in Everglades National Park (map, preceding page). Desk man at left keeps the log. The seine, 62 feet long and 9 feet deep, tapers from its wide mouth beneath the bridge to a narrow end that traps migrating shrimp.



was cut in 1957 to provide access from Florida Bay to the immense estuary at the tip of the Florida peninsula. Shrimp live in the estuary during their adolescence, and swim down the canal and other outlets as they approach maturity.

At the Institute of Marine Science we had long suspected that the young shrimp maturing in the shallows near Flamingo were part of the same population caught by commercial fishermen off the Dry Tortugas, 100 miles to the southwest. Finally we had proof: A female shrimp we tagged at Coot Bay, near Flamingo, on December 18, 1957, was recovered by a commercial trawler on the Tortugas fishing grounds four months later. Number 064 was the only shrimp recovered of the 476 tagged, but it was of great importance and was to help establish the permanent boundaries of Everglades National Park where the

conservationists wanted them. Later a number of shrimp stained with dye near Flamingo by Tom Costello and Don Allen, biologists of the U. S. Bureau of Commercial Fisheries stationed at our laboratory, were also caught in the trawls on the Tortugas grounds.

This confirmed the interrelationship of the national park with the fishery. And it lent particular urgency to a man-made crisis now threatening the park itself.

#### Everglades: a River, not a Swamp

Everglades National Park is a water park. Its uniqueness results from large quantities of water delivered in a particular way.

The uninformed regard the Everglades as a vast swamp. It is nothing of the kind. It is a great river, stretching across the southern end of the Florida peninsula. Unlike a stagnant swamp, it has a flow, though the move-



WORKSHOPS BY NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. STEEN © N.G.S.

ment is gentle and intermittent. The direction is always from north to south. And all of the numberless creatures that live in the park depend for their existence on an abundance of fresh water. Either they live in the water, or they feed or otherwise depend on aquatic life.<sup>10</sup>

When white settlers first came to this saw grass region, the great sheet of water stretching from Lake Okeechobee to the tip of Florida was a nuisance. Starting in the 1880's, canals were cut by the hundreds, bleeding off the sweet water into the ocean. Farmers sowed the black muck with beans and carrots and prospered by shipping vegetables to northern markets while farmers in New Jersey and Ohio were blowing on their hands, waiting for the spring thaw.

In 1928 a hurricane unleashed a devastating flood over the area, causing millions of dollars' worth of damage to farmlands and

drowning 1,800 persons. For years an occasional skeleton turned up when draglines cut into the muckland. To prevent another such tragedy, flood-control structures were begun immediately and are still being built.

#### Flood Peril Ends, but New Threat Arises

The Central and Southern Florida Flood Control District has changed the face of the earth over much of the Everglades with immense canals and dikes, and with gargantuan pumps that lift water by the ton and fling it from one place to another. Great artificial lakes—the conservation areas—have been created, impounding the water and prevent-

<sup>10</sup>See, in NATIONAL GEOGRAPHIC: "Saving Man's Wildlife Heritage," by John H. Baker, November, 1954; "Wildlife of Everglades National Park," by Daniel B. Beard, January, 1949; and "Haunting Heart of the Everglades," by Andrew H. Brown, February, 1948.



ing its free flow toward Florida Bay. The calamity of 1928 will not occur again.

But draining the Everglades exposed the soil to destruction by the elements. Erosion and compaction of soil have altered elevations enough to change the slope of the watershed: Water falling in the upper third of the region now flows away from the national park.

The water problem of south Florida has thus reversed itself in recent years. Instead of working feverishly to get rid of the water, we now direct our efforts to preserving it. The cities of the area need it. And so does Everglades National Park. If the proper action is taken, both can be served.

### How Much Water Is Enough?

Before the engineers of the flood-control district can allocate sufficient water to the park, however, they must learn how much is needed by the area's birds and other creatures. They have not been told because no one knows. No one has studied how much the growth of the native wildlife, its capacity to produce young, its well-being in general are controlled by the water supply.

With the support of the U. S. Public Health Service, we are working on this problem at the institute with a sense of urgency. We hope that within two or three years we can begin to tell what the Everglades National Park needs in the way of fresh water.

Durbin Tabb of our staff, in a report prepared for the National Park Service, says: "Animals and plants of the region are apparently adapted to natural drought of about two years' duration. Reduction of surface waters for longer periods would probably reduce much of the aquatic biota [animals and plants] beyond the point of recovery . . . and probably will cause a marked reduction in fish and shellfish populations there."

Most valuable of the shellfish, of course, are the hordes of pink shrimp maturing in the Everglades estuary before swimming to the Dry Tortugas grounds to spawn. They represent an annual catch of 15 to 20 million pounds, and their loss would mean a multi-million-dollar setback to the industry.

Thus we found ourselves in a skiff on the Buttonwood Canal last winter netting, examining, and counting shrimp. While Ed Iversen and Bernie Vokel emptied the net, Durbin Tabb recorded the speed of the current, took the water's temperature, and measured salinity. After collecting hundreds of these obser-

vations, we will know how environmental factors affect the shrimp.

We already know, for example, that numbers of migrants decrease rapidly as light strengthens: in full daylight the pink shrimp cease their migration, burrowing into the mud (pages 646 and 652).

We have found, too, that a drop in temperature quickens the activity of shrimp moving out of the canal. About half-grown at this stage, they hitchhike on the currents, or on loose grass and other debris. During two nights of a sharp cold spell in January, 1963 (the temperature dipped to 42° F.), our catches rose markedly because, we concluded, many of the shrimp hurriedly left the chilling estuary in search of the still-warm offshore depths of Florida Bay.

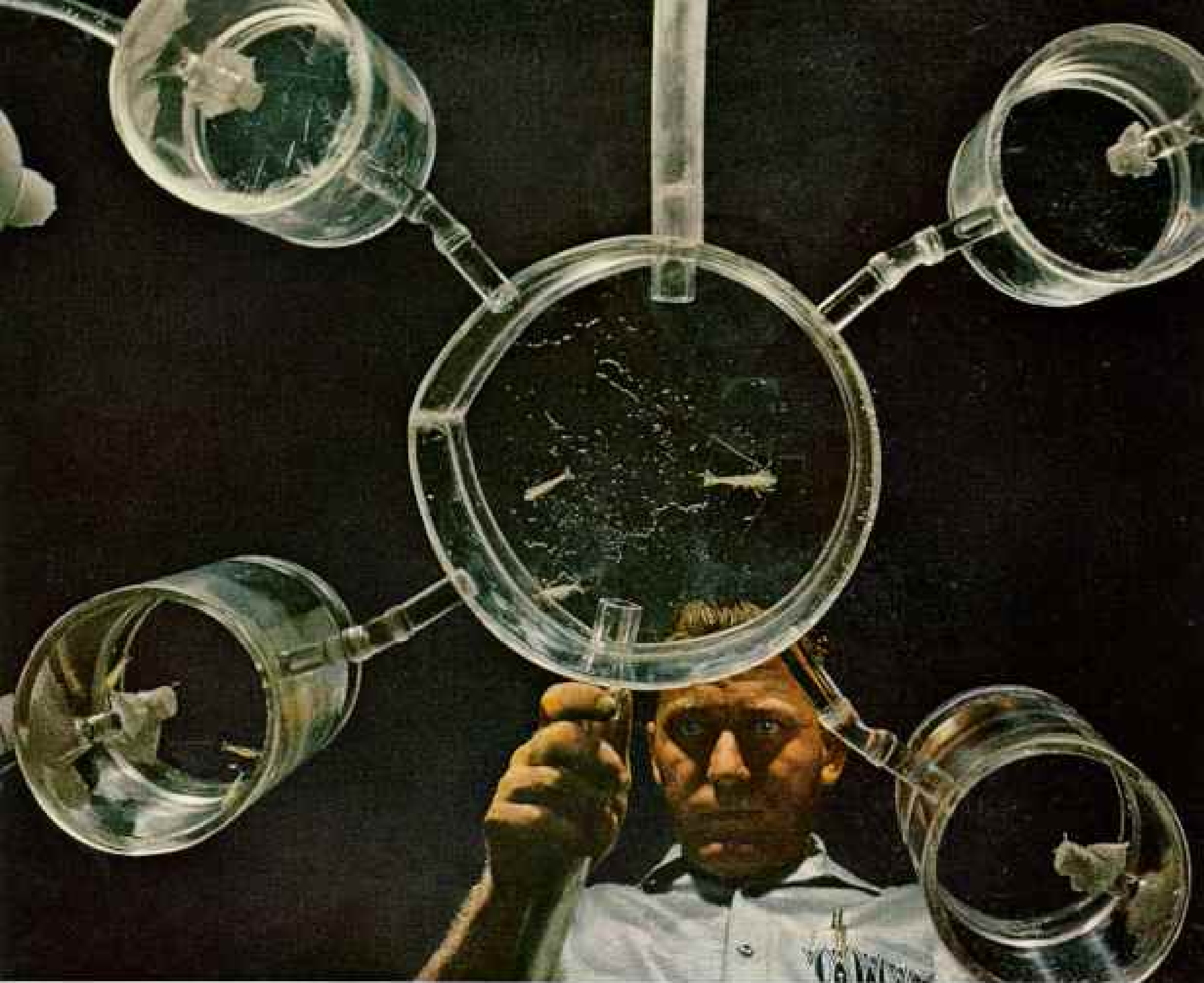
After the shrimp leave the estuary, they move to the spawning grounds off the Dry Tortugas to mate. When the young are produced, it would be a wise shrimp parent, indeed, that knew its own child. The newly hatched shrimp is so unlike the adult that it might easily be taken for a completely different creature. In a matter of hours the small shrimp magically transforms itself into another shape, and later a whole series of shapes, in four distinct groups of growth stages known as nauplius, protozoal, mysis, and postlarval, similar to those of the Japanese shrimp (pages 654-5). Any shrimp seeking to identify its offspring would throw up its antennae in despair.

### Marine Biologist Plays Midwife

We ourselves did not know how to distinguish the young stages of the pink shrimp from the many similar larvae around the Dry Tortugas. To find out, we attempted to raise them from egg to adulthood.

This work was started in 1959 by Sheldon Dobkin, one of our graduate students. His first step was to catch a female shrimp ready to spawn.

Since shrimp do not carry their eggs externally, like lobsters or crabs, Shelly had to be able to recognize an individual with ripe eggs. Another graduate student, William Cummings, had discovered that a ripe female has a characteristic opaque greenish color shining through the forward part of its shell. So Shelly picked lively, big green-tinted females, about 5 to 7 inches long, from the catch of a commercial trawler and placed three of them in a laboratory aquarium.



REDAIGNED © R.C.E.

The next morning he found eggs in the aquarium. Triumphantly he put them into various jars and dishes, and they began to hatch in the early afternoon. No midwife looked more affectionately at any child than Shelly did at the pinpoint-size nauplius larvae swarming in his miscellany of glassware. He began a night-and-day vigil, for transformations from one larval form to another might occur at any time.

Throughout the various nauplius stages, the larvae were sustained by the yolk stores of the egg. When the yolk had been absorbed, Shelly offered the small shrimp various kinds of food, mostly one-celled algae. Under the microscope he could see their tiny guts crammed with the green-colored particles, but either the amount or the kind of food was not right. None of the larvae survived the first protozoal stage.

Most of them, it seemed, simply starved to death. But some larvae apparently died when the hairlike setae on their legs became entangled with the filamentous algae offered to them. Weighted down and immobilized,

Four-armed laboratory device enables Dr. James Schmulbach to find what kind of water shrimp prefer. Tubes lead to containers of water varying in salt and organic content. Several shrimp have entered the chamber at lower left, containing 50 percent sea water.

Cannibalistic pink shrimp devours the remains of a companion. The mouth, here showing as a dark-red spot, is so far behind the tip of the head that the creature appears to be stuffing the food into its chest.

LIFE-OUT



Near seagirt Fort Jefferson, shrimp boats wait for darkness to begin trawling: pink shrimp—80 percent of Florida's catch—feed at night. The ghostly citadel, largest of America's 19th-century coastal bastions, stands in the Gulf of Mexico on Garden Key, one of the Dry Tortugas. The fort, abandoned since 1874, and surrounding islands today constitute a national monument.

PHOTO BY BILL BIRD



Resembling pea pods, young shrimp injected with dye will be released in the Dry Tortugas area. Commercial fishermen who catch them will report findings to marine scientists, thus providing further clues to the pink shrimp's migration pattern. Harmless dye tints the entire body initially but later recedes into the gills. Unstained shrimp at extreme right shows color contrast. Biologists of the U.S. Bureau of Commercial Fisheries dye shrimp on a Key West, Florida, pier (below).



they sank to the bottom and perished.

Although Shelly had failed to keep the larvae alive, he had accomplished something of great value: He had identified and described in detail six critical first stages—five nauplius and the first protozoal—in the life of the pink shrimp. Painstakingly, he filled in the remaining gaps by selecting specimens from our plankton nets and observing them in the laboratory. Ultimately at least one would survive a molt—shedding of the outer shell—and show us the next step in its life cycle.

Thus Shelly discovered the other two protozoal stages, as well as three mysis and a variable number (10 to 16) of postlarval stages.

Still, we had not raised any shrimp in the laboratory—at least not past the crucial hours when the larvae began feeding themselves. Now I handed the problem to Joseph Jay Ewald, another graduate student.

Ewald tried isolating each larva in a separate compartment of a plastic fishing tackle box. He developed a variety of tiny fodder





ESSENHOWER © NATIONAL GEOGRAPHIC SOCIETY

plants, mostly algae, and offered the little shrimp a mixture. Each day he carefully transferred them to a similar tackle box filled with fresh sea water.

Jay's techniques succeeded. Of approximately 1,200 first protozoae (and these, of course, were the survivors of a great many more eggs), only about 50 shrimp reached the postlarval stages. But these 50 represented a major biological triumph, and the few young adults that finally resulted may prove to be famous pioneers if someday we are able to raise shrimp on a commercial scale.

#### Scientists Go to Sea for Answers

However, shrimp farming in the United States is still in the future, and shrimp fishing is our immediate concern. If we were to make any contribution to commercial fishing in the U.S., there was still much to be learned about the life and death of the shrimp. Where were the larvae produced? What happened to them during their hazardous early weeks? Could man predict—or even influence—their

abundance? We tossed these questions to a senior member of our Fishery Division staff, Dr. Albert Jones.

For many months Dr. Jones and his staff, under a program sponsored by the United States Bureau of Commercial Fisheries, criss-crossed Florida Bay, using shrimp boats to trail plankton nets. After each haul we devoted hours to tedious sorting, hunched over microscopes in the laboratory.

Finally the pattern began to emerge. Dr. Jones concluded that spawning takes place in almost exactly the same Tortugas area where the commercial fishermen operate. As might be expected, the youngest larvae were found in abundance close to the deep-water spawning grounds. Progressively older larvae occurred—fewer and fewer—as the scientists approached the shore.

Quite clearly the young shrimp were migrating as they grew, heading toward the Everglades in which their parents had matured (page 653).

After collecting larvae every month for

Shunning light, a pink shrimp buries itself in aquarium sand except for its feelers and golf-ball eyes. Frequently the animal burrows deeper, leaving only a tiny hole for breathing. In the soft gray mud of the Tortugas grounds, shrimp hide to avoid predators as well as sunlight. At the slightest disturbance, they leap clear (opposite page).

ALL PHOTOGRAPHS UNLESS LISTED



Springing up like a grasshopper, the recluse explodes out of its hideaway (below), leaving a churning trail of sand.

REPRODUCED BY NATIONAL GEOGRAPHIC PHOTOGRAPHIC SOCIETY, WASHINGTON, D.C.



three years, Dr. Jones's biologists found that the little shrimp swarm most numerous from spring to early fall. The smallest catches came during winter months.

Great variations occur in the numbers from year to year—influenced, we suspect, by the abundance of predators and changes in currents, salinity, and clarity.

We are virtually certain that the number of shrimp larvae depends to a considerable extent on water temperature. "When the temperature near the bottom in Florida Bay gets below about 72°, we catch very few," says Dr. Jones. "In the spring the numbers of little shrimp increase just as the water begins to warm."

#### Sheer Numbers Assure Survival

From the moment the baby shrimp hatch, they have no friends—only swarms of enemies. Arrowworms lunge at them like crystal lances; copepods, jellyfishes, and the young of scores of fishes gobble them greedily. The declining numbers of larvae in our plankton hauls from stage to stage suggest that in a single week the death rate reaches 80 percent.

But the little shrimp has one thing in its favor: The presence of millions of millions—and perhaps even millions of billions—of relatives.

Now we set our minds to another problem: How do the larvae get from the spawning grounds around the Tortugas to their nurseries in the estuary, about 100 miles away?

Water currents must carry them there, we reasoned. The nauplius larva is barely visible to the naked eye, and its pear-shaped body hardly suggests an active swimmer.

"I have watched the larvae under a microscope," says Shelly Dobkin. "The nauplius swims upward by beating its appendages rapidly for about five seconds. Then it sinks on its back, resting, for 15 to 30 seconds."

The most advanced of the larvae, those in the third mysis stage, are still only an eighth of an inch long. Even though they swim briskly, it seems hard to believe that they could travel for scores of miles through the ocean under their own steam.

Thus, it appeared that currents must carry the little shrimp toward the coast. But after extensive water-current studies, designed by Dr. Fritz Koczy, Chairman of our Physical Science Division, we found to our surprise that the currents in Florida Bay were so slight they couldn't be accurately measured—less than 1/20th of a knot!

At this rate it would require about ten weeks for the Tortugas shrimp larvae to reach the Florida peninsula; that is, if the currents flowed in the right direction. But whatever feeble water movement we detected in Florida Bay was headed in the opposite direction!

So our neat theory was a shambles. But how else could the newly hatched larvae get to the nursery grounds?

Possibly the larvae—in the later stages at any rate—are stronger swimmers than we



WILSON © N.G.S.

give them credit for. Or, they may be able to ride incoming tides, and cling to something solid when the water is moving in the wrong direction. If so, they could move as much as five miles during every flood tide, and in ten days end up at the entrance to Buttonwood Canal or another inlet to the estuary.

#### "Tide Machine" May Solve Mystery

With the help of a research grant from the National Geographic Society, we are now investigating the intriguing "float-while-the-current-is-favorable-cling-when-it-isn't" theory. Soon we will have in operation a "tide machine" made of plastic. It will test the reaction of the little animals to current direction and strength, and gradually we will solve the "Case of the Wrong-way Current."

Such mysteries illustrate the complexity of the life history of the shrimp. Despite many attempts to raise them, there have been few successes—mostly on a limited scale in the laboratory. True, shrimp "farmers" have cultured them in Indonesia, India, the Philippines, and Japan for years. But these operators begin with young wild shrimp, and simply "pasture" and fatten them in captivity to market size.

However, in recent years Dr. Motosaku Fujinaga, a Japanese scientist, has developed astonishing methods for the farming of shrimp in the true sense, successfully raising them from egg to market size in a matter of six to ten months.

I was, of course, exceedingly curious about Dr. Fujinaga's methods. Unfortunately the scientific literature was tantalizingly scant and lacked many details, particularly the economic and practical aspects.

Consequently I was delighted when the Committee for Research and Exploration of the National Geographic Society offered to send me to Japan to study this remarkable shrimp-farming operation.

My wife Marion and I flew into Tokyo in the late dusk of a rainy March day. We stayed in Tokyo only long enough to meet Dr. Fujinaga and arrange a trip to his shrimp farms, located near the cities of Takamatsu and Aio, and on the island of Himeshima. Japan's Fisheries Agency kindly provided an able young scientist, Dr. Hideaki Takano, as interpreter.

On the train trip west through Yokohama, Kyoto, Hiroshima, and other historic cities, I kept Dr. Takano and Dr. Fujinaga busy for hours, answering questions. Takamatsu, site of Dr. Fujinaga's original shrimp farm, is on the island of Shikoku, across the Inland Sea from the main island of Honshu. We reached Takamatsu by ferry.

The next morning Marion, Hideaki, and I accompanied Dr. Fujinaga to the office of the Kuruma Shrimp Farming Company Limited. The name of the company comes from *kuruma-ebi* (meaning "wheel shrimp," for its resemblance to a spoked wheel when curled). The scientific name is *Penaeus japonicus*. While not the biggest shrimp in the world





*DAWN'S FAINT GLOW signals work's end for a night trawler in the Gulf of Mexico. A crewman hauls up the last netload of pink shrimp, and the Miss Fleta heads for daytime anchorage. Gulls hover in wait for their usual feast on the undersize shrimp, crab, and small fish that the shrimpers shovel overboard.*



(one Pacific species, *Penaeus monodon*, grows as large as 13¼ inches), kuruma-ebi reaches ten inches and more in length.

After the usual hospitable cups of green tea, we were ready to visit the laboratories, spawning tanks, and ponds of the pioneer shrimp farm (pages 656-7). Fortunately, even though we were too early to see the main springtime activity, a few huge gravid females swam in the big tile-lined tanks; several had already spawned.

Accustomed to seeing pink shrimp, I was amazed at the size of these females; one champion stretched a magnificent nine inches from horn to spiked tail. Their coloring was equally impressive—a handsome dark-brown-and-white vertical striping (page 653).

"A few of the female shrimp come from our own farms, but most of them still come from commercial fishermen—at prices up to \$3.50 a pound," Dr. Fujinaga told me. "These men fish with small trawls, and they supply the markets of Tokyo and other cities."

#### Hungry Females Will Eat Own Eggs

The big females carry between a third of a million and half a million eggs—occasionally as many as 1,200,000.

"When one of them spawns," Dr. Fujinaga told me, "an event which takes place always at night and mostly around midnight, she and any others in the tank are removed to prevent them from eating the eggs. The eggs float for a while, and if left alone gradually sink to the bottom."

Compressed air keeps the water in motion to prevent the eggs from piling up on the bottom of the tank; heaters keep it between 77° and 84° F. When temperature, salinity, and other factors are just right, the eggs hatch in 13 or 14 hours. Before long the tank swarms with tiny bits of life—the nauplius larvae.

#### Young Shrimp Change Stages Fast

"If spawning has been fairly successful," Dr. Fujinaga explained, "and the larvae get thicker than about 400,000 to the tank [slightly more than 42 gallons], we transfer some of them to another tank."

He dipped a sample of larvae into a glass cylinder and peered intently at them. He was not literally counting, but his experienced eye told him whether the larvae were too numerous for their own welfare.

Thirty-six hours after the shrimp hatch, they change from the nauplius to the protozoal stage. Like our pink shrimp, they have led a carefree existence so far, nourished by the yolk that came as a legacy in the egg. But now the soft life is over, and the larvae must begin to scratch for their food.

During this enormously hazardous period, the young shrimp's motive powers are feeble, and it lacks the ability to go out and track down a meal.

"Generous amounts of food on the bottom or swimming through the water even at a short distance are of no use," Dr. Fujinaga told me. "Unless the food is right in front of its nose, the protozoal larva starves to death."



Yanking the trawler knot of his net, a fisherman looses a cascade of pink shrimp onto the deck. In addition to the crustaceans, the catch may include squid, octopuses, sponges, crabs, and starfish dredged from the Gulf floor. The crew will behead the shrimp before icing them down in bins.

Goggle eyes glowing, pink shrimp march across the sandy bottom of a tank. Reflection of the photographer's light makes their orbs shine yellow; to marine scientists exploring the sea at night, the eyes resemble live coals in a lantern's glare.





Dr. Fujinaga grows his own shrimp baby food, a tiny diatom called *Skeletonema costatum*. A light burns over the diatom tank night and day, for the diatom needs illumination for growth and reproduction. After about four days the water turns into a thick yellowish-brown soup consisting of billions of diminutive plants.

A few dipperfuls of these diatoms are poured into the tank with the protozoae, while water agitation keeps the little plants floating in front of the shrimp, and feeding begins. Thus Dr. Fujinaga has surmounted the most critical stage in raising shrimp.

As the larvae grow, their appetites increase and their tastes change a little. While Dr. Fujinaga sometimes feeds the same "soup" to the mysis stages, he has discovered that they flourish better on "meat," such as oyster eggs and larvae, copepods, brine shrimp, or clam eggs.

Brine shrimp, used widely in tropical fish aquariums, are shipped as eggs and hatched as needed when placed in water. Dr. Fujinaga buys them from, of all places, San Francisco—at \$50 a gallon, delivered.

#### Unfed Shrimp Become Cannibals

The three mysis stages last about one day each, then come postlarval stages. Now the little shrimp become actively cannibalistic if not supplied with ample food, adding the problem of preventing thousands of little shrimp from ending up as one big one.

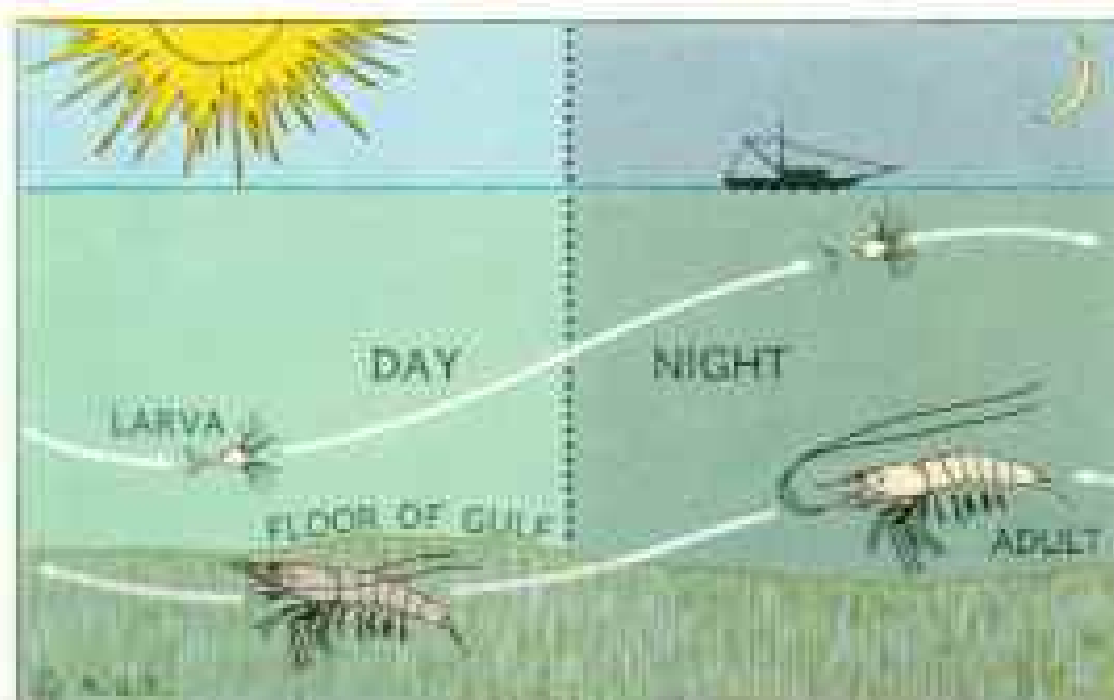
Ten days or so after the last mysis stage, the shrimp are transferred to small outdoor concrete rearing ponds about two feet deep. These double-bottomed ponds, invented by Dr. Fujinaga, permit air to be pumped up through the sand where the shrimp hide during the day. This added oxygen results in amazingly high yields—the equivalent of 9,000 pounds of shrimp to the acre in about ten months—on a small experimental scale.

"After 10 to 20 days in these ponds," said



2 1/2 INCHES LIFE SIZE

Thousands of shrimp eggs freckle the waters of an aquarium as a female pink shrimp spawns her progeny. To make this remarkable picture, first of its kind ever published, photographer Robert F. Sisson maintained a nighttime vigil, lying on his back beneath the glass tank.



Marked aversion to sunlight characterizes both the infant and the mature pink shrimp. During the journey from spawning grounds to estuary, the young, or larvae, descend in the daytime and rise toward the surface only after dark. When the animals return as adults to the spawning area, they swim close to the sea bed at night and bury themselves in the mud by day (page 646).

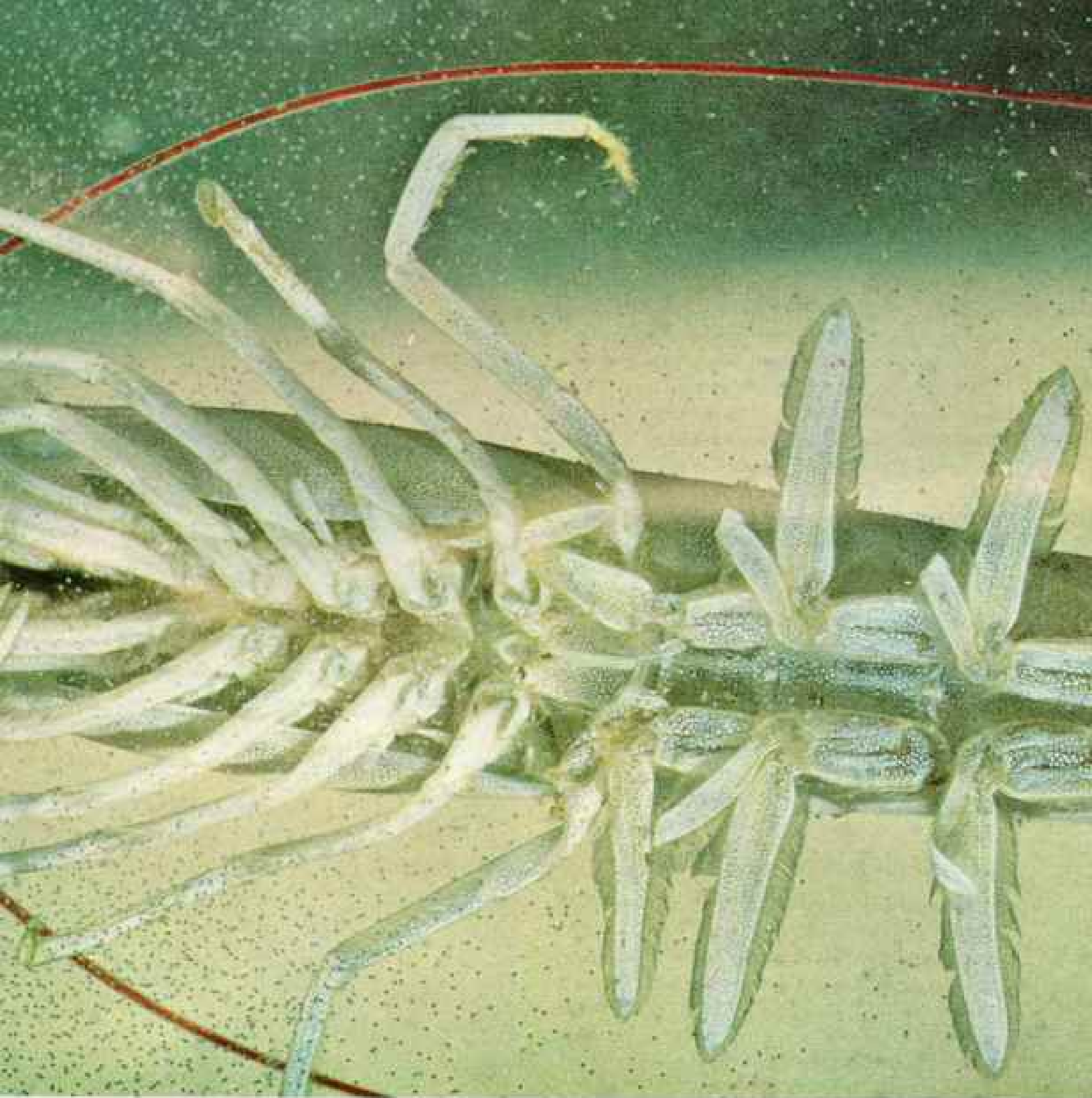


ILLUSTRATION BY W. C. C.

Artist's cross-section of Gulf waters reveals development of pink shrimp. **1 and 8:** Adult shrimp spawn, producing millions of eggs due to hatch about 13-14 hours later. **2-5:** Nauplius, protozoal, mysis, and postlarval stages of growth take place during the animal's approximately three-week trip to the coastal estuary. **6:** Young shrimp spend five to seven months in coastal shallows, growing to three- or four-inch length. **7:** Half-grown adults head for deep water. **8:** They reach the spawning grounds some two months later and spend the balance of their lives in these offshore areas.



## Life Cycle OF THE PINK SHRIMP

PRODUCED BY  
NATIONAL GEOGRAPHIC SOCIETY  
WASHINGTON, D. C. 20045  
DRAWN BY LISA WATSON. ILLUSTRATED BY W. C. C.



Dr. Fujinaga, "the shrimp are as much as three-fourths of an inch long. We sell some to nearby shrimp farms; the others we move to larger ponds for maturing. We follow the same plan at my new Aio farm, except that we transfer some shrimp to my other new farm on Himeshima for finishing."

We went next to Aio on the island of Honshu, after retracing our route across the narrowest part of the Inland Sea to Tamano.

Water from the Inland Sea pours through tide gates in a sea wall left when the Aio site was abandoned as a salt-making project. This gives adequate water exchange without the need for electric pumps. Says Dr. Fujinaga, "The difference in costs at the old and new locations will probably mean the difference between profit and loss."

The Aio farm still had a raw newness about it. Fresh earth lay heaped up where women laborers helped men to build the ponds. Great sheets of water, about ten acres each, encircled the little buildings. Two of the pools held shrimp ready for market. Workers in an outboard motorboat were dragging a special net in one pond. Dr. Fujinaga explained that a jet of water, delivered under pressure from a pipe dragged over the bottom, dislodges the shrimp from sand in front of the trawl net.

#### Chilly Bath Precedes Shipment

The shrimp caught in the Aio pond were transferred to a chilling tank in a nearby building. Here the water bubbled and rolled as compressed air was forced through it. It was dark too, covered by a trap door. Most important, it was cold—about 55° F. This slows the metabolism so that the shrimp can be shipped to market alive.

Herein lies the key to the whole Japanese farming operation. The shrimp are destined for restaurants in Tokyo and Osaka where the famous Japanese dish, tempura, is served. Tempura fanciers demand very fresh shrimp—and will pay high prices for them.

With Dr. Fujinaga, I followed the shrimp from their chilly bath into the packing house. There I got my greatest surprise of the trip.

"How are the shrimp shipped?" I asked.

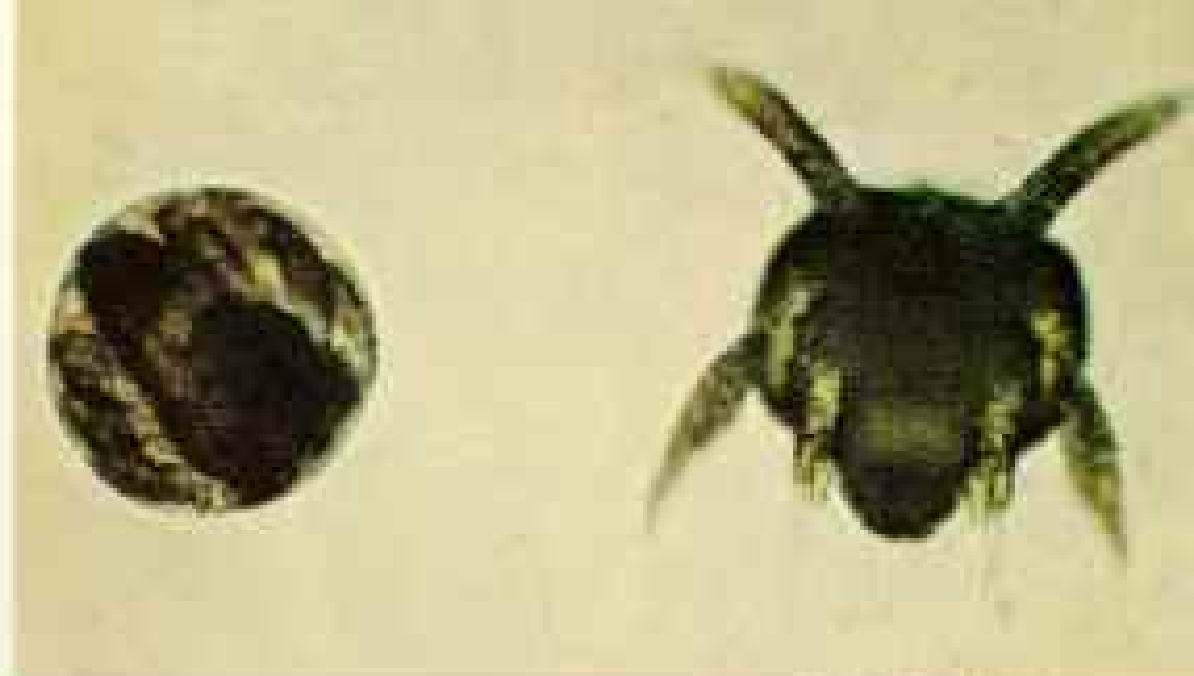
"In sawdust," said Dr. Fujinaga. I volunteered that it must be wet sawdust, of course. No, said Dr. Fujinaga, it was bone dry.

It is not polite to contradict your host, especially in Japan.

"What kind of sawdust do you use?" I asked.

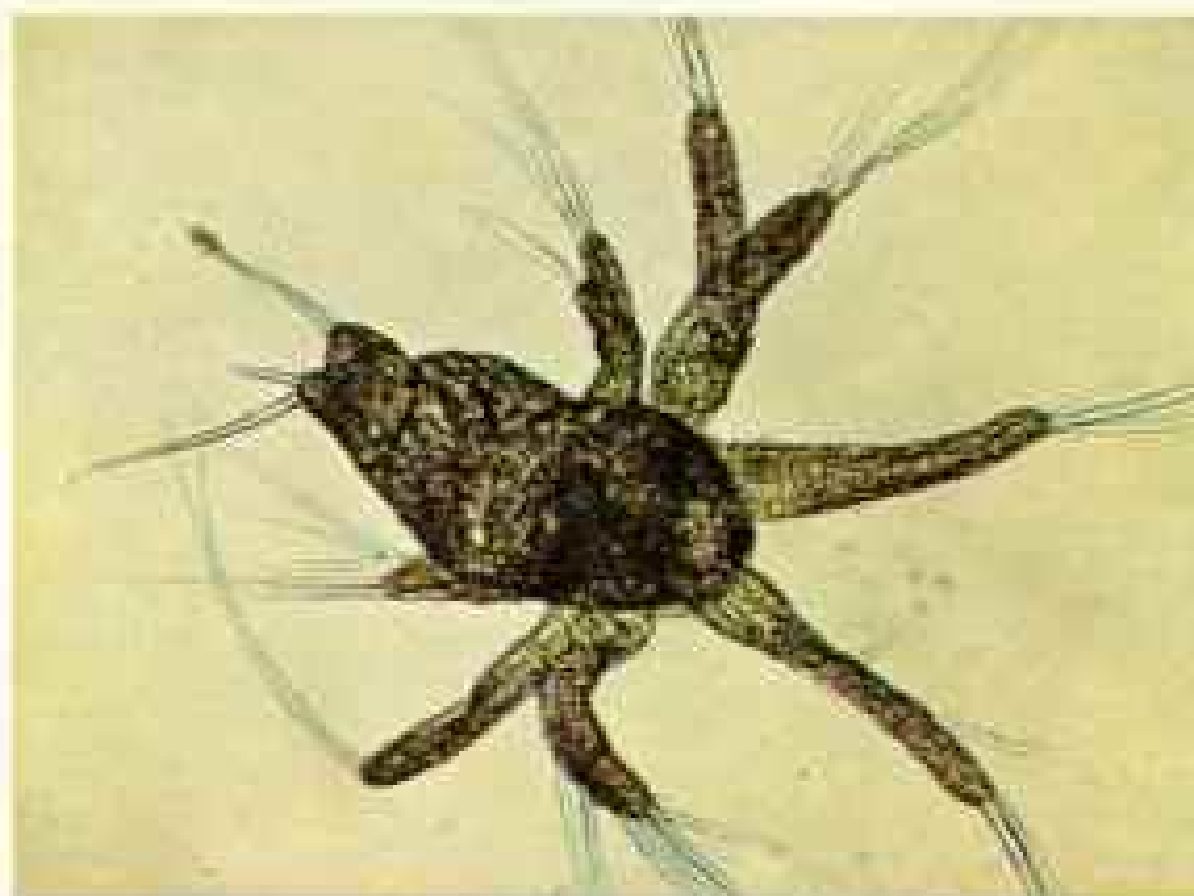
"Cedar."

Well, now I knew he was playing some



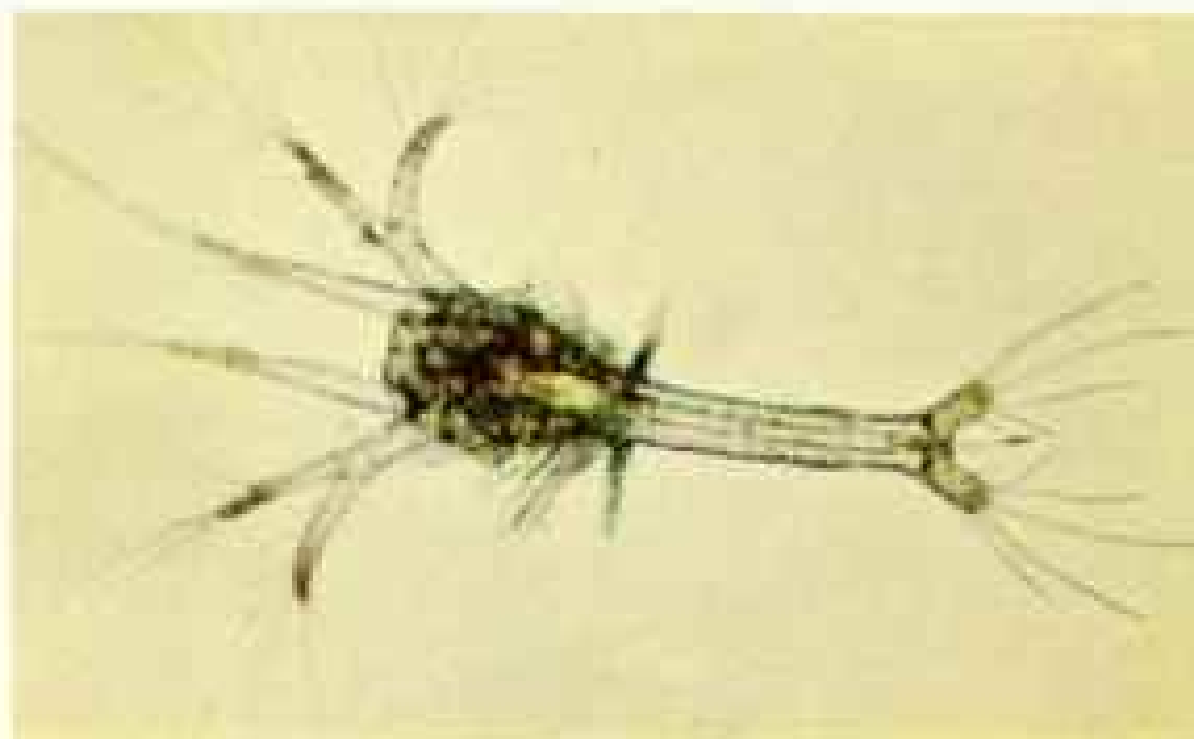
60 TIMES LIFE-SIZE

Fourteen-hour-old shrimp eggs begin to hatch.



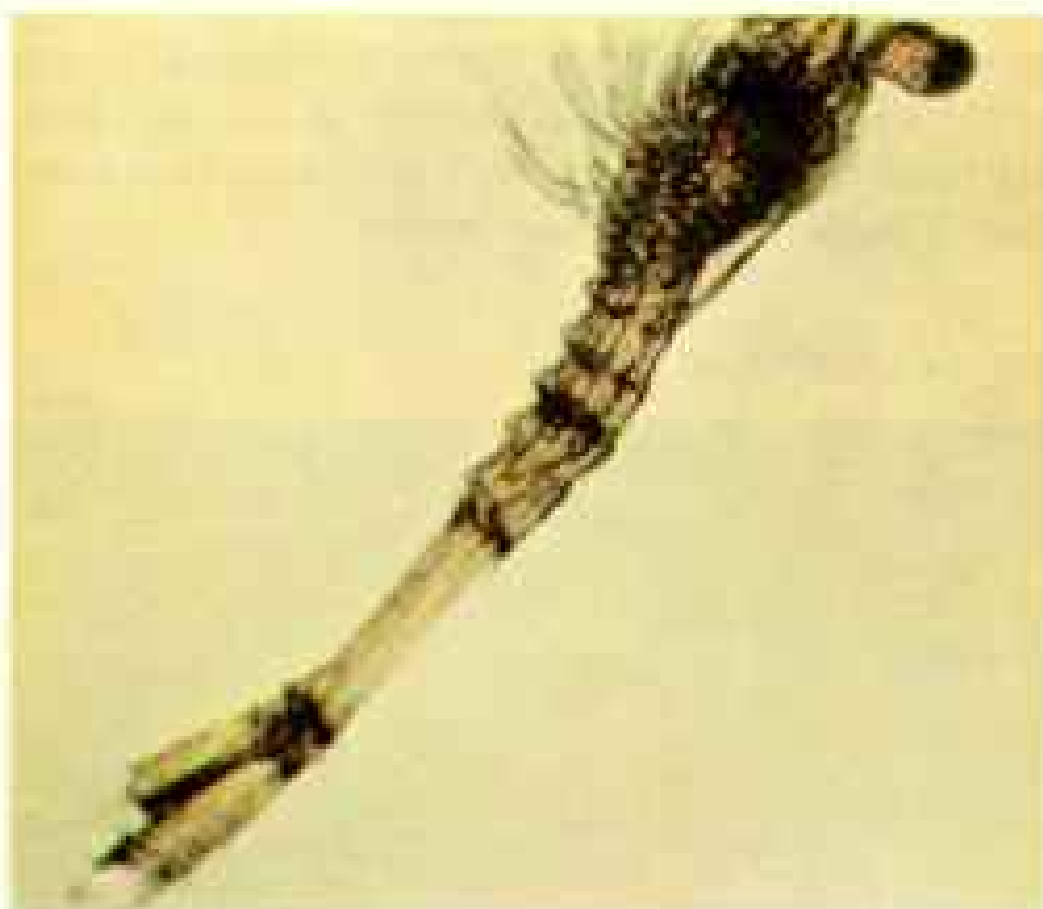
60 TIMES LIFE-SIZE

Thirty-four hours later: the last nauplius stage.



60 TIMES LIFE-SIZE

At 74 hours, protozoa grows a long tail.



WEDGEMORE'S BY JAMES PITCHERILL © N.A.S.

18 TIMES LIFE-SIZE

After six days, the mysis stages begin.

# Shrimp shapes

**J**APANESE kuruma shrimp, like their Florida cousins, undergo an amazing succession of physical changes between birth and maturity. The photographs on these pages, made at a commercial shrimp farm in Japan (next page), show some of the various stages of development.

Yolk from its egg nourishes the larva for the first 36 hours of its existence. From that time forward, it must find its own food or starve. Of the millions of eggs deposited by spawning females in the ocean, few reach adulthood. Full-grown *Penaeus japonicus*, like those at right, may exceed ten inches in length.

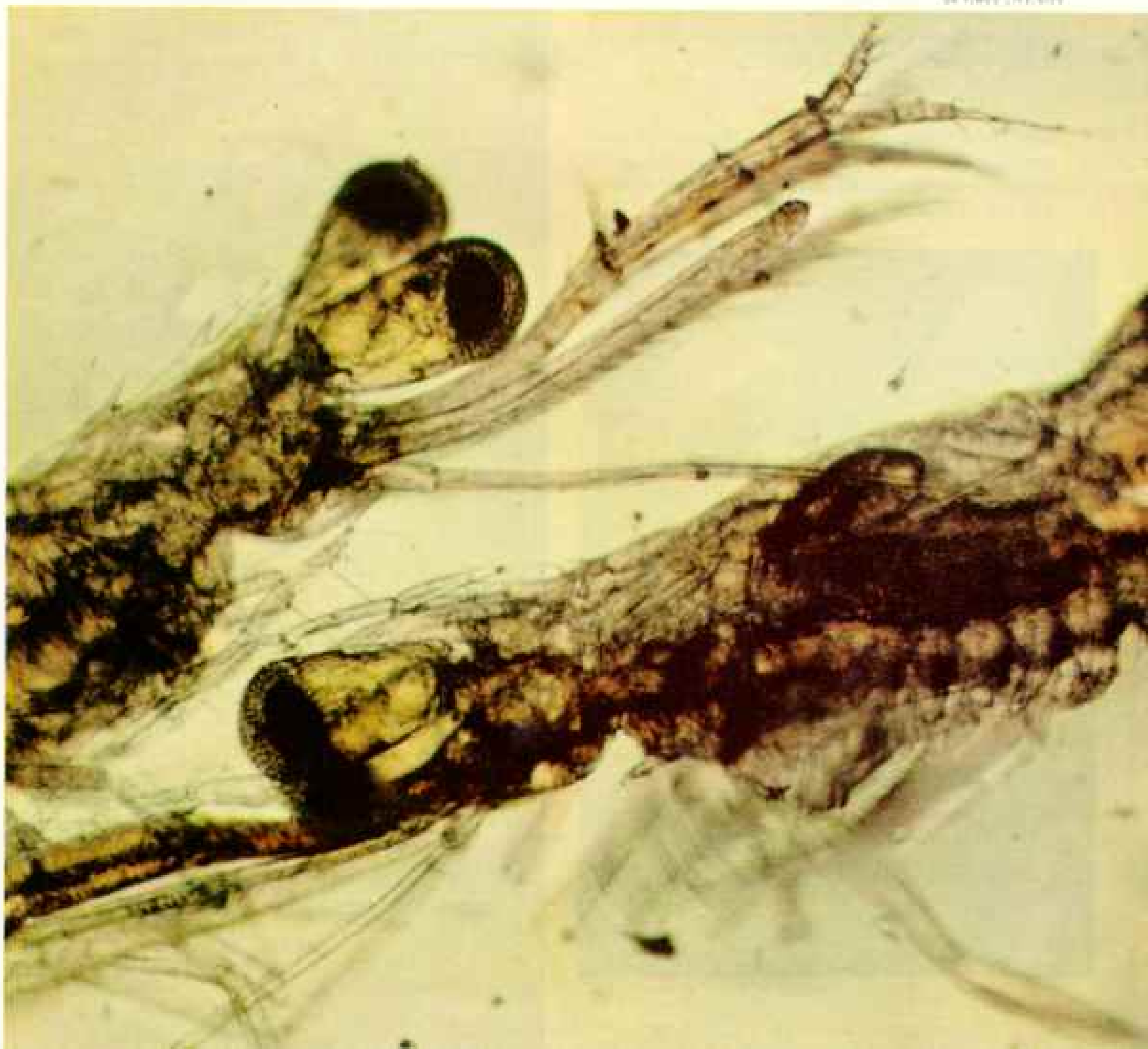


ONE-HALF LIFE SIZE

**Mother shrimp** cruise tank waters at the Takamatsu nursery in Japan. Lower female has already spawned, but the upper one still holds her eggs; they show as a dark row down the center of the back.

**Baby shrimp** in postlarval stage become actively cannibalistic if not adequately fed. Nursery managers now face an added task: preventing thousands of little ones from becoming one big one.

AS THEY ARE

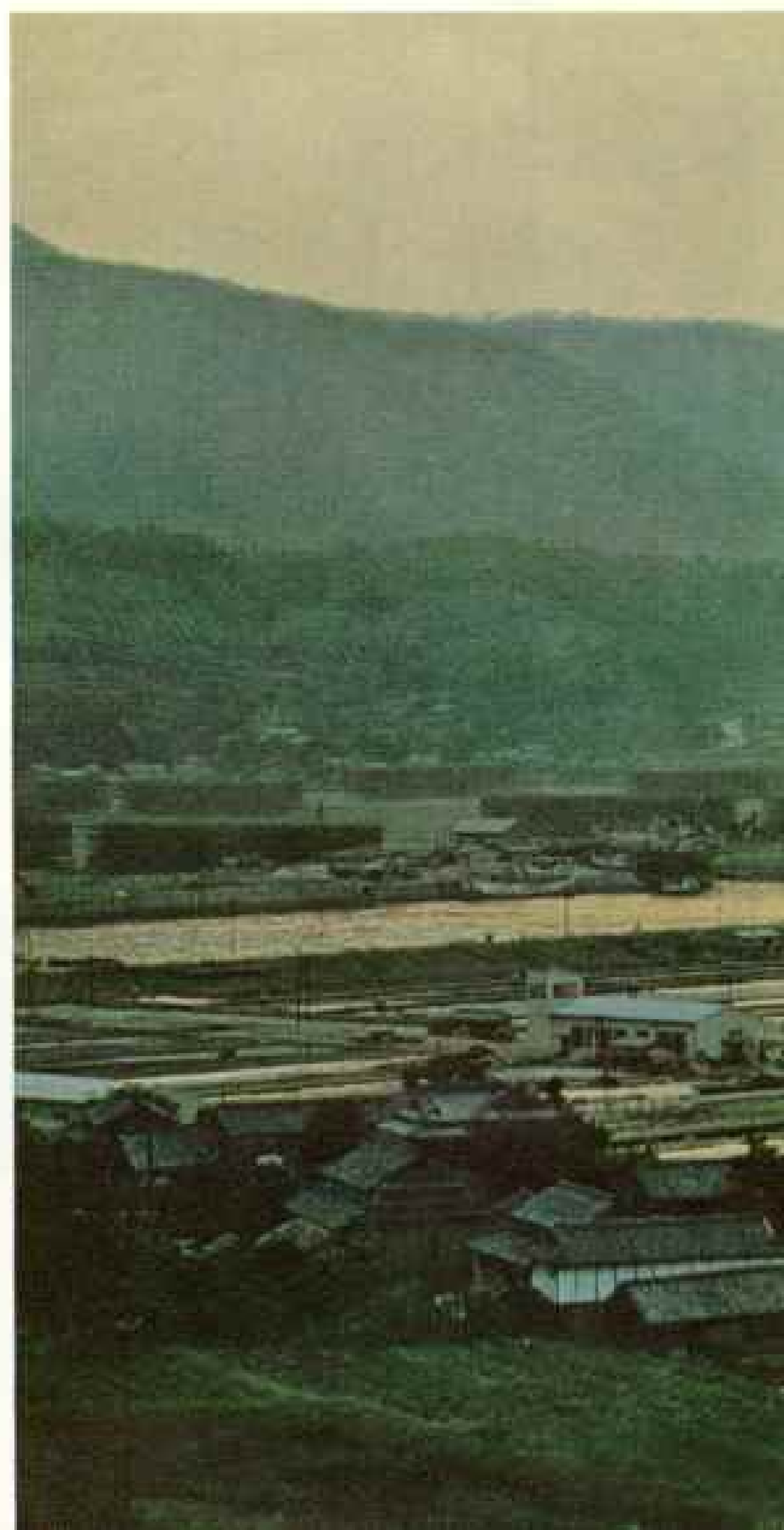




**Pioneer shrimp farmer** Dr. Motosaku Fujinaga (left), with an assistant, inspects a female shrimp ready to spawn in his hatchery at Takamatsu, Japan. In the temperature-controlled warm waters of these wooden, tile-lined tanks, eggs hatch into larvae; here the young spend the first three weeks of their lives.

**Two-foot-deep ponds** at the Takamatsu shrimp ranch border the Inland Sea. Young shrimp remain in these rearing pools 10 to 20 days before being moved to larger ponds.

**Women shrimp farmers** wash ground clam meat for their charges. The crustaceans raised in Japan require 6 to 10 months to reach market size; they sell for as much as \$4.40 a pound.



PHOTOGRAPHS BY JAMES PICKRELL © N.C.Z.



Japanese-type joke on me. Almost everybody, and especially a skilled biologist like Dr. Fujinaga, knows that cedar wood is repellent to insects. Wouldn't it also be harmful to other invertebrates, such as shrimp?

"Of course you don't really mean cedar!"

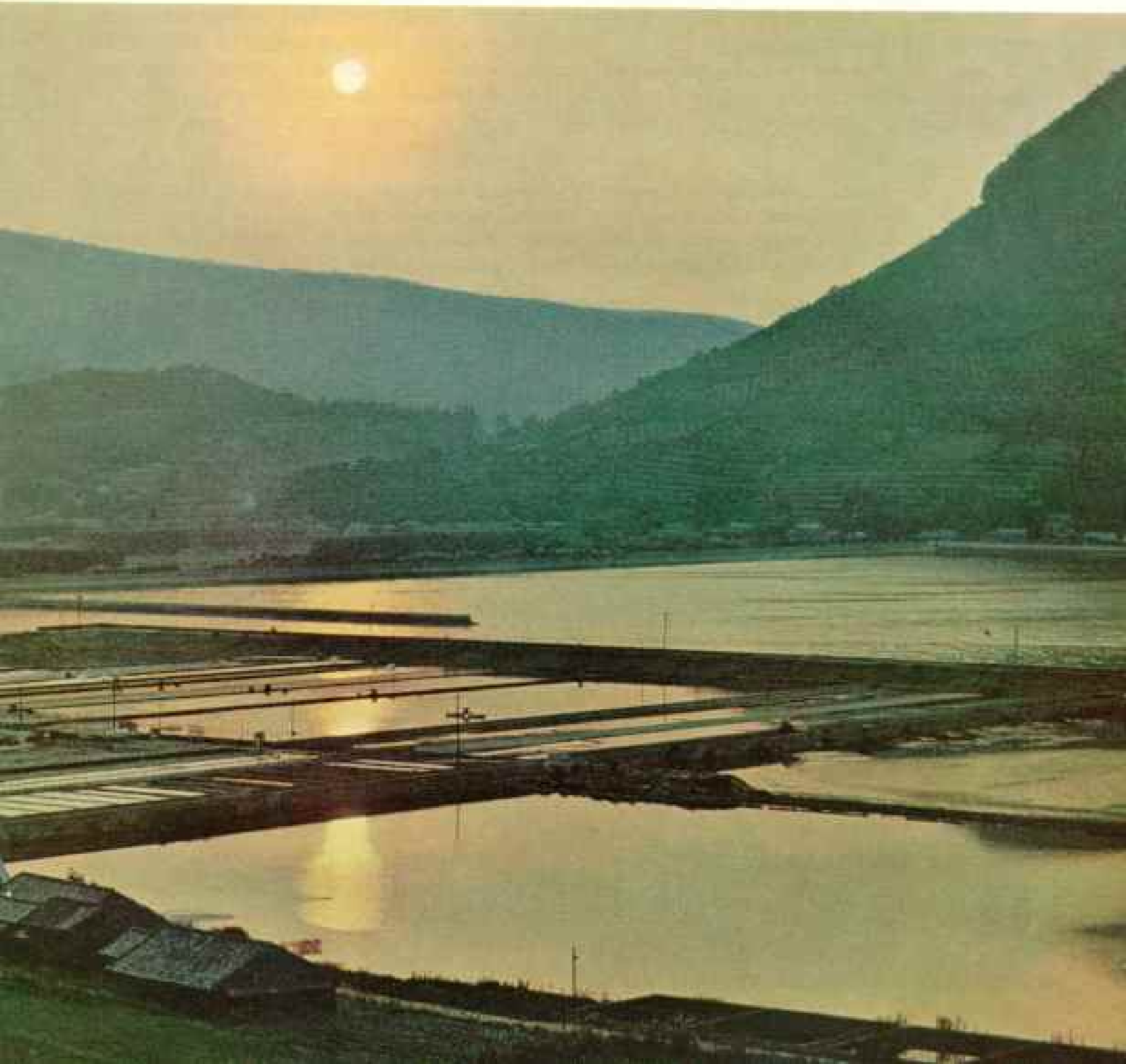
"Of course I *do* mean cedar!"

It was true. The live animals are packed in chilled, dry sawdust, in cardboard boxes holding about 66 to 100 shrimp each, and shipped, usually by rail. The sawdust insulates the shrimp against a rise in temperature, keeping their life processes barely ticking over, like the idling motor of a well-tuned car. The little water trapped in gill chambers of the shrimp is enough to supply them with the greatly reduced amounts of oxygen needed in their cold-induced torpor.

The tree called cedar in Japan, I learned, is not like that found in the forests of the United States, whose aromatic juices curl the toes of moths. Instead the Japanese cedar, *Cryptomeria japonica*, belongs to the same family as the California redwood and the giant cypress of the South. Its sawdust is light and inexpensive.

#### Price May Reach \$4.40 a Pound

Shrimp shipped this way survive for as long as four days in winter, and half that in summer. By train, the trip from Aio to Tokyo takes about 20 hours; by air, four. When necessary, a polyethylene bag of ice is put on top of the cardboard boxes to keep the little passengers comfortable until they reach a tempura restaurant.



This last dramatic journey is a fitting flourish to the long and painstaking care with which the shrimp are nursed from babyhood to adult size. The complex procedure is very costly; the returns must be great to justify it.

They are indeed. In summer, when farm-raised shrimp must compete with those caught by trawlers in the Inland Sea, they sell for about \$2.10 to \$2.30 per pound. In winter, when kuruma are otherwise unavailable, the price rises to about \$3.50 per pound. When the Japanese supply is really short, the price soars to an astonishing \$4.40 per pound! For similar size shrimp, U.S. fishermen receive from 45 to 80 cents a pound—and that is for the tails only.

Why in the world will the Japanese pay such astronomical prices?

The answer is that tempura is the best-loved of all traditional Japanese dishes, and shrimp is a favorite ingredient. To the epicure, the shrimp used in tempura must be alive until just before cooking.

I was told that 600 restaurants in Tokyo alone serve only tempura. In the rest of Japan a conservative estimate puts the number at

more than 3,000—not counting hotel dining rooms and regular restaurants that list tempura on their menus.

Oddly, this now traditional Japanese dish had a European origin. It is believed to have been brought to Japan by trading vessels centuries ago. Over the years it has been changed, refined, and ritualized by Japanese skill and taste.

#### Japanese Add a Dash of *Dashi*

If you doubt that the dish deserves its enormous reputation, try it sometime, as Marion and I did at Inagiku, one of the famous tempura restaurants in Tokyo.

We sat around a circular table with a seating capacity of 25. Handsome striped Fujinaga-raised shrimp, dug out of their sawdust shipping beds, swam in a large aquarium at the end of the room. Two cooks stood inside the circle of the counter, whipping up a thin egg-and-flour batter. Into it they dipped the newly killed shrimp, beheaded and peeled, but with their tail fans still attached, and dropped them into the hot cooking oil.

In about three minutes out came the first

**Savoring piping-hot shrimp.** Dr. Fujinaga and friends enjoy tempura, most popular of traditional Nipponese dishes. Many restaurants in Japan specialize in the delicacy, which features shrimp or other seafood. Cooks prepared this meal by dipping fresh shrimp into a thin egg-and-flour batter, then into boiling oil for about three minutes.

PHOTOGRAPH BY JAMES FERRALL © N.Y.S.



kuruma shrimp, golden brown and smoking hot. I liked them best just as they came from the pot, but the Japanese dip them into a mixture of *dashi* (a slightly sweetened soy sauce) and ground white radish.

After the kuruma-ebi, in quick and hot succession, came sillago (a kind of fish), squid, conger eel, and whitebait—tiny fish, tied in a bundle with seaweed. Cold lima beans, a dish of pickled vegetables, and clam soup were also served, so artfully that they appealed as much to the eye as to the palate.

All through the meal hot sake flowed. This is Japan's famed rice wine, served in tiny cups. By tradition you must keep your neighbor's cup filled; the diners beside me took this responsibility very seriously.

Finally we left the overworked cooks and retired to an anteroom to drink green tea and eat the biggest strawberries I have ever seen—some of them three inches from tip to stem. One, topped with whipped cream, made an adequate dessert.

Well, now it was easier to understand why kuruma shrimp command such fabulous prices. And I could see why Dr. Fujinaga had decided to retire in 1954 as Director of the Research Bureau of the Japanese Government's Fisheries Agency and enter the shrimp culture business.

I understood, too, how the Inagiku restaurant could afford to serve kuruma shrimp, even at \$4 to \$7 per meal. While four or five shrimp may constitute tempura's main ingredients, cheaper seafoods and still cheaper vegetables round out the dinner.

If the price of farm-raised kuruma shrimp is high, so are the costs of their culture. Despite years of hard work, capped with brilliant technical success, Dr. Fujinaga has yet to make a profit from his operation. But he told me that he expects to "turn the corner" within two or three years.

#### U. S. Shrimp Farms? Not now, but...

What about shrimp culture of the same kind in the United States?

I would say that its feasibility is doubtful at the present time. Dr. Fujinaga has one overwhelming advantage that an American shrimp farmer would not have—the great demand for live shrimp that forces the price up to astonishing levels. We simply do not have such a market.

But I refuse to write off the possibility of a successful American shrimp farm some time in the future. Technical progress in marine culture inevitably will lower the cost of rais-



ENTICEMENT BY GEORGE F. BULLY © N.E.S.

Treat to eye as well as palate, this shrimp tree graced a buffet table at the dedication of the Society's new headquarters in Washington last year. Sue Botine samples the luscious pink "fruit."

ing shrimp. And the demand for seafoods—especially shrimp—in the United States continues to grow. Thus anything, including shrimp farming, is possible.

I hope so. It would be rewarding to see a whole new segment added to the Nation's fishing industry, with attendant gains in jobs and income for many people. And I would derive great pleasure from going to a tempura restaurant in Miami to dine sumptuously on shrimp delivered alive from a farm on the Gulf coast.

THE END



Profiles of the Presidents: The third of five articles

# THE AMERICAN GIANT



# COMES OF AGE

By FRANK FREIDEL

Professor of History, Harvard University

*Previous articles on the Presidents appeared in November, 1964 (Washington through John Quincy Adams), and January, 1965 (Jackson through Buchanan).*

AMERICAN PRESIDENTS between 1861 and 1901 found themselves presiding over a Nation spectacularly transforming itself into an industrial giant. Scarcely deterred by the shattering four years of the Civil War, the Nation moved forward at an ever-accelerating tempo. Settlers poured into the West in such numbers that by 1890 frontier lines had to be erased from the maps.

These were decades of bonanza, and sometimes of bust, in the boom towns, on cattle ranges, and across ever-expanding wheat lands. These were the years when rail networks spread to knit the continent more tightly than men had dreamed possible.

Above all, this was the era when the United States advanced from fourth to first place among manufacturing nations. Inventors like Alexander Graham Bell and Thomas A. Edison helped revolutionize American life.

From farms and overseas, ambitious men and women moved to the growing cities. As the era began, only a sixth of the people lived in cities; as it closed, a third were urbanites.

Through the centennial years of the 1870's and 1880's, Presidents proudly emphasized the progress the Nation had made since its founding. Benjamin Harrison, taking office in 1889, a hundred years after George Washington (page 707), remarked that the center of population had moved westward from the vicinity of Baltimore to near Cincinnati.

"But our growth has not been limited to territory, population, and . . . wealth," he said.

With blast-furnace fury, America's industrial revolution exploded in the mid-1800's. Experiencing a mighty spurt of scientific awareness and an influx of immigrants, the country emerged a colossus. In this painting, "Forging the Shaft," artist John Ferguson Weir depicts the foundry at Cold Spring, New York. Abraham Lincoln visited here to inspect guns produced for the Civil War. Busy ironworks characterized the spirited era of Presidents Lincoln through McKinley.



METROPOLITAN MUSEUM OF ART, GIFT OF LEVIN S. BLOOMINGDALE



"The masses of our people are better fed, clothed, and housed than their fathers were. . . . Not all of our people are happy and prosperous. . . . But on the whole the opportunities . . . to the individual to secure the comforts of life are better than are found elsewhere."

In part, Harrison was answering Grover Cleveland, who uttered stern warnings in his message to Congress of December, 1888:

"Our survival for one hundred years is not sufficient to assure us that we no longer have dangers to fear in the maintenance, with all its promised blessings, of a government founded upon the freedom of the people. . . . Upon more careful inspection we find the wealth and luxury of our cities mingled with poverty and . . . discontent with agricultural pursuits. . . . Corporations, which should be the carefully restrained creatures of the law and the servants of the people, are fast becoming the people's masters."

In Harrison's optimism and Cleveland's pessimism are reflected the two faces of the age. Yet both men, like every President from Lincoln through McKinley, believed the Nation basically must solve its problems through a free working of economic laws. In theory, Presidents seemed to have little responsibility for the economy.

Nevertheless, Lincoln had brought to the Federal administration such dynamism that it fought and won a great war for survival. Nor did Lincoln hold so firm a view of the limitations of government. In 1854 he wrote: "The legitimate object of government is to do for the people what needs to be done, but which they can not, by individual effort, do at all, or do so well, for themselves."

From the 1870's into the 1890's, numerous dissatisfied people repeatedly sought Federal aid to help lift their economic burdens. They obtained considerable legislation—to increase money supply, regulate railroads, and dissolve monopolies. But not until the 20th century, with Theodore Roosevelt, were they to obtain a President who would wield in their behalf the positive strength of a Lincoln.





**First Presidential phone call** connects Rutherford B. Hayes with Alexander Graham Bell. In 1877, at Rocky Point, Rhode Island, Hayes (left) listens over a bobbinlike receiver-transmitter. From Providence, Mr. Bell speaks to the President through 1.3 miles of wire. A few months later, Hayes installed the first telephone in the White House. Not until the Hoover Administration in 1929, however, did the instrument sit on the desk of a Chief Executive.

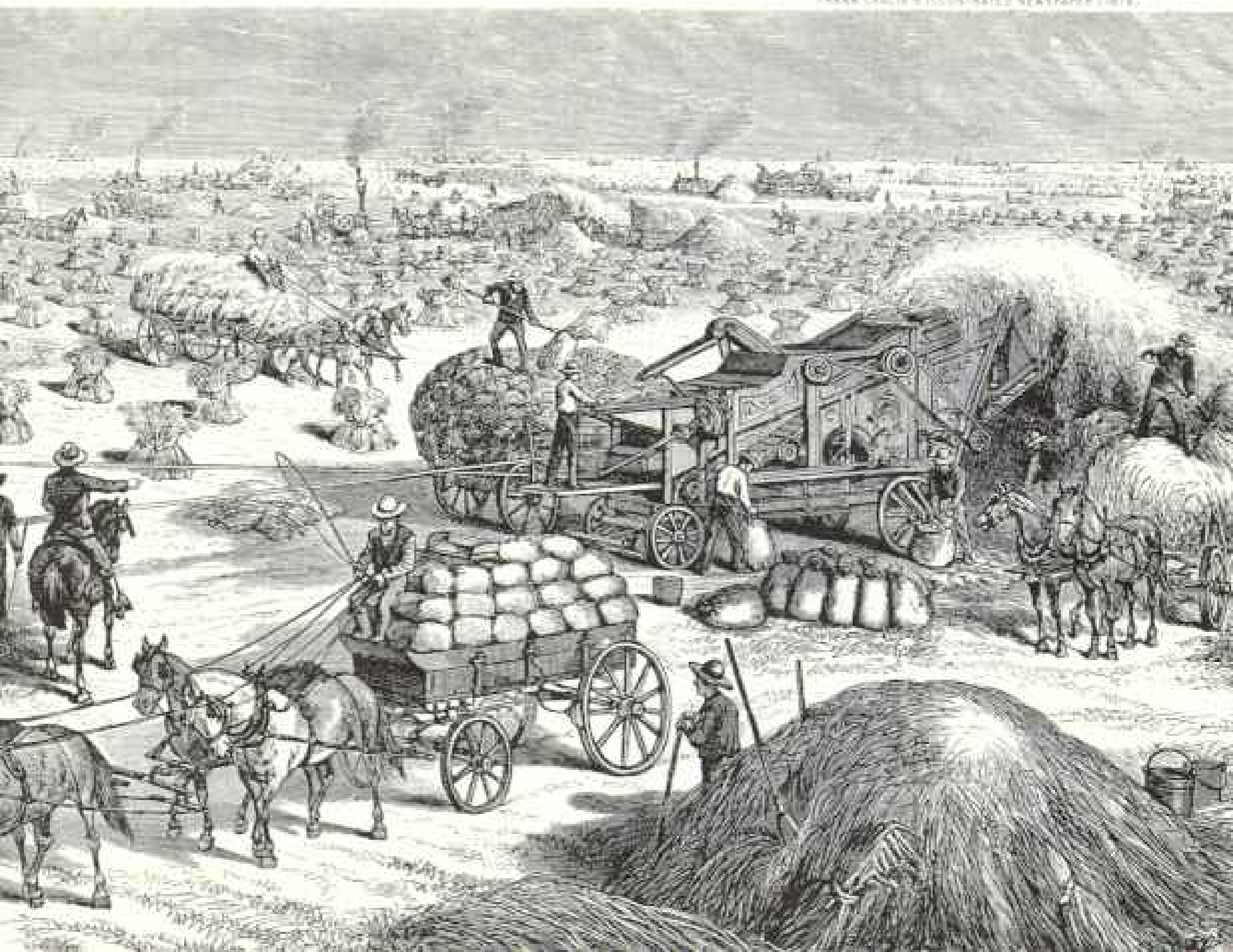
**Melting pot of the West**, Chicago in 1870 reels from droves of immigrants, merchants, frontiersmen, and Indians who jam the station platforms. Only one year earlier, east and west coasts had been stapled together by a steel ribbon of track. As early as 1854, this booming metropolis had become the Nation's railway hub; more than 200 trains rumbled into the city each day.

**Steam-snorting engines** power threshing machines harvesting the wheat crop in the Dakota Territory during the late 1870's. Men bag the grain that pours out of the horseless thresher at a rate of some 600 bushels a day. Wagon in foreground hauls away the sacked bounty.



—PRODUCED BY NATIONAL GEOGRAPHIC SOCIETY, GEOGRAPHIC ART DIVISION © N.G.S.

FRANK LINDSAY'S ILLUSTRATED NEWSPAPER PHOTO.



# Abraham Lincoln

SIXTEENTH PRESIDENT 1861-1865

**A**BRAMHAM LINCOLN, inaugurated at a time of crisis when the Federal Union seemed irrevocably dissolved, pledged all his political skills and statecraft to the Union's preservation. He grew in office and achieved that rare greatness necessary to rally the North, to sustain it through a long and discouraging war, and ultimately to reunite the American Nation.

He also lifted from the land the stigma of slavery. And in words of unsurpassed eloquence, he set forth the humanitarian ideals that gave meaning to the conflict and inspiration to later generations.\*

The son of a Kentucky frontiersman, Lincoln in his youth had to struggle for a living and for learning. Five months before receiving the nomination for President, he sketched his early life:

"I was born Feb. 12, 1809, in Hardin County, Kentucky. My parents were both born in Virginia, of undistinguished families. . . . My

mother, who died in my tenth year, was of a family of the name of Hanks. . . . My father . . . removed from Kentucky to what is now Spencer county, Indiana, in my eighth year. . . . It was a wild region, with many bears and other wild animals still in the woods. There I grew up.

## "Necessity" Among His Teachers

"There were some schools, so called; but no qualification was ever required of a teacher, beyond '*readin, writin, and cipherin,*' to the Rule of Three. . . . Of course when I came of age I did not know much. Still somehow, I could read, write, and cipher. . . . but that was all. . . . The little advance I now have upon this store of education, I have picked up from time to time under the pressure of necessity."

Of his physical appearance, Lincoln added, "I am, in height, six feet, four inches, nearly; lean in flesh, weighing, on an average, one hundred and eighty pounds; dark complexion, with coarse black hair, and grey eyes—no other marks or brands recollected."

Lincoln grew up with a keen desire for knowledge and made extraordinary efforts to attain it while working on a farm, splitting rails for fences, and keeping store in the log-cabin village of New Salem, Illinois, now reconstructed (page 666).

After serving as a captain in the Black Hawk War, he became a licensed lawyer and spent eight years in the Illinois Legislature. In 1837 he moved to Springfield, from where he rode the circuit of courts, sharpening his skills

\*See "Lincoln, Man of Steel and Velvet," by Carl Sandburg, NATIONAL GEOGRAPHIC, February, 1960.

**Pipestem figure**, angular 6-foot-4 Abe, tallest of the Presidents, often walked alone late at night near the White House, sometimes pausing to talk to strangers. His clothes "hung upon him as if on a rack to dry," said biographer Carl Sandburg. Charles W. Reed, a trumpeter of the 9th Massachusetts Battery, executed this rarely seen sketch.

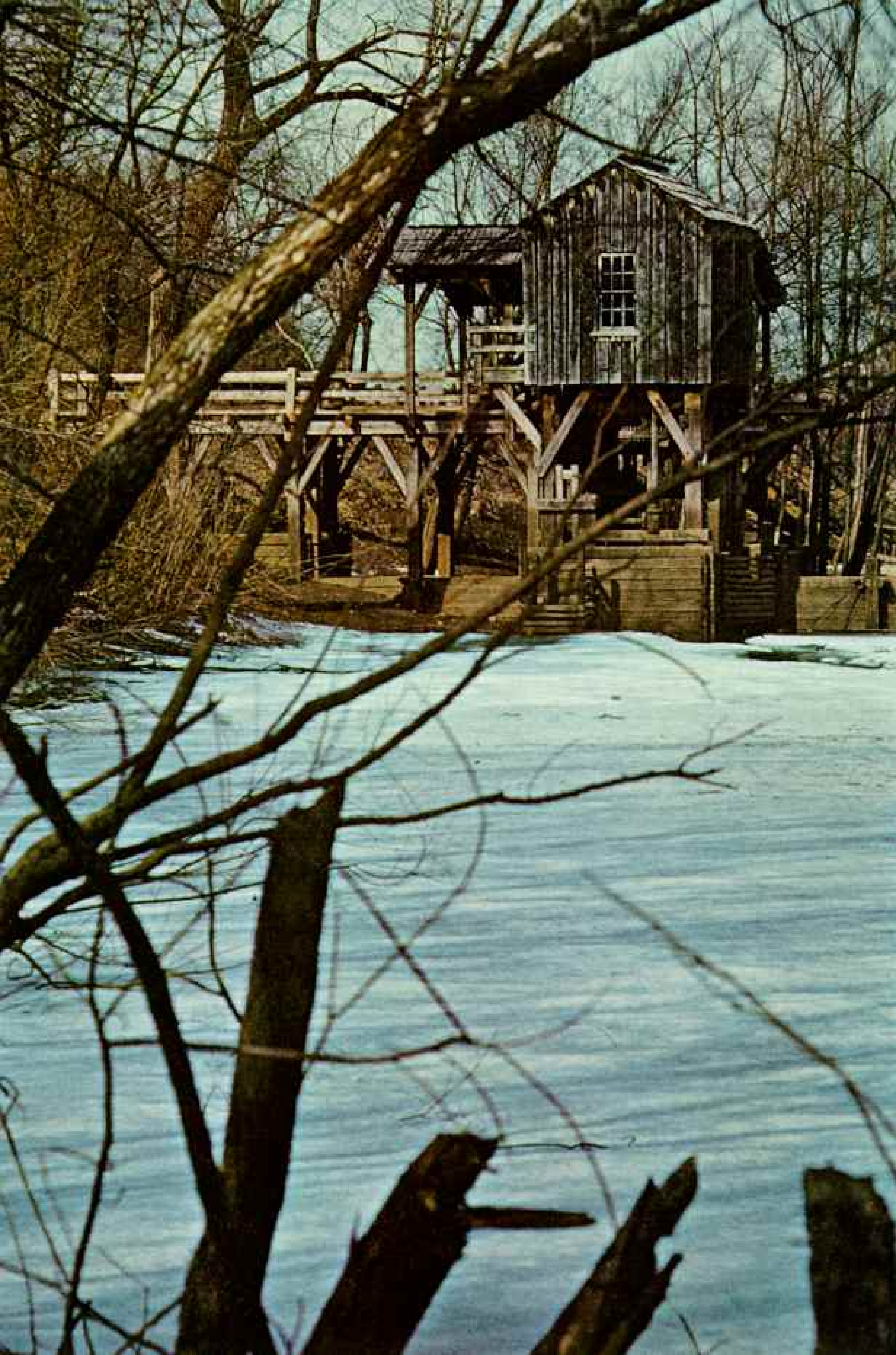
"**He can sit and think** without food or rest longer than any man I ever saw," said his law partner of Abraham Lincoln, whose election triggered the Civil War but whose firm hand preserved the Union. He was the first President to be cut down by an assassin.



LIBRARY OF CONGRESS







and enjoying success as a prairie lawyer.

In November, 1842, he married Mary Todd, from Lexington, Kentucky, who had been staying at her sister's home in Springfield. Lincoln bought a large frame house at Eighth and Jackson Streets, now maintained as a state memorial (pages 670-71). In his favorite rocker, one of the many original furnishings on display, he stretched out his long legs and watched his four boys, those "dear codgers," romp at his feet. Only one son, Robert Todd Lincoln, lived to maturity.

#### Slavery Issue Provokes a Prophecy

Elected to Congress in 1846 as a member of the minority Whig Party, Lincoln was able to win little national distinction and returned to his thriving law practice after a single term. But his law partner said of him, "His ambition was a little engine that knew no rest."

Lincoln as a Whig politician rose less spectacularly than Democrat Stephen A. Douglas, the "Little Giant." Still, by 1858 after he had joined the rising Republican Party, he was recognized as the strongest man to oppose Douglas for Senator. Lincoln opened that campaign with his portentous "House Di-

vided" speech: "I do not expect the Union to be *dissolved*—I do not expect the house to *fall*—but I *do* expect it will cease to be divided. It will become *all* one thing, or *all* the other."

Lincoln challenged Douglas's doctrine of "popular sovereignty" in a remarkable series of debates (next page). At Knox College in Galesburg, Illinois, Lincoln branded slavery "a moral, social and political evil."

Lincoln lost the election, but acquired a nationwide reputation that won him the Republican nomination for President two years later, in 1860. Several months before the convention, he made headlines in the East for his speech at Cooper Union, a New York landmark which visitors find virtually unchanged from Lincoln's day.

"Let us have faith that right makes might," Lincoln said, "and in that faith, let us, to the end, dare to do our duty as we understand it."

In the election, Lincoln received only a plurality of the popular vote over Democrat Douglas, Southern Democrat John C. Breckinridge, and Constitutional Union Party candidate John Bell; but he gained a majority of the electoral vote.

There was little in Lincoln's background



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Rustic mill in New Salem, Illinois, overlooks the spot where Lincoln in 1831 ran aground with a flatboat full of squealing pigs. Later he lived in New Salem and became a state representative. The mill rises above a snow-covered field where the Sangamon River formerly flowed.

"May he yet guide the Ship of State," read the title of this 1860 campaign poster depicting Lincoln as a young man piloting a flatboat down the Mississippi to New Orleans. A line engraving tinted for posters, the picture lacks color around the flagstaff and Abe's chest.

and appearance to inspire confidence that he could meet the challenge posed by the tier of states in the Deep South that had seceded to form the Confederacy. One reporter traveling eastward with the President-elect remembered how dismayed people were by Lincoln's high-pitched voice, and his "most unprepossessing features . . . gawkiest figure, and . . . most awkward manners." These superficialities were quickly overshadowed as Lincoln began to take action as President.

In his Inaugural Address, on March 4, 1861, Lincoln was conciliatory yet firm toward the South. "In *your* hands, my dissatisfied fellow countrymen, and not in *mine*, is the momen-

tous issue of civil war," he warned them. "The government will not assail *you*. . . *You* have no oath registered in Heaven to destroy the government, while *I* shall have the most solemn one to 'preserve, protect, and defend' it."

#### Shells Over Sumter Light War's Fuse

Lincoln thought secession legally impossible. He was determined to enforce Federal laws—"to hold, occupy, and possess" Government property—in the South. The Nation turned its attention to Fort Sumter, Federal property in the harbor of secessionist Charleston, South Carolina. On April 6, the President announced he was sending supplies to the

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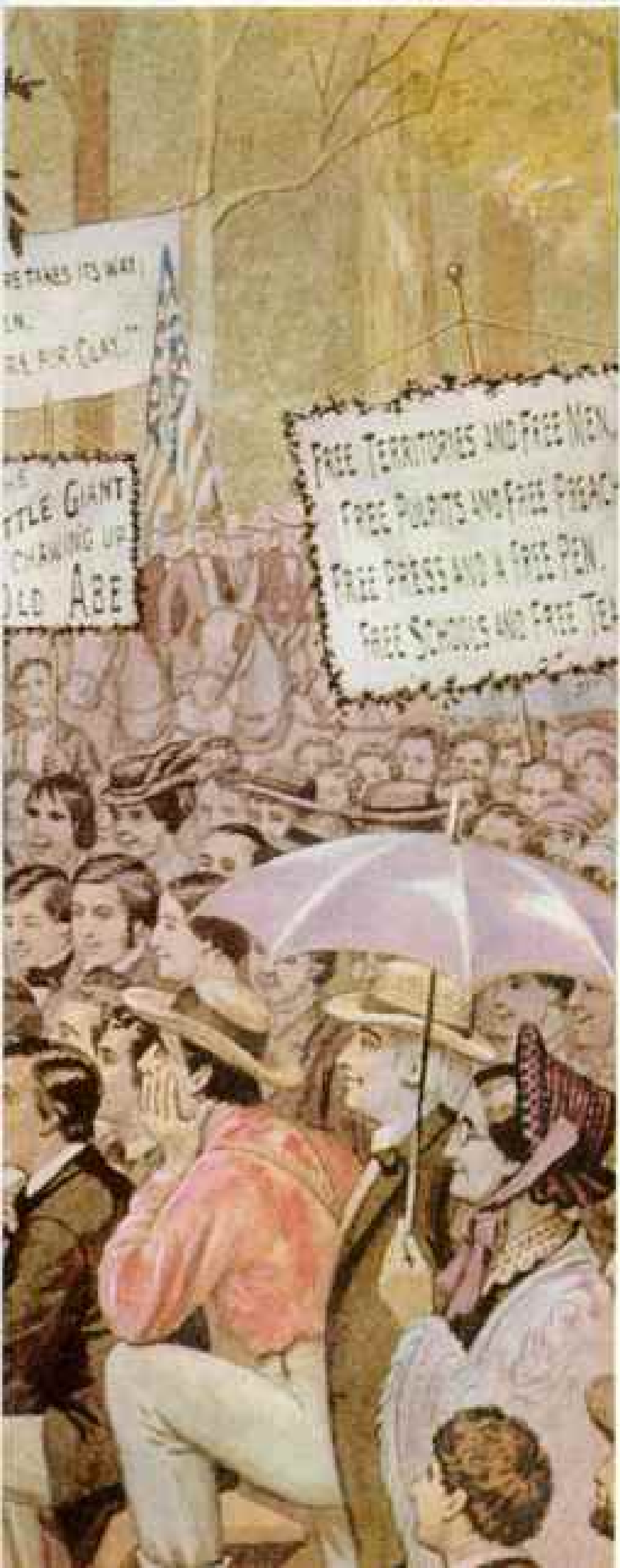
fort. Confederate batteries opened fire on April 12 and forced its surrender. The Civil War had begun."

In the hectic early months of the war, which brought the Union rout at Manassas, or Bull Run, Lincoln pursued a careful political course in order to retain the sympathies of Border States. At the same time he exercised to the utmost his wartime powers as Commander in Chief.

Through shrewd dispensation

*\*See "The Civil War," by Maj. Gen. Ulysses S. Grant 3rd, USA (Ret.), NATIONAL GEOGRAPHIC, April, 1961.*

EDITH BROWN BELL, WOODEN ENTERPRISES, INC.



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**Rail Splitter Lincoln** drives a wedge with a maul in an 1860 campaign poster, an allusion to his hard-working youth. Down the river floats a flatboat, recalling his trips on the Mississippi. On the far bank looms a hazy image of the White House—a result of artistic license. The slogan "Rail Splitter" first became popular at a state convention when two rails were displayed from a lot of 3,000 he helped cleave. At 21, Abe paid for some trousers by splitting 400 rails for each yard of cloth.

**Second of seven great debates:** Lincoln talks to a crowd of 15,000 on a misty day at Freeport, Illinois, in 1858. Behind him, with hand jauntily on hip, stands Democrat Stephen A. Douglas, the "Little Giant." Running for the Senate, Lincoln challenged the incumbent Douglas to debate. The ensuing series of oratorical jousts made Lincoln a national figure. Douglas won the election, but he split his party with his affirmative stand on the question Lincoln here poses: "Can the people of a United States Territory exclude slavery . . . prior to the formation of a State Constitution?" Two years later the Democratic rift helped Lincoln defeat Douglas for the Presidency. In 1958, this scene from an old lantern slide decorated a 4-cent stamp commemorating the 100th anniversary of the Lincoln-Douglas Debates.

Proud and graceful, Mary Todd Lincoln wears a brooch portraying her husband. Ambitious for his career, she once remarked: "Doesn't he look as if he would make a magnificent President?" A polished hostess, she longed to entertain lavishly at the White House—her Inaugural gown in 1865 cost \$2,000. But the strain of the war and the loss of "Little Willie," second of her sons to die, shattered her spirit. Nevertheless, the First Lady devoted much of her time to work among the wounded soldiers in hospitals, where she distributed fruit and wine.

PAINTING BY FRANCIS B. JOHNSON, COURTESY ROBERT LOVELL BEANWITZ

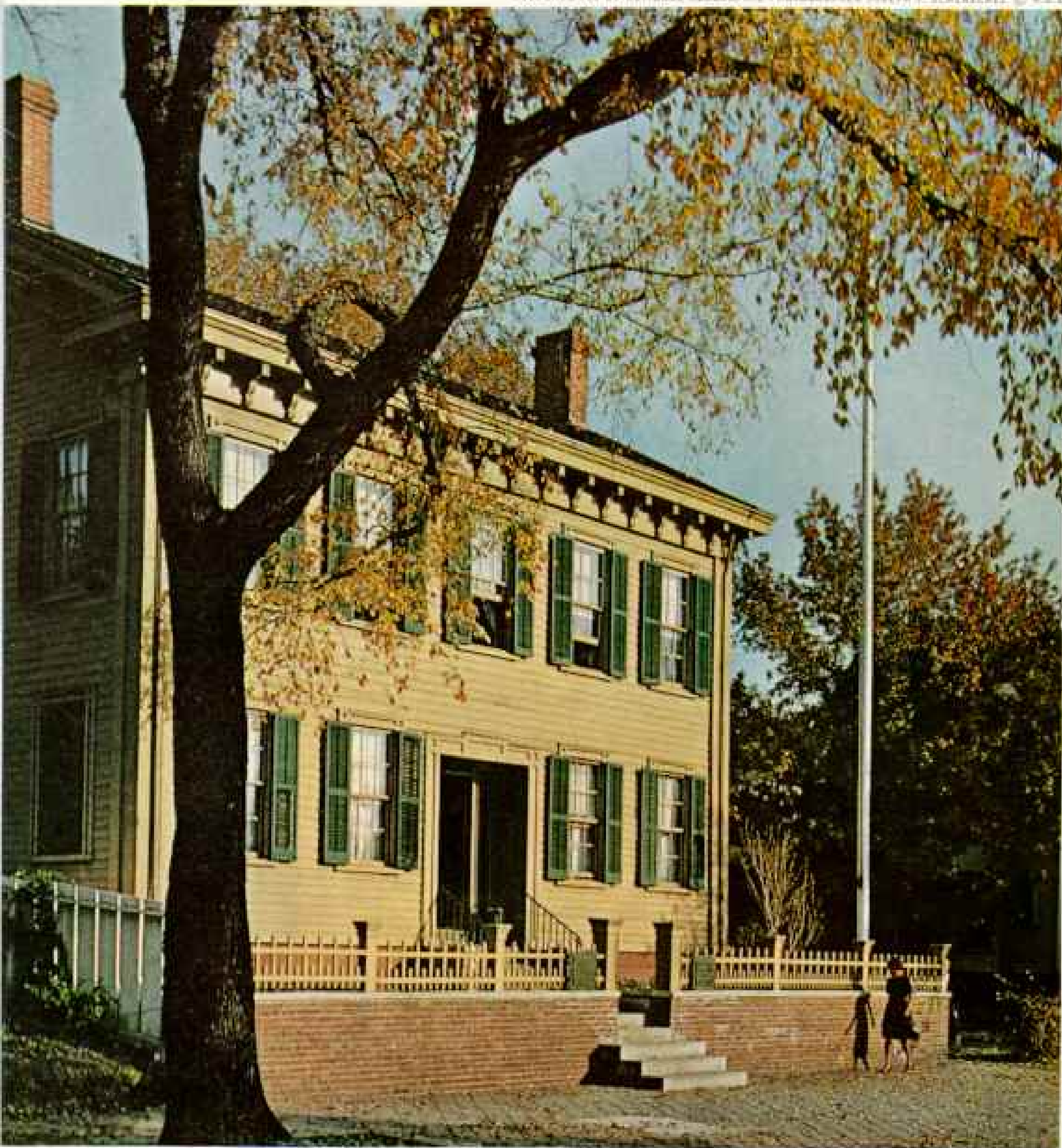


of patronage, he built the Republican Party into a strong national organization. By his extraordinary arts of personal persuasion, he kept within the party politicians ranging in their views from the conservatism of northern Democrats and former Whigs, such as Secretary of State William H. Seward, to the radicalism of the abolitionists, such as Secretary of the Treasury Salmon P. Chase. Lincoln, a brilliant politician, emerged a great statesman.

Sensing public opinion as had no President since Andrew Jackson, he assumed leadership over popular attitudes through an occasional

public statement or letter to the press. Thus, he maintained relative unity while charting a course in 1862 toward emancipation, even as the Union Army recoiled from shattering clashes in Virginia—the Seven Days' Battles on the peninsula, and the Valley Campaign—where Robert E. Lee and Stonewall Jackson repeatedly inflicted disconcerting blows.

Union heroism in September beside bloody Antietam Creek in Maryland gave President Lincoln the victory he needed to announce, on January 1, 1863, the Emancipation Proclamation, declaring slaves in Confederate territory "forever free."



Only home Lincoln ever owned, this venerable frame dwelling stands in Springfield, Illinois. Today a state memorial, it wears "Quaker brown," the original tan color. Lincoln lived here for 17 years before moving to the White House.

Trademarks of Lincoln, beaver, white kid gloves, and cane actually belonged to him. Stovepipe hat served as his "office"; he carried important papers in its crown. Lincoln disliked wearing gloves, though his wife dutifully outfitted him with them. He kept stuffing them into his coat until, upon one occasion, he discovered his pockets bulging with seven or eight pairs.





**HEAD QUARTERS**  
**CADWALADER REGIM'T.**



**S. W. CORNER NINTH AND WALNUT STREETS.**

**RECRUITS WANTED**  
**FOR THREE YEARS OR DURING THE WAR.**

ONE IN EACH HOUSE LEAVING THE CITY.

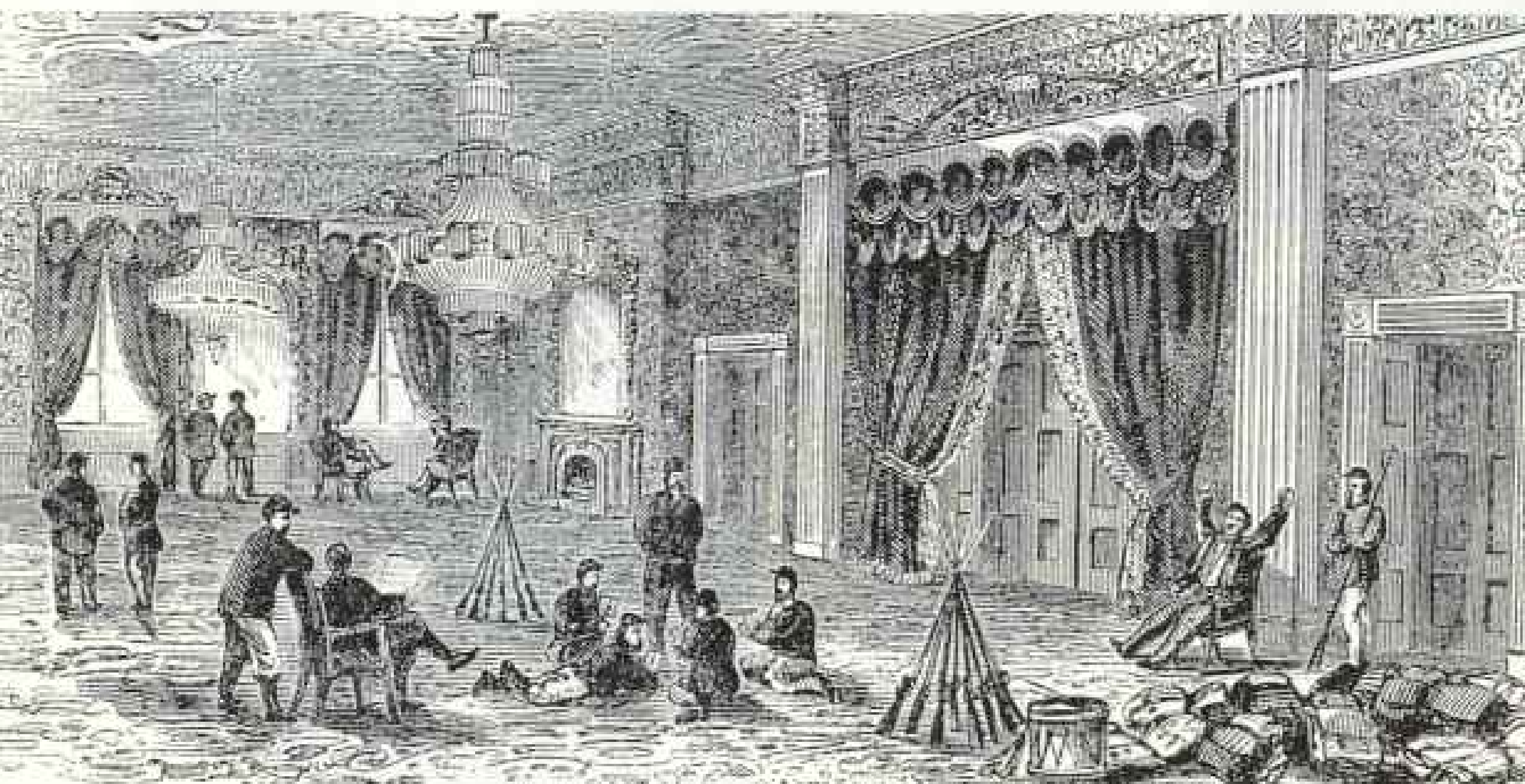
Active able-bodied Young Men are Wanted to fill up this Regiment.

THE ATTENTION OF  
**MECHANICS AND WORKING MEN**  
**MILITARY EXPERIENCE.**

**COL. W. F. SCHREIBER.**



Appealing for volunteers, posters papered the North at the outbreak of the Civil War. Lincoln, assuming unprecedented powers, called for recruits without prior Congressional approval. Troops camped in the East Room of the White House (below) when officials feared the fighting would sweep Washington. Wear on furnishings necessitated extensive renovation.



LIBRARY OF CONGRESS ABOVE; LETTIE BENSON J. LOSSIGNY, PICTORIAL FIELD-BOOK OF THE CIVIL WAR, WHITE HOUSE COLLECTION



PAINTING (PROOF) BY EUGENE DE LAMB, SALESIEDER, LINCOLN MUSEUM, 1866; ENGRAVING FROM A PAINTING BY FRANCIS B. CARPENTER, LIBRARY OF CONGRESS

"Amid the whizzing bullets," wrote Lincoln biographers Nicolay and Hay, "the President . . . stood . . . with that grave and impassive countenance . . . until an officer fell mortally wounded within three feet of him . . ." Thus Lincoln in 1864 sees Union troops repel an attack on Fort Stevens, seven miles from the Capitol. Maj. Gen. Horatio Wright tugs at the arm of his Commander in Chief, who finally took cover. Lincoln saw only this one Civil War battle.

Addressing the Cabinet, Lincoln reads his Emancipation Proclamation for the first time. The edict freed slaves in Confederate territory, bolstered northern morale, and won sympathy abroad. The original painting hangs in the Capitol.



Final destruction of the institution of slavery came through the Thirteenth Amendment. By dint of Lincoln's persistent political pressure, the amendment received the necessary two-thirds vote in Congress in January, 1865, and was ratified before the end of the year.

Maj. Gen. George B. McClellan's failure at Antietam to pursue and destroy Lee's army rankled Lincoln, as did the blundering of Ambrose E. Burnside at Fredericksburg, Virginia, and the retreat of "Fighting Joe" Hooker from nearby Chancellorsville. "My God! My God!" moaned Lincoln. "What will the country say?" Not until July of 1863, when Ulysses S. Grant took Vicksburg and George G. Meade prevailed at Gettysburg (though he, too, irked Lincoln by his failure to pursue Lee), could the President see improved military leadership.

**Black-plumed hearse** drawn by 16 shrouded horses bears the body of the martyred President through New York City in a primitive painting.

On Good Friday, 1865, Lincoln fell at the hand of John Wilkes Booth. After lying in state at the White House and Capitol, his body began a 1,700-mile trip to Springfield, Illinois, for burial in Oak Ridge Cemetery. The train paused in many cities, reversing the route Lincoln followed to his first Inauguration. Here troops at present arms meet the bier at a railway station in New York. Black cloth drapes the building at left.

Last year, 745,000 persons visited Lincoln's tomb in Springfield, which bears the inscription: "Now he belongs to the ages."

**Official mourning ring** with box honors Lincoln. Washington is the only other President known to have been so memorialized.

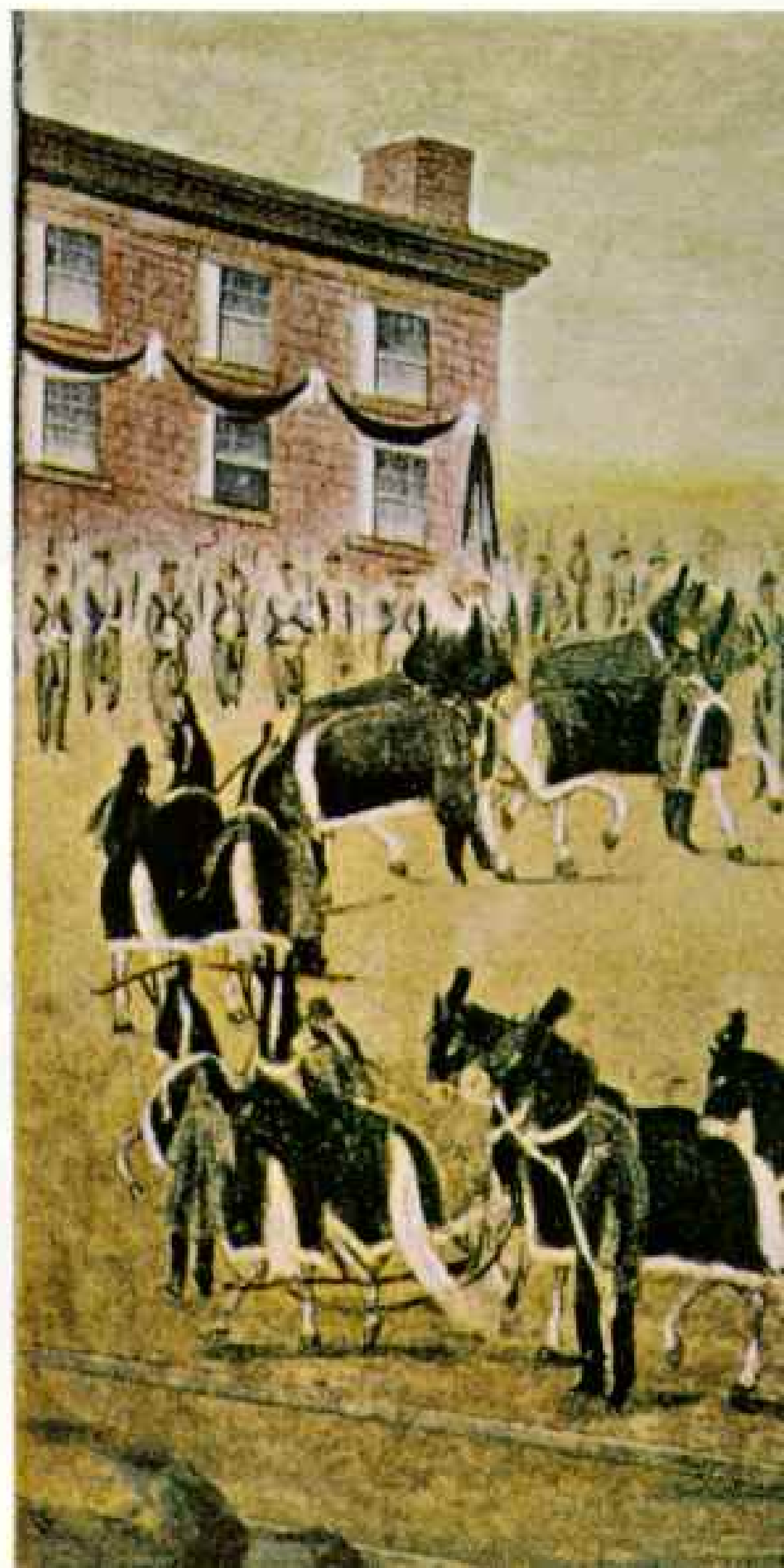
SMITHSONIAN INSTITUTION



At Gettysburg, where batteries of mute cannon today brood over the national battlefield, President Lincoln addressed himself to the conscience and aspirations of the American people, and, indeed, the world.

In the David Wills home, which still faces the town square, the bedroom where Lincoln revised his "few appropriate remarks" remains much the same as when the President slept there. At the battlefield cemetery the next morning, he spoke for two minutes, ending the immortal Gettysburg Address with the resolve "that this nation, under God, shall have a new birth of freedom—and that government of the people, by the people, for the people, shall not perish from the earth."

In planning for peace, Lincoln was flexible and generous, wishing to persuade southerners to lay down their arms and join in reunion.





The generous terms of reconstruction he announced in December, 1863, failed to weaken resistance and provoked sharp criticism among Radical Republicans in Congress.

#### President Envisions Noble Peace

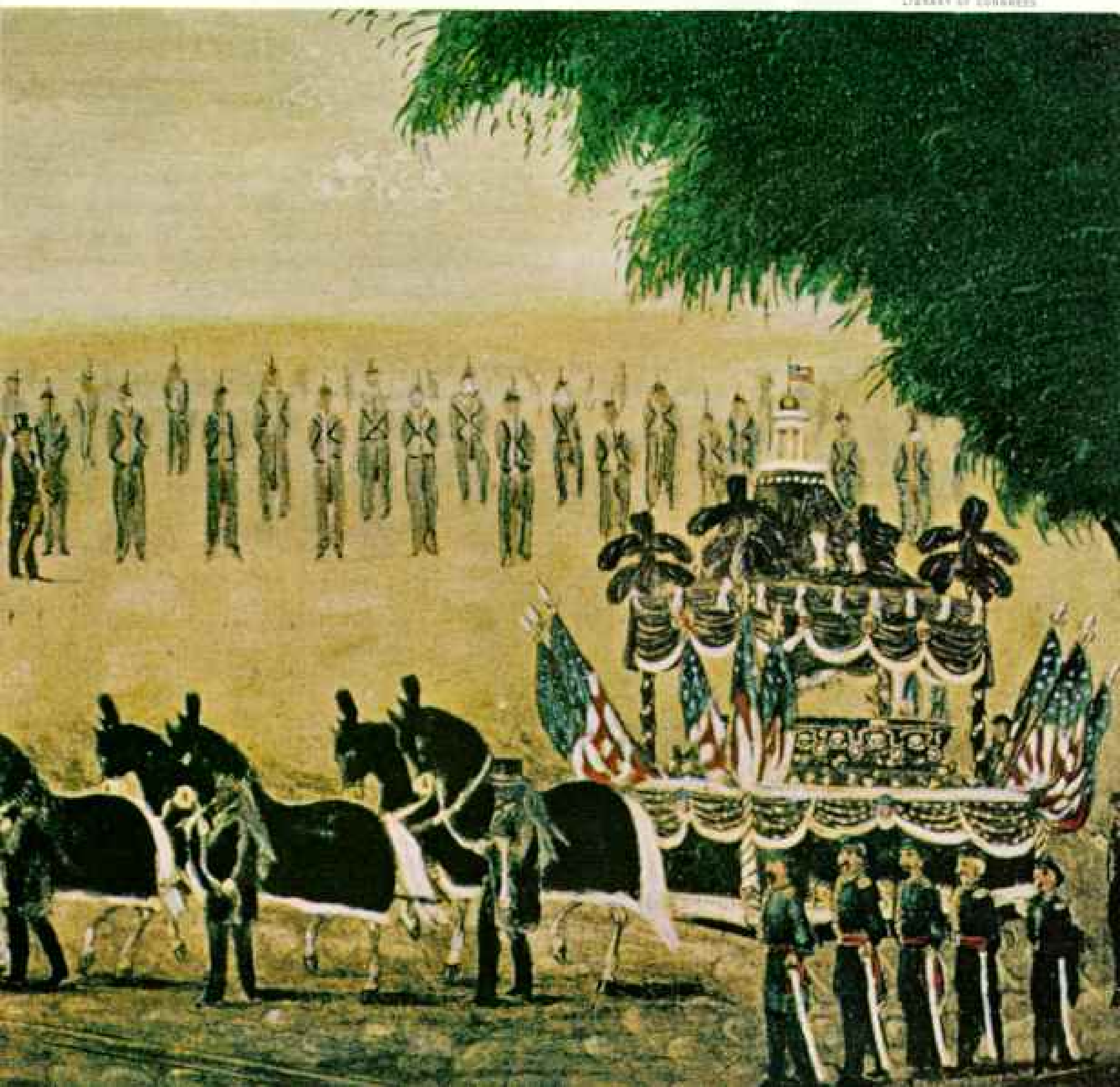
Lincoln, with Andrew Johnson as his running mate, won re-election in 1864, defeating McClellan. Maj. Gen. William Tecumseh Sherman meanwhile marched through Georgia, cutting the Confederacy in two, and Grant besieged Lee's army, entrenched at Petersburg. The Civil War neared its end.

In the spring of 1865, facing serious challenge from the Radical Republicans, Lincoln offered no single detailed formula to return the "seceded States, so called" to their "proper practical relation" with the Union. The spirit that guided him, however, was clearly

that of his Second Inaugural Address, seen today inscribed on a wall of the Lincoln Memorial in the Nation's Capital:

"With malice toward none; with charity for all; with firmness in the right, as God gives us to see the right, let us strive on to finish the work we are in; to bind up the nation's wounds."

On April 14, 1865, just five days after General Lee's surrender at Appomattox Court House, President Lincoln was assassinated. In Ford's Theatre in Washington, now being restored by the National Park Service as the Lincoln Museum, the President was shot in the head by an actor, John Wilkes Booth, who somehow thought he was helping the South. Quite the opposite was the result, for with Lincoln's death the chance for peace with magnanimity died.



# Andrew Johnson

SEVENTEENTH PRESIDENT 1865-1869

**A**NDREW JOHNSON, thrust into the White House by the assassination of Abraham Lincoln, was an old-fashioned Southern Jacksonian Democrat of pronounced states' rights views. He tried to reconstruct the Federal Union by giving speedy control of Southern States to those who would take the oath of allegiance. Arrayed against him were the Radical Republicans in Congress, a loose coalition of men of varying views ranging from idealistic to mercenary, but brilliantly led and ruthless in their tactics.

Johnson, lacking Lincoln's statecraft and adroitness of political maneuver, was no match for them. Although courageous and stubborn, he was indecisive, putting off action until too late. Defeated in his policies, almost removed from office by the Senate, he was one of the most unfortunate of Presidents.

Born in Raleigh, North Carolina, in 1808, he grew up in poverty and without schooling. His father died while Andrew was very young, and the boy later was apprenticed to a tailor. He ran away from his master, and in a few years he opened a tailorshop of his own in Greeneville, Tennessee (page 678). There, when he was 19, he married Eliza McCardle, who taught him reading and writing. In later years he paid tribute to her, saying: "God's best gift to a man—a noble woman."

As the young tailor prospered—he boasted that he always "was punctual to my customers, and did good work"—he bought a comfortable home in Greeneville, which has now been restored as part of a national historic site. Johnson participated in local debating forums, developing a powerful though crude oratorical style.

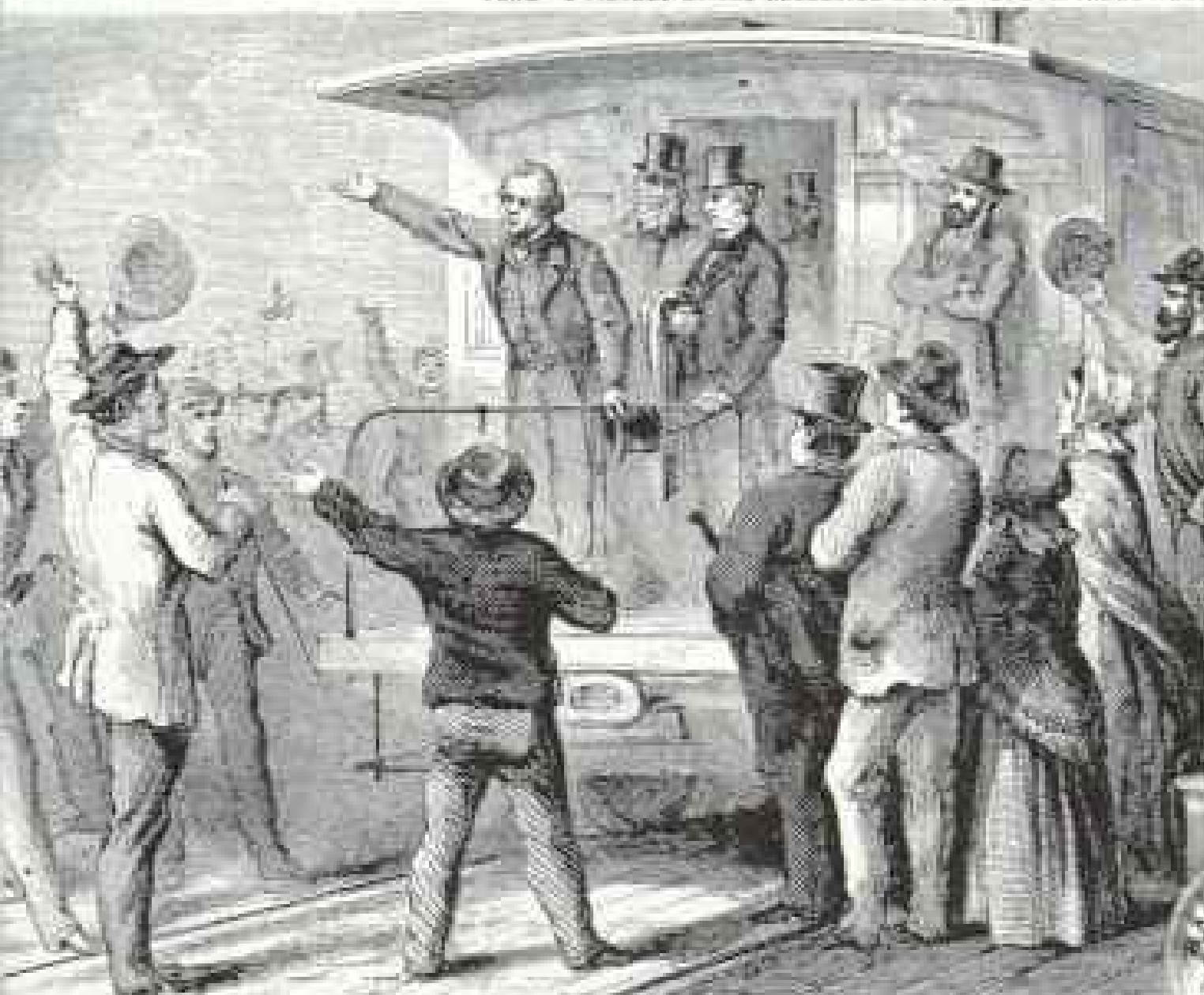
## Common Man Finds Uncommon Voice

Entering politics, he became an adept stump speaker, delivering withering retorts to hecklers, everlastingly championing the common man, and vilifying the plantation aristocracy. Elected alderman, then mayor, he advanced to the State Legislature and on to the U.S. House of Representatives for ten years. He returned to Tennessee to serve as governor, and after two terms he won election to the U.S. Senate.

In Congress during the 1840's and '50's, Johnson tirelessly advocated a homestead bill to provide free farms to the landless. He was enraged when President Buchanan, heeding planter protests, vetoed one such bill.

During the secession crisis, Johnson made a firm stand in defense of the Union and Constitution. Remaining in his seat in the Senate even when Tennessee seceded, he became a hero in the North but a traitor in the

FROM THE PICTURE OF THE DECEASED SLAYER BY J. T. THORNTON



Piercing eyes and grim mouth of Andrew Johnson reflect the bitter fight he waged with Congress over Reconstruction in the South. He favored leniency in permitting Southern States to resume their Constitutional functions, while the Radicals in Congress cried for a harsher course. When Johnson stood in their way, they impeached him—making him the only Chief Executive to face such a trial.

Crowds jeer Johnson in almost every city as he makes the "Swing around the Circle," a tour of East and Middle West in 1866. He failed to win support of the people in his battle with Congress over Reconstruction.







Weather-worn tailorshop in Greeneville, Tennessee, reminds visitors of Andrew Johnson's poverty-stricken youth. At 14 he became a tailor's apprentice to help his widowed mother. Mastering the trade, he went into business for himself in 1827. The same year he married Eliza McCardle, who spent long hours reading to him as he worked. At night she taught him to write. His shop, now a part of the Andrew Johnson National Historic Site, became a gathering place for political discussions.

Brocade wedding vest attests to Johnson's skill as a tailor. He made the garment for a Greeneville customer in 1839.



SMITHSONIAN INSTITUTION

eyes of most southerners. At the request of President Lincoln, in 1862 he became Military Governor of Tennessee, and with much difficulty made the state serve as a laboratory for Reconstruction.

In 1864 the Republicans, calling themselves the National Union Party, nominated Johnson, a southerner and a Democrat, to run for Vice President, to give backing to their contention that their party was a coalition of all loyal men.

#### Leniency Marks Johnson Program

On the day after Lincoln's death, President Johnson delighted a delegation of Radical Republicans by exclaiming to them, "Treason must be made infamous and traitors must be impoverished."

The Radicals were misled, for true to views he had long held, Johnson proceeded in the summer and fall of 1865, while Congress was not in session, to reconstruct the former Confederate States along lines almost as lenient as Lincoln had offered. He pardoned all those who would take an oath of allegiance, except for former leaders of the Confederacy and men of wealth whom he required to obtain special Presidential pardons—and he was generous in bestowing these.

By the time Congress met again in December of 1865, most state governments were operating in the South and had ratified the Thirteenth Amendment, which abolished slavery. But Black Codes—state laws which tended to deprive freedmen of their rights—began to appear. Ex-Confederates were prominent in the legislatures and administrations of these states, and several score former Confederate officers and officials, including the former Vice President of the Confederacy, had been elected to Congress.

Radical Republicans in Congress moved vigorously to block the Johnson program of Reconstruction. They obtained the support of those northerners who were dismayed to see southerners keeping many prewar leaders in positions of authority and imposing many prewar restrictions upon Negroes. The Radicals' first step was to refuse to seat in Congress any of the Senators and Representatives from the former Confederate States.

Next the Radicals passed measures on behalf of the former slaves. Johnson, firmly persisting in a prewar view of the Constitution, vetoed the bills as violations of states' rights. His veto of a bill to extend the life of the Freedmen's Bureau—an agency providing relief to Negroes—was sustained. A rejoicing



HARPER'S WEEKLY 1868

Delivering impeachment summons, the Senate Sergeant at Arms hands Johnson the writ in the White House. Charged with "high crimes and misdemeanors," the President escaped conviction by a single vote. Vilified as Chief Executive, he received a standing ovation seven years later as a United States Senator from Tennessee.

group of southern sympathizers serenaded Johnson at the White House. He responded with a strong speech in which he charged that Radical Republican leaders were traitors.

The Radicals retaliated by passing legislation over Johnson's veto—the first time that Congress had overridden a Presidential veto of an important bill. They passed the Civil Rights Act of 1866, which established Negroes as American citizens and forbade states to discriminate against them.

A few months later Congress went even further and submitted to the states the Fourteenth Amendment, which defined citizenship and specified that no state should "deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws." All former Confederate States except Tennessee refused to accept the amendment.

There were two bloody race riots in the South. In late summer of 1866, when Johnson toured the East and the Middle West, he faced hostile, heckling audiences (page 676); in Con-

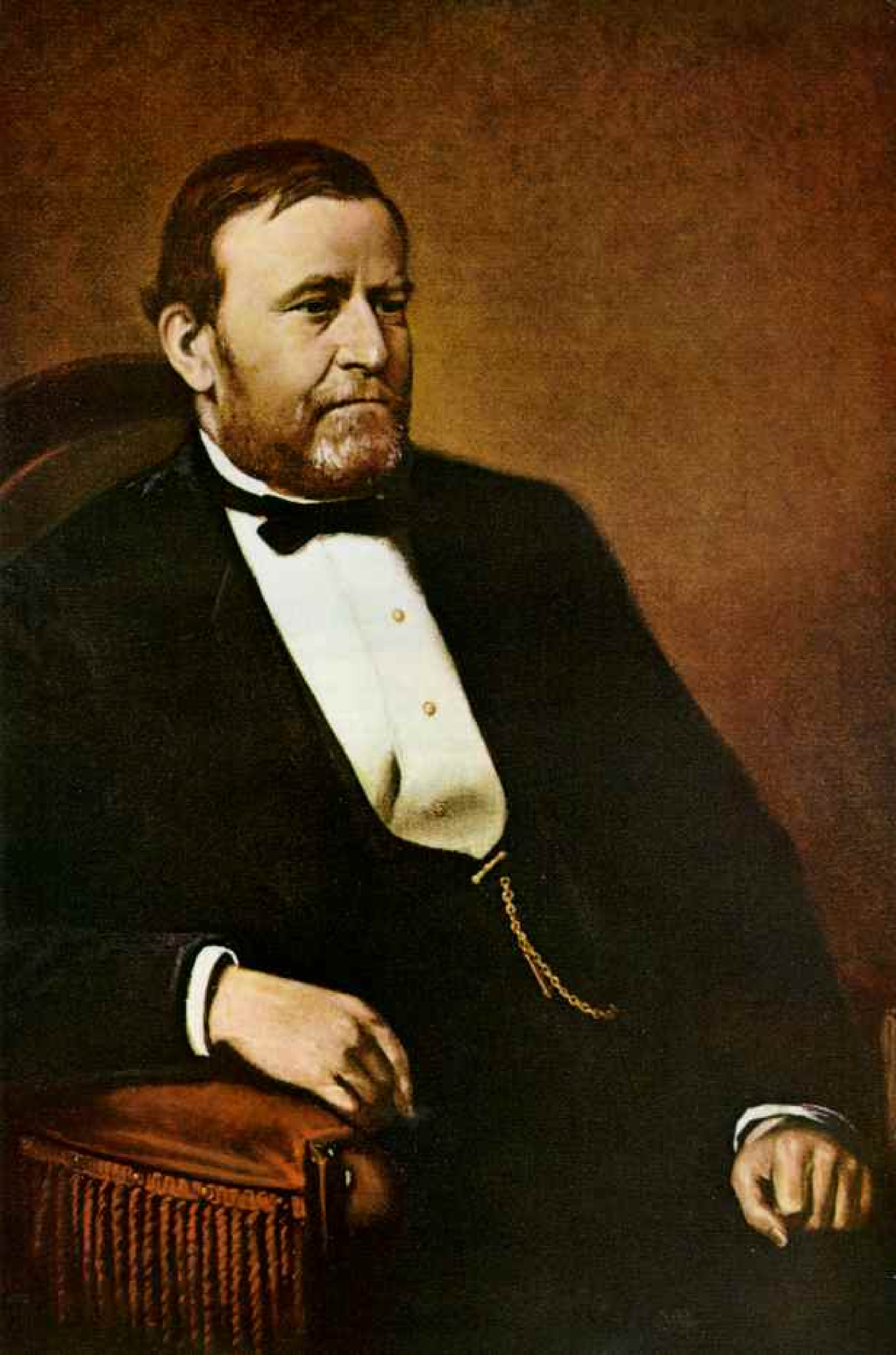
gressional elections that fall Radical Republicans won overwhelming victories.

In March, 1867, the Radicals initiated their own plan of Reconstruction, placing Southern States under military rule until they met certain requirements, including approval of the Fourteenth Amendment.

#### Senate Holds Trial of President

The Radicals also passed laws that placed restrictions upon the President. Johnson allegedly violated one of these, the Tenure of Office Act—ruled unconstitutional in 1926 by the Supreme Court—when he dismissed Secretary of War Edwin M. Stanton. The House voted 11 articles of impeachment against Johnson (above), and he was tried by the Senate in the spring of 1868. When that chamber voted, the tally fell only one ballot short of the two-thirds majority required for conviction.

In 1875 Tennessee returned the "Old Com-moner" to the Senate, but a few months later, in Greeneville, he died, leaving this instruction for his burial: "Pillow my head on the Constitution of my country."





*U. S. Grant*  
EIGHTEENTH PRESIDENT 1869-1877

**U**LYSSES S. GRANT, who displayed such conspicuous and inspiring leadership as commander of the Union armies during the Civil War, was the logical Republican candidate for President in 1868. In accepting the nomination, he urged, "Let us have peace."

When he was elected, after a spirited campaign, the American people hoped for an end to the turmoil of the previous decade. But his initial ignorance of the functioning of the Government and of political machinery led him to look to Republican leaders. Though he served two terms and became adept in the routine of the Presidency, he seldom rose above the level of those who advised him.

Born in 1822, the son of a Point Pleasant, Ohio, tanner, Grant was a shy boy notable only for his skill in handling horses. He went to West Point rather against his will and graduated in the middle of his class.

During the Mexican War he fought brilliantly under Zachary Taylor, whom he admired and whose casual way of dress he adopted. After the war, Lieutenant Grant

married Julia Dent (page 684), sister of one of his West Point roommates. In 1854, while doing dreary duty on the Pacific coast and lonely without his family, he resigned from the Army.

Discouraging and unsuccessful civilian years followed. He tried farming, and in 1855 built near St. Louis his log "Hardscrabble" house, now part of a private estate. His next unsuccessful venture was in real estate.

At the outbreak of the Civil War he was working in his father's leather store in Galena, Illinois. A substantial home presented by Galena townspeople to the general after the war is now a state memorial; in it repose original furnishings, including Grant's favorite chair, his cuspidors, and cigars (page 684).

#### Swift Rise Begins With Militia Post

Grant did not promote himself vigorously for a command, but at 39 the quiet, diffident, stubby little man was appointed by the Governor of Illinois to be colonel of an unruly volunteer regiment. He quickly whipped it into a disciplined unit, and by September, 1861, he was a brigadier general in command

PHOTOGRAPH ATTRIBUTED TO MATHEW BRADY, LIBRARY OF CONGRESS

Civil War hero who attained the Presidency, Ulysses S. Grant ironically came to hate both warfare and politics. Rejected as nominee for a third term, penniless, and stricken with cancer, the general went to Mount McGregor, New York, in the Adirondacks. He died there in 1885, soon after finishing the memoirs that earned his family nearly half a million dollars. He lies buried in the world-famous tomb on Riverside Drive in New York City.

On the battlefield, Grant meets with members of his staff in 1864 during the siege of Petersburg, Virginia.



**Tipping his top hat,** President Grant with his wife greets Egyptian commissioners in Philadelphia at the opening of the Nation's Centennial in May, 1876.

A month later, Alexander Graham Bell gave the first public demonstration of the telephone in the east gallery of this building. Judges almost overlooked the exhibit, until a royal visitor and friend of Bell's, Dom Pedro, Emperor of Brazil, called their attention to the invention.

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HISTORICAL REGISTER OF THE CENTENNIAL EXPOSITION, 1876. LIBRARY OF CONGRESS



at Cairo, Illinois. Within three years after re-entering the Army he had become commander of all Union land forces; within eight years, President of the United States.

Grant's unusual aptitude was hard to analyze; perhaps Charles Francis Adams, Jr., took his measure in these words: "... he is cool and quiet... and in a crisis he is one against whom all around, whether few in number or a great army as here, would instinctively lean. He is a man of the most exquisite judgment and tact. See how he has handled this Army."

Grant recognized the importance of controlling the Mississippi Valley. In February, 1862, he started up the Tennessee River in pursuit of this objective, captured Fort Henry, and then attacked Fort Donelson on the Cumberland. When the Confederate commander asked for an armistice, Grant replied, "No terms except an unconditional and immediate surrender can be accepted." The Confederates capitulated, and Lincoln promoted "Unconditional Surrender" Grant to major general.

#### Lincoln Finds a Fighting General

On April 6-7, at Shiloh, its somber woods now a national military park, Grant fought one of the bloodiest battles in the West and won a narrow victory. President Lincoln fended off demands for his removal by saying, "I can't spare this man—he fights."

Now the approaches to Vicksburg lay open. Grant maneuvered and fought with skill and ingenuity to win this city, key point on the Mississippi, and thus cut the Confederacy in two. On July 4, 1863, Vicksburg surrendered. In November, 1863, Grant's troops stormed up Lookout Mountain and Missionary Ridge, breaking the Confederate hold on Chattanooga and opening the way for a deep thrust into the South.

Lincoln, in March, 1864, appointed Grant general in chief. Taking an overall view of the war, Grant directed William T. Sherman to drive through the South while he himself stayed with George G. Meade's Army of the Potomac as it pinned down Robert E. Lee's Army of Northern Virginia.

After a year of fighting in Virginia, Grant forced Lee's surrender. On April 9, 1865, at Appomattox Court House, Grant wrote out magnanimous terms of capitulation that would prevent treason trials.\*

When Grant became President, he ran the

\*See "Appomattox, Where Grant and Lee Made Peace With Honor a Century Ago," by Maj. Gen. Ulysses S. Grant 3rd, USA (Ret.), *Geographic*, April, 1963.

**Valiant victors,** Grant and the Viceroy of China, Li Hung Chang, meet when Grant tours the world after his second term. An immediate friendship developed between the two, both generals who had led victorious armies during civil wars. The Viceroy gave an 8-hour, 70-course dinner for his guest. Grant rated his host as "one of four great men" he met on the trip. The others: Britain's Lord Beaconsfield (Disraeli), German Chancellor Otto von Bismarck, and French statesman Léon Gambetta.

Grant received royal receptions in every port of call during the two-year global jaunt. He talked with the Emperor of Japan, climbed glaciers in Switzerland, and sailed the Nile in Egypt. But he wearied of paintings, statues, and architecture, and balked at tiger hunting in India; though hardened to war, he disliked killing animals.



LIBRARY OF CONGRESS (CARPENT); GRANT-VANDERBILT COLLECTION, SMITHSONIAN INSTITUTION (LEFT)



Carved chest of Irish bogwood in Washington's Smithsonian Institution bears the date of Grant's visit to Dublin: January 3, 1879.



LIBRARY OF CONGRESS

Bundled in miner's garb, Grant and his party prepare to descend into a silver mine at Virginia City, Nevada. Mrs. Grant stands between her husband and U. S. Grant, Jr. Beside the general at right: Mrs. James Graham Fair, wife of a Nevada mining banker who later became a U. S. Senator. The group includes a young Japanese lantern-bearer.

The general showed a keen interest in mines and stopped to make a personal inspection near the end of his round-the-world journey.

Before descending into the mine, Grant bet financier John W. Mackey a silver dollar that Mrs. Grant would not go down. And, indeed, at the head of the shaft, she took one look and exclaimed, "I wouldn't go down in that hole for the whole mine." But when Mrs. Grant heard that her husband had bet against her courage, she promptly entered.





ILLUSTRATION (1894) BY EDWARD R. BRIDGEMAN © W.S.L. CHICAGO HISTORICAL SOCIETY

Victorian elegance enriched Grant's home in Galena, Illinois, now restored. In the parlor, a horsehair sofa and chairs surround a marble-topped center table. Brussels lace curtains and rose-and-gold-brocade draperies cover the windows. In 1868 friends of Grant gathered in this parlor to congratulate the general on winning the Presidential election.



"Life at the White House," wrote Julia Dent Grant, "was like a beautiful dream... a garden spot of orchids, and I wish it might have continued forever." Her zest for living made her a good hostess and a happy First Lady.

administrative offices of the Government much as he had run the Army. But he displayed little of his Army shrewdness in his choice of subordinates; his Cabinet was for the most part undistinguished. An exception was Secretary of State Hamilton Fish, who succeeded in negotiating the Treaty of Washington to settle claims against Great Britain, such as those resulting from construction of the Confederate commerce raider *Alabama*. Fish also persuaded Grant to remain neutral despite provocation from Spain during a long rebellion in Cuba, but did not restrain the President in one of his major foreign policy ventures, an attempt to annex the Dominican Republic in 1869.

Personally a man of scrupulous honesty, Grant accepted handsome presents from admirers without the slightest thought that

favours might be expected in return. Worse, he allowed himself to be seen with two speculators, Jay Gould and James Fisk, who tried to corner the market in gold. When Grant awoke to their scheme, he authorized the Secretary of the Treasury to sell sufficient gold to break the corner, but the speculation had already wrought havoc with business. Other scandals tainted some of Grant's most trusted administrative officers, and even his personal secretary.

In the cause of conservation, Grant in 1872 established the Nation's first national park—Yellowstone—2,221,000 spectacular acres in northwestern Wyoming, with adjoining strips of Montana and Idaho.

During the campaign of 1872 when Grant stood for re-election, he was attacked by Liberal Republican reformers. They were, in



LIBRARY OF CONGRESS

**Mane and tail whipping like black flame**, a high-stepping trotter skims over New York City's dusty Harlem Lane carrying ex-President Grant and his friend Robert Bonner. The general delighted in racing fast horses, and this road, now St. Nicholas Avenue, provided a favorite course. As President, Grant once whisked down a street some blocks from the White House and was arrested for speeding. The policeman, suddenly realizing whom he had stopped, stood flabbergasted. "Officer, do your duty," said Grant. The patrolman took the horse and rig to the station house, and the amused President walked back to the Executive Mansion. Grant's expert horsemanship had won honors for him at West Point. Riding a sorrel during graduation exercises, he set an Academy jumping record that endured for 25 years.

Grant's view, "the narrow-headed men," their eyes so close together that "they can look out of the same gimlet hole without winking." The general's friends in the Republican Party came to be known proudly as "the Old Guard."

In domestic affairs, Grant allowed Radical Reconstruction to run its course in the South, bolstering it at times with military force. Nevertheless, by the end of his second term almost all the Southern States had been "redeemed" by political leaders dedicated to white supremacy.

Grant favored the conservative, sound-money policies and high protective tariff advocated by eastern Republicans. In the serious depression that followed the Panic of 1873, he held firm to these policies despite increasing agitation, particularly among distressed farmers in the West. Ultimately, inflation was

checked, and the national credit was restored.

Upon retiring from the Presidency in 1877, Grant went on a triumphal tour around the world; it took more than two years (page 683). After his return, his confidence again was betrayed by an unprincipled man. Grant became a silent, nonparticipating partner in an investment firm which, in 1884, went bankrupt, losing him all his own capital and all he had borrowed. At about the same time he learned that he had throat cancer.

With a will, he set about the writing of his recollections to pay off his debts and provide for his family. Racing against death, he produced a memoir of classic quality which ultimately earned his family some \$450,000. Soon after completing the last page in 1885, he died. His tomb, a national memorial, stands in New York City's Riverside Park.

R. B. Hayes

NINETEENTH PRESIDENT 1877-1881

**R**UTHERFORD B. HAYES, beneficiary of the most fiercely disputed election in American history, brought to the White House dignity, honesty, and moderate reform. His attractive wife, Lucy Webb Hayes, to the delight of the Woman's Christian Temperance Union, carried out her husband's wishes in the White House by serving no wines or liquors. As a result, she became known as "Lemonade Lucy."

Born in Delaware, Ohio, in 1822, and educated at Kenyon College and Harvard Law School, "Rud" Hayes was an earnest, diligent youth. After five years' law practice in Lower Sandusky (now Fremont), Ohio, he moved to Cincinnati, where he began to flourish as a young Whig lawyer. The Kansas-Nebraska Act, which repealed the Missouri Compromise, stirred his antislavery feelings and brought him into the Republican camp.



Hayes fought in the Civil War, was wounded in action, and rose to the rank of brigadier general. While he was still in the Army, in July, 1864, Cincinnati Republicans ran him for the House of Representatives. He accepted the nomination, but would not campaign, explaining, "An officer fit for duty who at this crisis would abandon his post to electioneer for a seat in Congress ought to be scalped."

Elected by a heavy majority, Hayes entered the House in December, 1865, disturbed by "Rebel influences . . . ruling the White House," but also concerned at the ultraradicalism of Pennsylvania Congressman Thaddeus Stevens. Yet, on major issues he voted as Stevens wished. In 1867 Hayes was elected Ohio Governor and intermittently served three terms.

#### Furor Follows Indecisive Election

The combination of safe liberalism, party loyalty, and a good war record made Hayes the Republican nominee in 1876, when one wing of the party clamored for reform while the other demanded a practical politician and military hero. He ran against a Democratic reformer, Governor Samuel J. Tilden of New York, who had smashed the Tweed Ring.

Although a galaxy of famous Republican speakers, and even Mark Twain, stumped for Hayes, he suspected that the Democrats had the better chance of winning. When the first returns seemed to confirm this, Hayes went to bed, believing he had lost.

The popular vote apparently was 4,300,000 for Tilden to 4,036,000 for Hayes. Whether or not Hayes was elected depended upon contested electoral votes in three Southern States—Louisiana, South Carolina, and Florida—in which there had been conspicuous irregularities; there was also a dispute in Oregon. If all

**Demure Lucy Hayes** introduced egg-rolling parties on the White House lawn. An advocate of abstinence, she received this portrait as a gift of appreciation from the Woman's Christian Temperance Union.

**"Healer of strife,"** Rutherford B. Hayes drew the curtain on the Civil War by removing troops from the South. In a contested race, he won office by only one electoral vote.

*Paintings by Daniel Huntington, White House Collection*







ILLUSTRATION BY ULM C. SELTZER; DANIEL-BOON PRINTER OF THE AMERICAN WEST; GILLERMAN INSTITUTE OF AMERICAN HISTORY AND ART

the disputed electoral votes went to Hayes, he would win; a single one would elect Tilden.

The country was in a furor as months of uncertainty followed. Behind the scenes, hectic negotiations proceeded between southern Democrats and northern Republicans. The Republicans promised the southerners at least one Cabinet seat, Federal patronage, subsidies for internal improvements, and withdrawal of Federal troops from Louisiana and South Carolina. The southerners accepted.

#### Electoral Commission Decides Race

At the end of January, 1877, Congress established a special Electoral Commission to rule upon the disputed votes. The commission, made up of eight Republicans and seven Democrats, decided every one of the contests in favor of Hayes by a vote of eight to seven.

The high-minded Hayes chose men of high caliber for his Cabinet, but outraged many Republicans, since not only was his Postmaster General an ex-Confederate (to fulfill his promise to the southerners), but one of his Cabinet officers had bolted the party as a Liberal Republican in 1872. He won a battle with Senator Roscoe Conkling, leader of a

Republican faction known as the Stalwarts, over appointments to the New York Customs House, Conkling's patronage bailiwick. But Congress steadfastly ignored Hayes's pleas for overall Civil Service reform.

In his policies toward the South, Hayes pledged in his Inaugural that the rights of Negroes would be protected, but advocated the restoration of "wise, honest, and peaceful local self-government." This meant the withdrawal of troops, which Hayes hoped, together with other conciliatory policies, would lead to the building of a "new Republican party" in the South to which white businessmen and conservatives would rally.

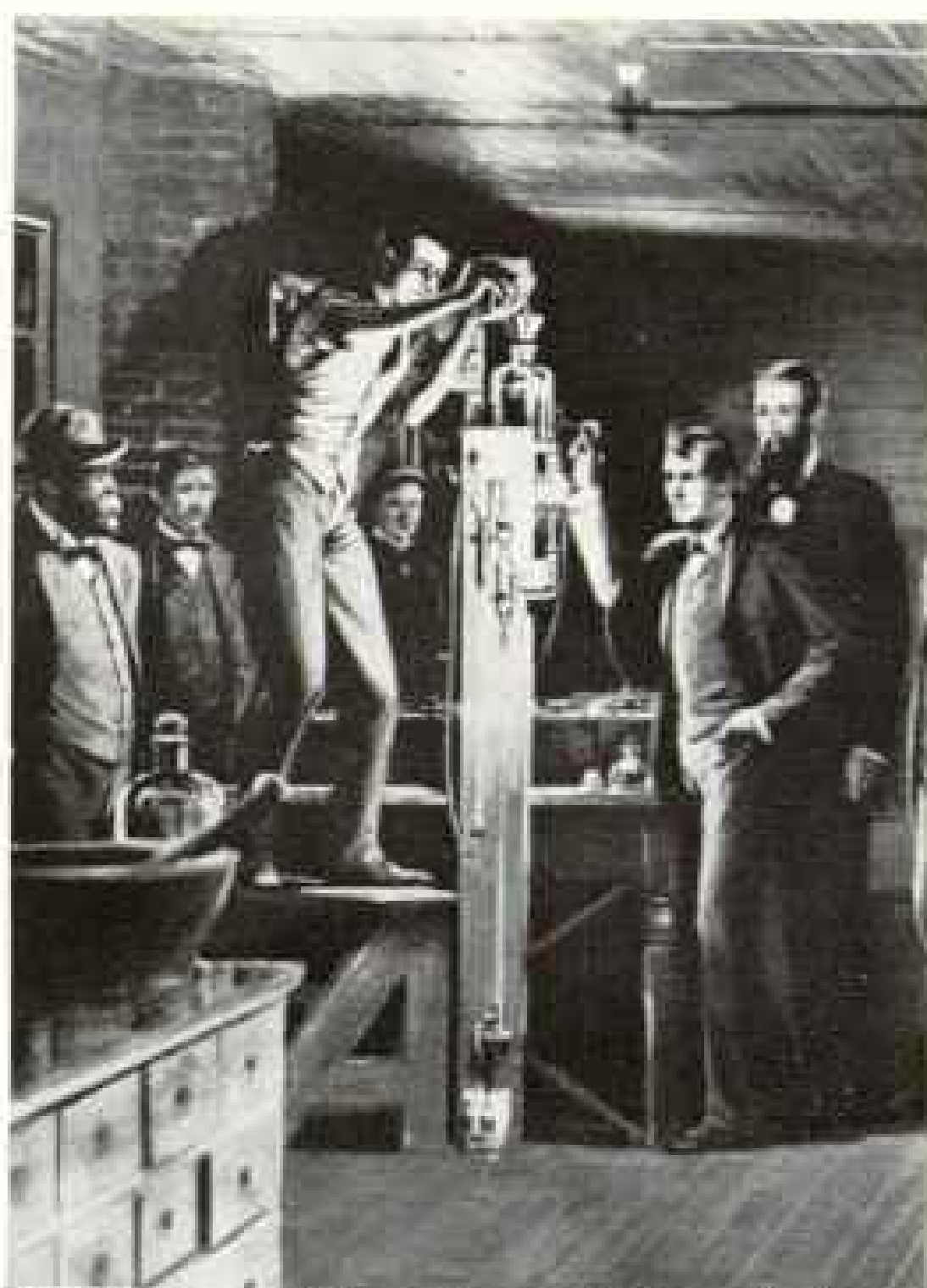
Many of the leaders of the New South did indeed favor Republican economic policies and approved Hayes's financial conservatism, but they faced annihilation at the polls if they joined the party of Reconstruction.

Hayes, who had announced in advance that he would serve only one term, retired in 1881 to his 25-acre estate, Spiegel Grove, in Fremont, where he spent the last 12 years of his life. His personal papers and other historic items are preserved there in the Hayes Memorial Library and Museum.

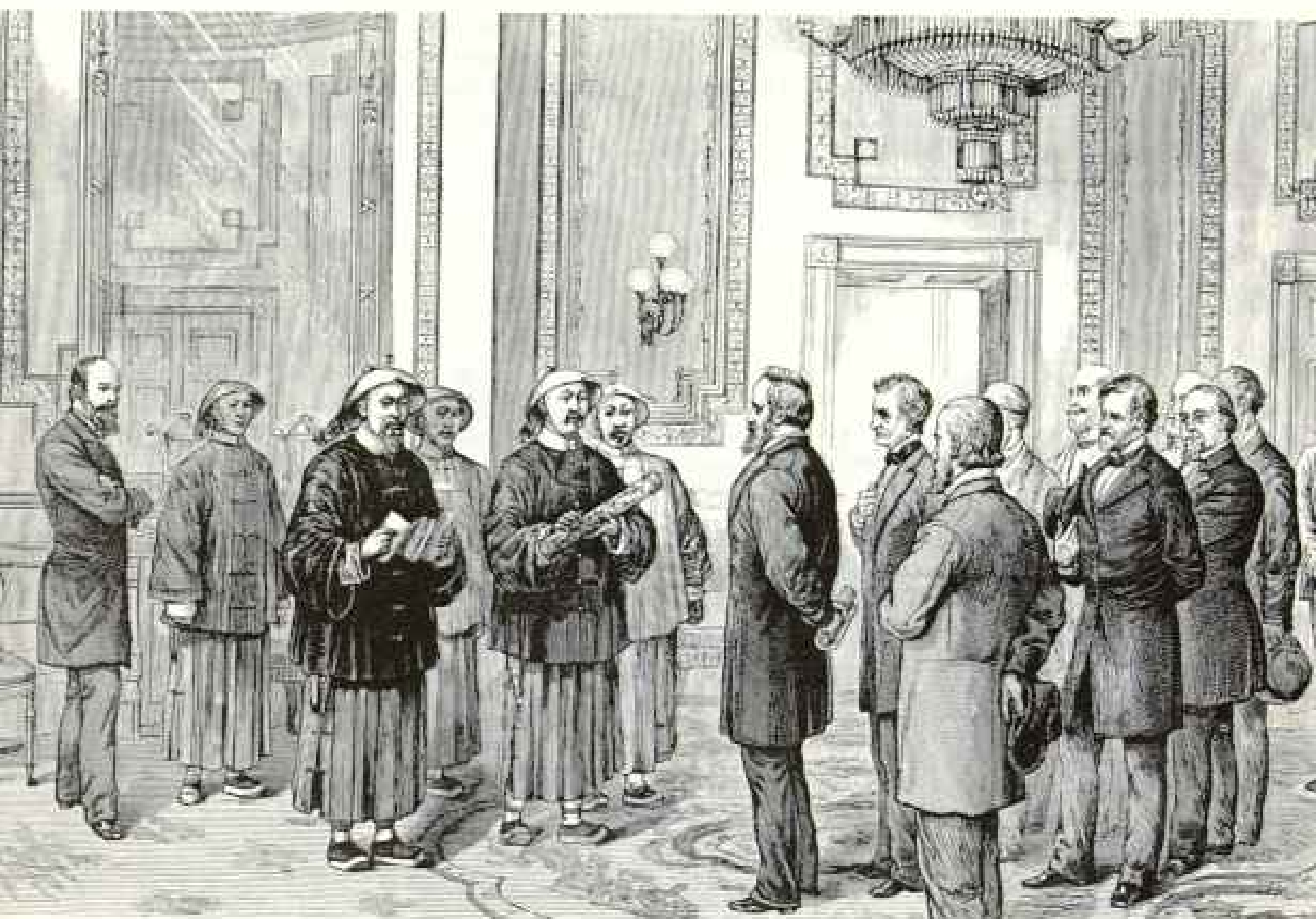
**Poised for battle,** Nez Percé warriors guard the flight of their women and children during a 1,000-mile exodus from an Idaho reservation. Chief Joseph staged a bloodless raid for supplies at this Army depot on Cow Island in Montana Territory. Federal troops captured the exhausted Indians less than 50 miles from Canada and freedom.

**Bewitching glow** bathes the laboratory of Thomas A. Edison, as the inventor successfully tests his incandescent lamp in Menlo Park, New Jersey. The date: October 19, 1879. Edison, hand in pocket, watches as his assistant, Francis Jehl, adds mercury to a glass reservoir on the pump stand. The pear-shaped bulb burned brilliantly more than 40 hours. Electric lights were not installed in the White House until the Administration of Benjamin Harrison in 1891.

**First Chinese minister** to the United States calls on Hayes in 1878. The President hears Chun Lan Pin express hope for East-West diplomatic relations. When Congress tried to prohibit Chinese immigration the next year, Hayes vetoed the bill, declaring that he would do nothing to wound the pride of "a polite and sensitive people."



PAINTING BY W. J. FLEMING, COURTESY CONSOLIDATED EDISON COMPANY OF NEW YORK (LONDON: FRANK LESLIE'S ILLUSTRATED NEWSPAPER (1879))





James A. Garfield

TWENTIETH PRESIDENT 1881

**J**AMES A. GARFIELD, last of the log-cabin Presidents, won back for the Presidency a measure of the prestige it had lost during Reconstruction. His attacks against political corruption, and a successful test of power against a prominent Senator, doubtless would have led to sharp contests with Congress; but before he could engage in them, he was assassinated by a disappointed office seeker.

Garfield was born in Cuyahoga County, Ohio, in 1831. Fatherless before he was two, he soon began helping his older brother Thomas work the family farm and later drove barge teams along the Ohio and Erie Canal.

Hungry for knowledge, young Garfield earned enough money to obtain a sound education in the classics. He graduated from Williams College in Massachusetts in 1856, returning to Ohio as professor of Greek and Latin at the Western Reserve Eclectic Institute (later Hiram College). Within a year he became its president.

#### Schoolmate Becomes His Bride

In 1858 he married a former schoolmate, Lucretia Rudolph. Their home, Lawnfield, at Mentor, Ohio, near Cleveland, is now a state memorial. On its grounds stands a replica of the cabin in which Garfield was born.

On Sundays, as a lay preacher, Garfield

delivered ornate sermons. He was young for his responsibilities, but his commanding height, broad shoulders, and heavy beard compensated for his age. The classics and poetry fascinated him; friends liked to tell how he amused them by simultaneously writing Latin with one hand and Greek with the other.

Entering Republican state politics, he was elected to the Ohio Senate in 1859, and during the secession crisis he advocated coercing the seceding states back into the Union. He learned enough law to be admitted to the bar in 1861.

An effective recruiter of soldiers, Garfield persuaded many of his students to join the 42d Ohio Volunteer Infantry, then became their colonel. He diligently studied manuals and drilled the regiment into shape.

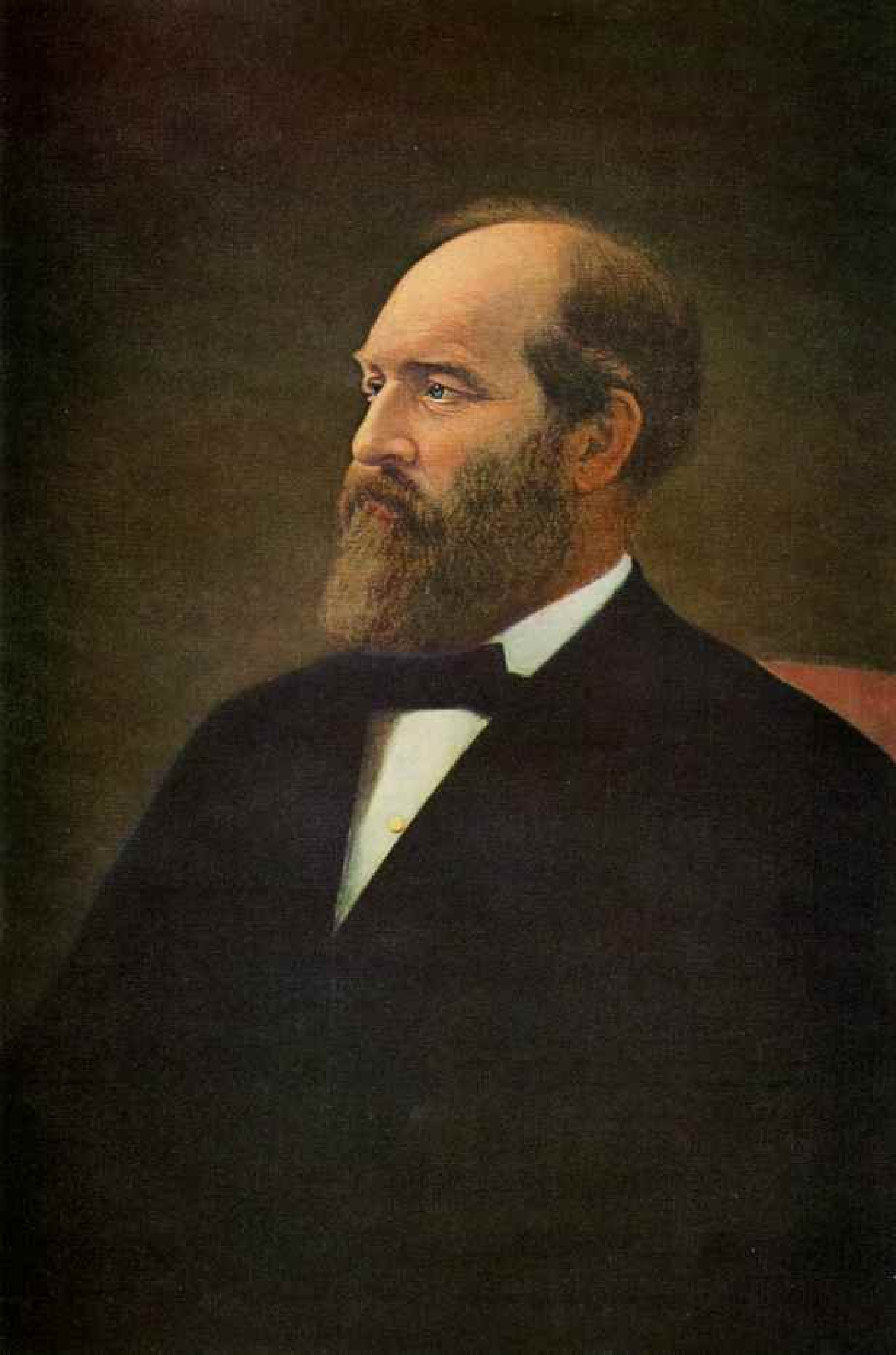
At the beginning of 1862, when Union military successes had been few, Garfield had command of a brigade at Middle Creek, Kentucky, against Confederate troops led by a West Pointer, and won a small victory. At age 31 he became one of the youngest brigadier generals in the Union Army.

In the next two years his skills as a staff officer brought him promotion to the rank of major general. Meanwhile, in 1862, an Ohio constituency elected him to Congress. President Lincoln persuaded the reluctant



*From Canal Boy to President*, a biography of Garfield by Horatio Alger, Jr., recounts the youthful days of the President when he drove horses along the Ohio and Erie Canal. Like all Alger heroes, Garfield epitomized the American rags-to-riches dream.

Genial scholar, James A. Garfield managed his own Presidential campaign and won by shrewdly remaining silent on key political issues. As President, he brought prestige to the office by challenging the control of state machines over Federal patronage.



**Breathless moment of a desperate search:** As Garfield lies mortally wounded, Alexander Graham Bell listens with a telephonelike receiver for a "click" that would indicate the location of a bullet. Bell employs an electrical device he rigged for detecting metal. Steel springs in the mattress created a field of interference, rendering the examination inconclusive. Garfield died a victim of assassination after only six months in office. Below, a congressional memorial service card bears the name of William McKinley, who was elected President 16 years later and also died by an assassin's bullet.

DISTRICT OF COLUMBIA PUBLIC LIBRARY



Garfield to resign his commission in the Army. It was easier to appoint major generals than to obtain effective Republicans for the House of Representatives.

In the next 18 years, as Garfield was repeatedly re-elected, he became the leading Republican in the House. Although many of his Ohio constituents were opposed to the deflationary sound-money policies of the Republican Party, Garfield unflinchingly supported them; on the other hand, he was not an ardent enough advocate of the high protective tariff in his early career to suit Ohio industrialists. In addition, he was plagued with a whisper of scandal, his name having been found in a memorandum book listing men of influence, among them high officials and Congressmen, who had received stock in *Crédit Mobilier*, a corrupt railroad construction company.

#### Convention Chooses a Dark Horse

In the 1880 Republican Convention, Garfield nominated John Sherman of Ohio for President. Sherman opposed ex-President Grant, choice of the Stalwart wing, and Maine Senator James G. Blaine, whose faction was dubbed the "Halfbreeds." When none of the candidates could win a majority, Garfield himself, on the 36th ballot, became the dark

horse nominee. Chester A. Arthur, of the Stalwarts, was nominated for Vice President.

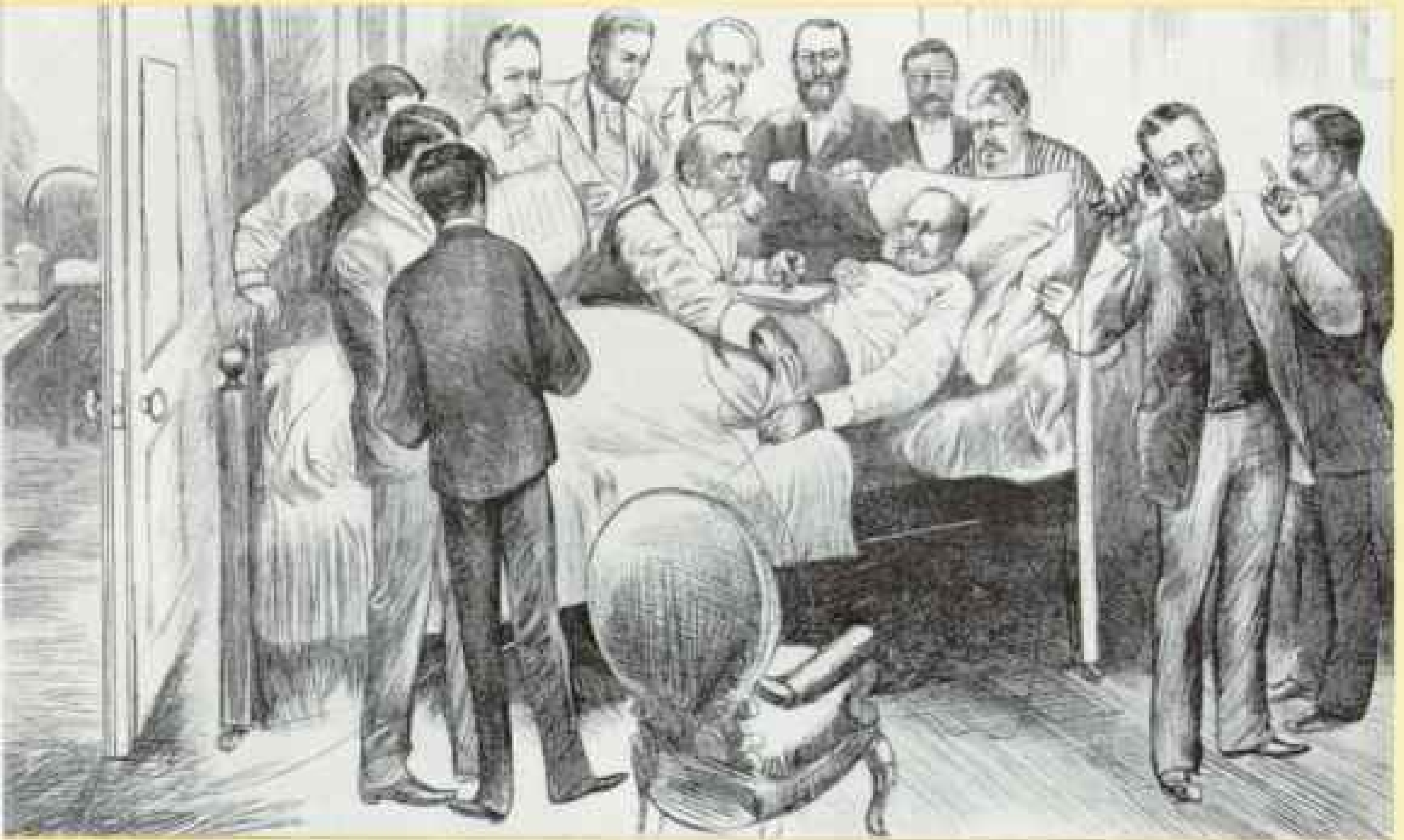
Out of the nine million votes cast, Garfield defeated the Democratic nominee, Gen. Winfield Scott Hancock, by a narrow margin. However, by carrying New York, he won a comfortable electoral majority, 214 to 155.

As President, Garfield tried to build a balanced administration, and he gave some offices to Stalwarts. But he angered the Roscoe Conkling-U. S. Grant faction by refusing to accept their choice for Secretary of the Treasury, by appointing a New York party regular to the Cabinet without prior permission from the Stalwart machine, and by making Blaine Secretary of State.

Almost at once the new Postmaster General, Thomas L. James, began to expose frauds by leading Republicans who had been making money through the awarding of contracts for the delivery of rural mail. Despite protests from injured politicians, President Garfield backed his Postmaster General in his investigation. Further, Garfield challenged control of patronage in the New York Customs House by Conkling, U. S. Senator from New York.

When he submitted to the Senate a list of appointments, including many of Conkling's friends, he named the Senator's arch-rival,





William H. Robertson, to run the Customs House. Conkling contested the nomination, tried to persuade the Senate to block it, and appealed to the Republican caucus to compel its withdrawal.

But Garfield would not submit: "This . . . will settle the question whether the President is registering clerk of the Senate or the Executive of the United States. . . . shall the principal port of entry . . . be under the control of the administration or under the local control of a factional senator."

Conkling maneuvered to have the Senate confirm Garfield's uncontested nominations and adjourn without acting on Robertson. Garfield countered by withdrawing all nominations except Robertson's; the Senators would have to confirm him or sacrifice all the appointments of Conkling's friends.

In a final desperate move, Conkling and his fellow Senator from New York resigned, confident that their Legislature would vindicate their stand and re-elect them. Instead, the Legislature elected two other men; the Senate confirmed Robertson. Garfield's victory was complete.

Garfield, having come through this test of strength successfully, was now able to turn his attention to foreign policy. Secretary of

State James G. Blaine announced the calling of a conference of the American Republics to meet in Washington in 1882.

The conference never took place. On July 2, 1881, Garfield, in a holiday mood, left the White House bound for Williams College. In Washington's Baltimore and Potomac railroad station, a lawyer from Chicago named Charles J. Guiteau, who had unsuccessfully sought a consular post, proclaimed loudly that he was a Stalwart and shot the President in the spine.

#### Inventor Aids Stricken President

For weeks, in stifling summer heat, Garfield lay between life and death in the White House. An air-conditioning system was devised to cool his bedroom. Alexander Graham Bell, who had invented the telephone, tried to locate the bullet with an induction-balance electrical device (above).

The President, emaciated and helpless, was taken by special train to the New Jersey seaside, where he seemed to rally for a few days. But on September 19, 1881, he died from an infection and internal hemorrhage, wondering in his last moments about his place in history. Today's X-rays, surgery, and antibiotics might have saved his life.



*Chester A. Arthur*

TWENTY-FIRST PRESIDENT 1881-1885

CHESTER A. ARTHUR, who had been notable only as an accomplished practitioner of the spoils system, comported himself in the White House with a dignity and competence that quite belied national forebodings. A tall, handsome man with clean-shaven chin and sidewhiskers, Arthur had always looked like a President; he proved that he could also act like one.

The son of a Baptist preacher who had emigrated from northern Ireland, Arthur was born in Fairfield, Vermont, in 1830. He graduated from Union College in the class of 1848, taught school, was admitted to the bar, and practiced law in New York City. Early in the Civil War he served as Quartermaster General of the State of New York.

For his services to the New York Republican organization, President Grant in 1871 appointed him Collector of the Port of New York. Arthur effectively marshaled the thousand Customs House employees on behalf of U. S. Senator Roscoe Conkling's Stalwart Republican machine.

Honorable in his personal life and his public career, Arthur nevertheless was a firm believer in the spoils system at the very time that it was coming under vehement attack from the reformers. President Hayes, who opposed at least the worst aspects of the spoils system, in 1878 ousted Arthur and his chief associate, Conkling and his followers tried to win redress by fighting for the renomination of Grant at the 1880 Republican Convention. Failing, they reluctantly accepted the nomination of Arthur for the Vice Presidency.

During his brief tenure as Vice President, Arthur stood firmly beside Conkling in his

Tall and stylishly groomed, Chester A. Arthur won a reputation for elegance and pleasant, easy manners. He pushed a fearless reform policy that led to the first national Civil Service law.

To relieve his solitude in the White House, Arthur reads to Nell, his 13-year-old daughter. The President's wife died a year before he took office. Nell occasionally attended official ceremonies with him (page 697); a son was away at college.

patronage struggle against President Garfield. But Garfield's assassination by a disgruntled job seeker changed Arthur's outlook. Undoubtedly horrified by the manner in which he had become Chief Executive, he was eager to prove himself above machine politics. He was to be seen most often not with his old associates, but as a man of fashion with the elite of Washington, New York, and Newport.

The White House became notable for its elaborate Victorian hospitality as Arthur's sister, Mary Arthur McElroy, acted as hostess. His wife, Ellen Herndon Arthur, had died the previous year.

#### Civil Service Gains a Champion

To the indignation of the Stalwart Republicans, the Presidency transformed the former Collector of the Port of New York into an insistent champion of Civil Service reform. In ordinary times, Congress, growing unwieldy in its closely divided membership of Republicans and Democrats, undoubtedly would have ignored Arthur on Civil Service, as it did on most other matters. But public pressure, heightened by the assassination of Garfield, forced Congress to heed the President.

FRANK LESLIE'S ILLUSTRATED NEWSPAPER (1882)





In 1883 Congress passed the Pendleton Act, which established a bipartisan Civil Service Commission, forbade levying political assessments against officeholders, and provided for a "classified system" that made certain Government jobs obtainable only through the taking of competitive written examinations. The act also protected employees against dismissal for political reasons.

Out of a total of 133,000 Federal positions, only 14,000 were classified at first, but the act provided that subsequent Presidents could increase the number by executive order. Over the next six decades, as Presidents leaving office extended the list to protect their appointees, a majority of Federal employees came under Civil Service.

#### Attempt to Cut Tariff Draws Fire

Acting independently of party dogma, Arthur also tried to revise existing tariff rates downward. He wished them to be high enough to protect American industries but low enough so that the Government would not be embarrassed by annual surpluses of revenue.

The surpluses had encouraged reckless appropriations. Congressmen habitually expended the extra tax money on river and harbor improvements in their districts. These bills, though sometimes meritorious, were generally believed to be so worthless that the term "pork barrel" came to be applied to them. When President Arthur vetoed a large pork barrel bill, an incredulous Congress overrode his veto.

In 1882 Arthur appointed a commission to study tariff revision. The commission, made up of protectionists, recommended a 20 to 25 percent cut, but when the process of revision began, lobbyists persuaded Congressmen to raise about as many rates as they lowered. When Arthur signed the resulting Tariff Act of 1883, aggrieved westerners and southerners, who blamed the tariff for their having to buy manufactured goods dearly and sell farm products cheaply, looked to the Democratic Party for redress. Thus the tariff began to emerge as a major political issue between the two parties.

The Arthur Administration enacted the first general Federal immigration law. Arthur approved a measure in 1882 excluding immigrants who were paupers, criminals, idiots, or insane. Congress suspended Chinese immigration for a ten-year period; later it extended and strengthened the restriction.

The conduct of foreign affairs continued to be dull and quiet, but a portent of the future was Arthur's approval of legislation in 1883 to construct four steel warships—the first vessels of a modern American Navy.

Arthur demonstrated as President that he was above factions within the Republican Party, if indeed not above the party itself. His reward in 1884, when he hoped to receive renomination, was to be dropped, not only by both major factions in the party but by its reformers as well. Two years later, in 1886, he died, respected for his high purpose as President. His grave is in Albany, New York.



F. JAY HENNES, FORMER PHOTOGRAPHER OF THE OLD WEST, FROM "YELLOWSTONE THE FRONTIER," BY FREDERICK TILDER (ALFRED A. BRUFF), 1946, HARPER'S WEEKLY (1944)

Sidewhiskers grayed by the cares of his office, Arthur vacations in 1885 at Upper Geyser Basin in Yellowstone National Park. Lt. Gen. Philip H. Sheridan (seated at left) arranged the Presidential visit. Arthur's Secretary of War, Robert T. Lincoln, son of Abraham Lincoln, sits at right.

Spray and splinters fly as an explosion shatters the hulk of the *Joseph Henry* in the harbor of Newport, Rhode Island. Aboard the *Triana*, Arthur and his daughter Nell review the Navy's 1884 demonstration of a newly developed torpedo. His endeavors to update the fleet laid the beginnings of the modern United States Navy.







Grover Cleveland

TWENTY-SECOND 1885-1889 and TWENTY-FOURTH PRESIDENT 1893-1897

**G**ROVER CLEVELAND, the first Democrat to be elected President after the Civil War, believed that the Government could best contribute to prosperity by not interfering with the free functioning of economic forces.

He ceaselessly fought what he regarded as the evils of governmental "paternalism," whether tariff protection to large corporations or relief to drought-stricken farmers. His were the most widely accepted economic views of the time.

Courageous, resolutely independent, Cleveland has been the only President to leave the White House and return for a second term four years later.

One of nine children of a Presbyterian minister, Cleveland was born in Caldwell, New Jersey, in 1837, and was raised in upstate New York. As a lawyer in Buffalo, he became notable for his single-minded concentration upon whatever task faced him.

At age 44 he suddenly emerged into a political prominence that carried him to the White House in less than four years. In 1881 he was elected as a reform Mayor of Buffalo, and a year later, reform Governor of New York, in both positions distinguishing himself by his frequent use of the veto to curb political favoritism and corruption.

As candidate for President, Cleveland enjoyed not only Democratic support but also aid from a number of reform Republicans, the "Mugwumps," who disliked the record of the Republican nominee, James G. Blaine, "the plumed knight from Maine." Cleveland received a plurality of only 29,000 votes.

#### Bachelor Finds White House Lonely

While living in Buffalo, Cleveland had been content to lead a bachelor's existence, but in the White House, where he had inherited President Arthur's French chef, he was not entirely at ease at first.

"I must go to dinner," he wrote a friend, "but I wish it was to eat a pickled herring Swiss cheese and a chop at Louis' instead of the French stuff I shall find."

In June, 1886, he married 21-year-old Frances Folsom (page 701), becoming the only Chief Executive whose wedding was held in the White House. They had five children.

Resolute reformer, Grover Cleveland despised political corruption and attacked it at every opportunity. "He sailed through American history like a steel ship loaded with monoliths of granite," wrote H. L. Mencken. One of the hardest working Presidents, he often labored at his desk until 2 a.m. Though his brusque use of veto powers angered many factions, Cleveland proved a masterful public servant.

Tower of integrity, Cleveland in caricature guards the U. S. Treasury. For years veterans of the Civil War had been raiding the Federal vaults with fraudulent pension claims. Cleveland took the trouble to read the pension bills and, outraged by the deceit, vetoed hundreds of them.



Painting by Eastman Johnson, White House Collection

Vigorously Cleveland pursued his credo that the Government must not give special favors to any economic group, whether powerful or weak. He even vetoed a bill to appropriate \$10,000 to distribute seed grain among drought-stricken farmers in Texas.

Demonstrating phenomenal industry, Cleveland tried to end waste and corruption in the granting of pensions through private bills to Civil War veterans who failed to meet lenient Government requirements. On one busy day, the Senate voted 400 of these bills, some of them having a basis, but many of dubious or spurious merit.

Cleveland, working late into the night, read through hundreds of documents supporting such bills, and while he signed 1,453, he returned hundreds with tart veto messages.

When Congress, pressured by the Grand Army of the Republic, passed a bill granting pensions for disabilities not caused by military service, Cleveland vetoed it, too, risking strong opposition in the next Presidential campaign from the old soldiers.

He also incurred the wrath of the railroads by ordering an investigation of their Federal land grants, forcing the return of 81,000,000

acres. In 1887 he signed the Interstate Commerce Act, which provided for the first Federal regulation of the railroads.

Cleveland angered business when, in his Annual Message to Congress in December, 1887, he called for a reduction of high protective tariffs. It was pointed out to him that he had given the Republicans an effective issue for the 1888 campaign, but he retorted, "What is the use of being elected or re-elected unless you stand for something?"

Cleveland lost in 1888, though he received a larger popular vote than his opponent, Benjamin Harrison; electoral votes in New York and Indiana swung the election to the Republican candidate.

#### Wrath Falls on Tariff Lobby

As a "lame-duck" President, Cleveland spoke before Congress in December of 1888 and again poured his wrath upon the corporate beneficiaries of tariff protection:

"He mocks the people who proposes that the Government shall protect the rich and that they in turn will care for the laboring poor. . . . A just and sensible revision of our tariff laws should be made for the relief of

FRANK LESLIE'S ILLUSTRATED NEWSPAPER (1887)



**Youngest First Lady, Frances Folsom Cleveland, 21,** wears a satin wedding gown with a 12-foot train and a border of orange blossoms. Her marriage to the 49-year-old bachelor in 1886 marked the only wedding ceremony of a Chief Executive in the White House. Cleveland finished a day's work before the 7 p.m. wedding. Fewer than 40 persons attended the rites, which the President altered by deleting the word "obey" from the bride's vows. During his second Administration, Mrs. Cleveland became the first wife of a President to give birth to a child in the White House.



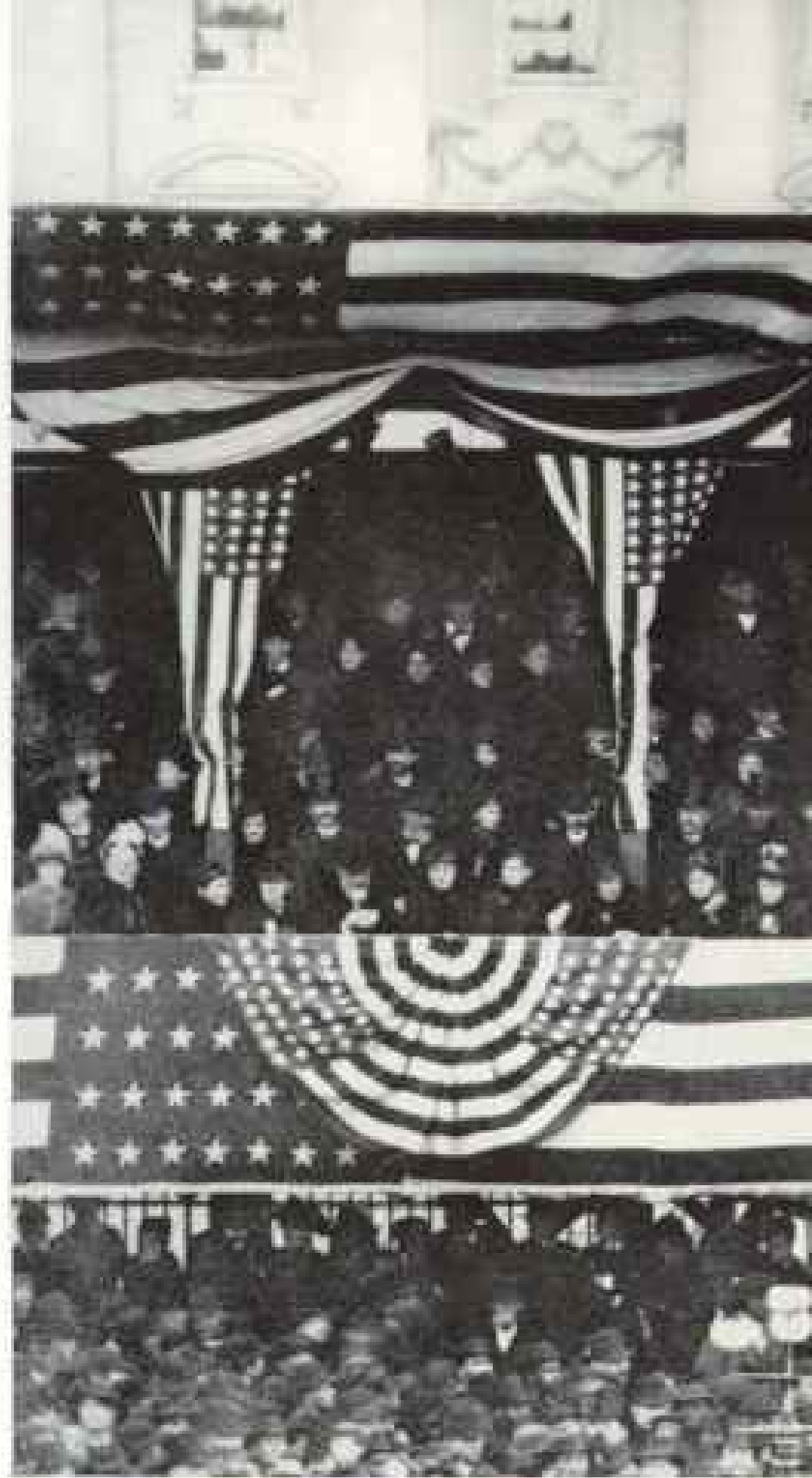
**Shower of shoes and rice** rains down on Cleveland and his wife as they leave the White House (lower right). Following a dinner reception, the bride changed into a gray silk traveling dress for a honeymoon trip to Deer Park in the mountains of Maryland. The bridal couple left from a private exit in the Red Room at the top of the steps. Wedding guests shout blessings as the President and First Lady board their closed carriage.

**Hopeful, huddled masses** of immigrants gaze at the Statue of Liberty as they enter the harbor of New York City aboard the liner *Germanic*. A year earlier, in 1886, President Cleveland had dedicated the impressive structure on Bedloe's Island (now Liberty Island). A gift from France, the Lady of Liberty stretches skyward 152 feet above her 150-foot-high pedestal. In the late years of the 19th century, she welcomed more than a million immigrants from Germany—more than any other nationality.





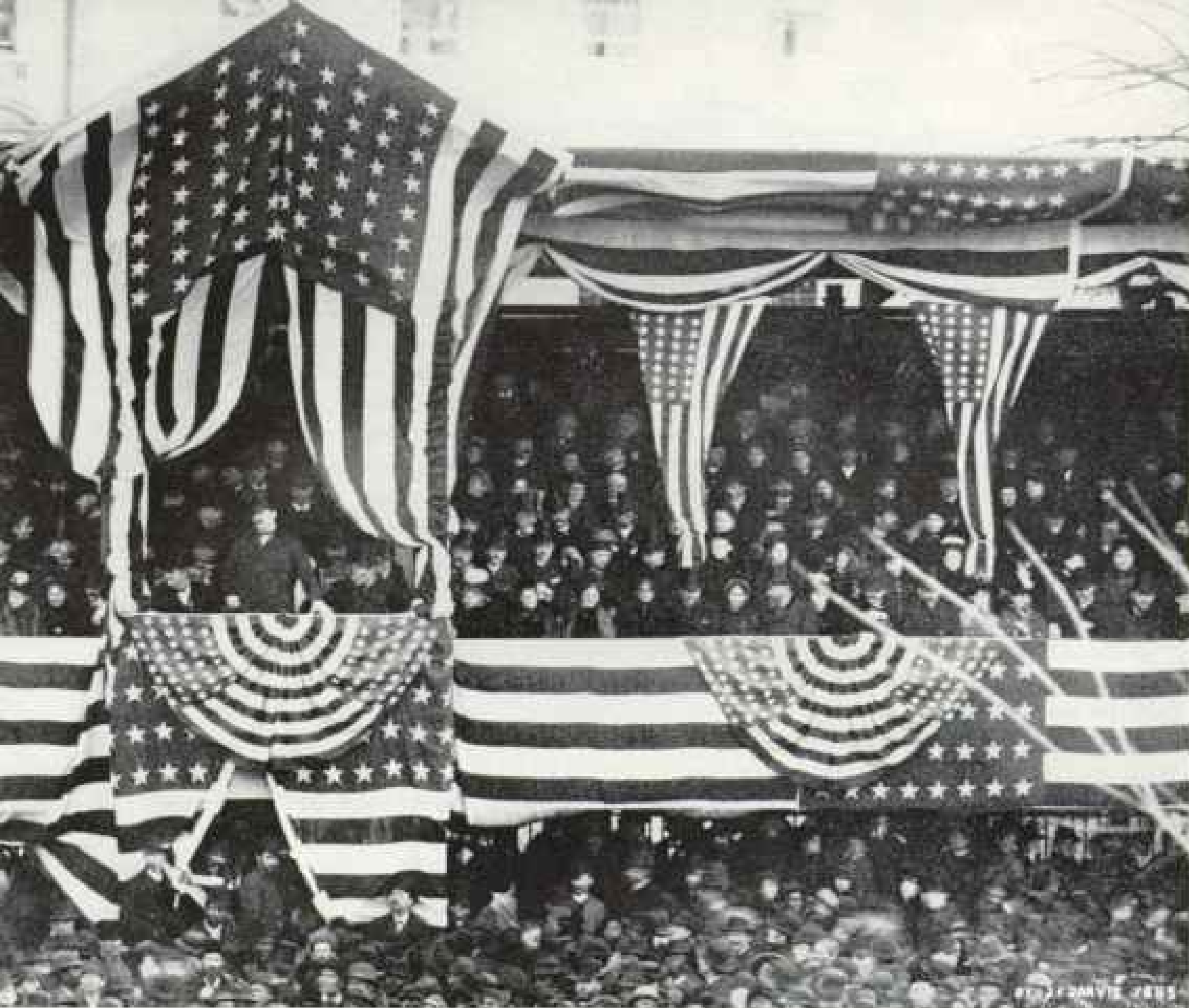
First Democratic Presidential victor in 28 years, Cleveland watches his Inaugural parade from a stand in front of the White House. Only the grand review of General Grant's troops at the end of the Civil War surpassed the Cleveland procession that pounded down Pennsylvania Avenue in 1885. A few hours earlier, a crowd of some 30,000 at the Capitol heard Cleveland sworn in as President for the first time. Four years later he lost the election, but won in 1892, thus becoming the only President to serve nonconsecutive terms.



Cleveland scowls at a representative of Tammany Hall who has posted a petition for political appointments at the White House gate: a magazine cartoon depicting his ceaseless vigilance against corruption. As Governor of New York, Cleveland had blasted New York City's political machine, with its Tammany tiger symbol. As President, he continued to fight pressure groups, and the penchant for honesty made his first Presidential term the embodiment of reform. His forthright stands proved him the strongest President between Abraham Lincoln and Theodore Roosevelt.

HUCK LIBERL FROM THE COLLECTION OF ASSOCIATE JUSTICE PETER STEWART





LIBRARY OF CONGRESS

those of our countrymen who suffer under present conditions."

In 1892, Cleveland and Harrison faced each other again, this time with Cleveland winning. Soon after his return to the White House, he had to cope with an acute economic depression, and a crisis in his health. Secretly hospitalized aboard a yacht cruising the East River, he had a malignant growth removed from the roof of his mouth.

### Gold Triumphs Over Silver

As he made a rapid and full recovery—though it was 25 years before the whole story was made public—he focused his attention not upon business failures, farm foreclosures, and unemployment, but upon the Treasury crisis. Exerting his Presidential authority, he obtained repeal of the mildly inflationary Sherman Silver Purchase Act, and, with the aid of Wall Street loans, maintained the Nation's gold reserve.

When Coxe's Army, seeking unemployment relief, marched on Washington, Cleveland had the leader, Jacob S. Coxe, arrested for walking on the grass. And when the Pullman strike against wage cuts in Chicago tied up railroads, Cleveland authorized his

Attorney General to obtain an injunction against the strike. The injunction was violated, and he sent Federal troops. "If it takes the entire Army and Navy of the United States to deliver a post card in Chicago," he declared, "that card will be delivered."

In 1895 Cleveland invoked the Monroe Doctrine, requiring Great Britain to accept arbitration of a disputed boundary in Venezuela. This action won him public acclaim, but, overall, his policies during the depression of the 1890's were unpopular. His party deserted him in 1896, nominating William Jennings Bryan of Nebraska.

At the end of his first term Cleveland had told Washington newspaper correspondents, "The animating spirit of the Administration was administrative reform."

He did succeed in bringing new high standards of service to the executive branch, but the conservative economic policies which he pursued with such incorruptible courage failed to bring the Nation the widespread prosperity he sought for it.

After leaving the White House, Cleveland lived in retirement in Princeton, New Jersey, and died in 1908. His last words were:

"I have tried so hard to do right."



TWENTY-THIRD PRESIDENT 1889-1893

**B**ENJAMIN HARRISON, nominated for President on the eighth ballot at the 1888 Republican Convention, conducted what became known as a “front-porch” campaign, delivering short speeches to delegations that came to visit him in Indianapolis.

Since he was only 5 feet, 6 inches tall, Democrats called him “Little Ben”; Republicans replied that he was big enough to wear the hat of his grandfather, “Old Tippecanoe.” Cartoonists drew him as a diminutive figure almost hidden under a huge beaver hat.

In the election, although he received 90,000 fewer popular votes than Cleveland, he carried the electoral college, 233 to 168.

Benjamin Harrison was born in 1833 on William Henry Harrison’s farm near North Bend, Ohio. He was seven when his grandfather was elected President. He attended school in Cincinnati and graduated from Miami University at Oxford, Ohio. In 1853, the year he was admitted to the bar, he mar-

ried Caroline Lavinia Scott (below), who later became the first President General of the Daughters of the American Revolution.

The newlyweds moved west to Indianapolis where Harrison became an industrious lawyer, beginning his *Indiana Reports*, records of state court proceedings, which ultimately reached ten volumes. He also campaigned with ardor in behalf of the Republican Party.

#### War and Politics Keep Him Busy

During the Civil War the Governor of Indiana appointed him colonel of the 70th Regiment, Indiana Volunteer Infantry, which engaged in severe combat as part of Gen. William Tecumseh Sherman’s army. Upon the fall of Atlanta, Harrison hurried back to Indiana, at the request of the governor, to enlist recruits and engage in political combat against the Copperheads—Southern sympathizers in the North—in the campaign of 1864.

After the war, he became a moral pillar of Indianapolis. He built a fine home—although the front porch wasn’t added until after he became President.

Concentrating intently upon legal cases, Harrison sometimes passed friends in the street without noticing them. Democrats turned this characteristic against him, defeating him for governor in 1876 by unfairly stigmatizing him as “Kid Gloves” Harrison. Nevertheless, his political stature grew. In the 1880’s he served in the United States Senate, where he championed the causes of Indians, homesteaders, and Civil War veterans.

As President, Harrison resisted strong pressure for patronage by Republican leaders,

**First President General** of the Daughters of the American Revolution, Caroline Scott Harrison enjoyed painting watercolors and started the White House china collection.

**Heritage of public service** distinguished Benjamin Harrison. He filled the shoes of his grandfather, William Henry Harrison, who 48 years earlier had served as the Nation’s ninth President. His great-grandfather had signed the Declaration of Independence. Benjamin Harrison favored a vigorous foreign policy and extended the National Park System in the American West.

*Paintings by Eastman Johnson (opposite) and Daniel Huntington, White House Collection*









In a frenetic dash for free land, 50,000 pioneers race to claim home sites in Oklahoma Territory,

who were hungry for spoils after four years of Democratic rule. Although he had made no political bargains, his supporters had given innumerable pledges in his behalf. When Boss Matt Quay of Pennsylvania heard that Harrison ascribed his victory to Providence, he exclaimed that Harrison would never know "how close a number of men were compelled to approach the gates of the penitentiary to make him President."

Harrison favored extension of Civil Service, but the pressure was too great. Within a year, his own Postmaster General, John Wanamaker, had dispensed postmasterships to 30,000 deserving Republicans.

Harrison signed the Sherman Antitrust Act, which would later figure dramatically in domestic affairs, but his own times were not ripe for its enforcement. He also initiated rural free delivery of mail.

A vigorous foreign policy marked Harrison's Administration, and he personally helped shape it, since Secretary of State James G. Blaine was frequently ill. The first Pan-American Congress, meeting in Washington in 1889, established an information center, which later became the Pan-American Union.

Harrison guided Blaine in asserting American claims in Samoa and in seeking, unsuccessfully, to obtain a harbor in Haiti. At the end of his administration he sent the Senate a treaty annexing Hawaii, but President Cleveland withdrew it.

The perplexing domestic problem President Harrison faced was that of trying to maintain a protective tariff and at the same time to reduce the Treasury surplus being built by the high rates.

#### Budget Reaches a Billion Dollars

Republican leaders in Congress successfully met the challenge. Representative William McKinley of Ohio and Senator Nelson W. Aldrich of Rhode Island framed a still higher tariff bill, containing some rates that were intentionally prohibitive. Harrison, who believed in protection, nevertheless tried to make the tariff more acceptable to other nations by writing in reciprocity provisions.

To help spend the surplus, Harrison signed substantial appropriation bills for the improvement of rivers and harbors, building a two-ocean Navy, and subsidizing steamship lines, and for the first time except in war,



opened by Harrison for settlement in 1889.

Congress appropriated a billion dollars. When critics attacked it as the "billion-dollar Congress," Speaker Thomas B. Reed replied, "This is a billion-dollar country."

By the end of the Harrison Administration, the surplus had evaporated, and prosperity seemed about to disappear as well.

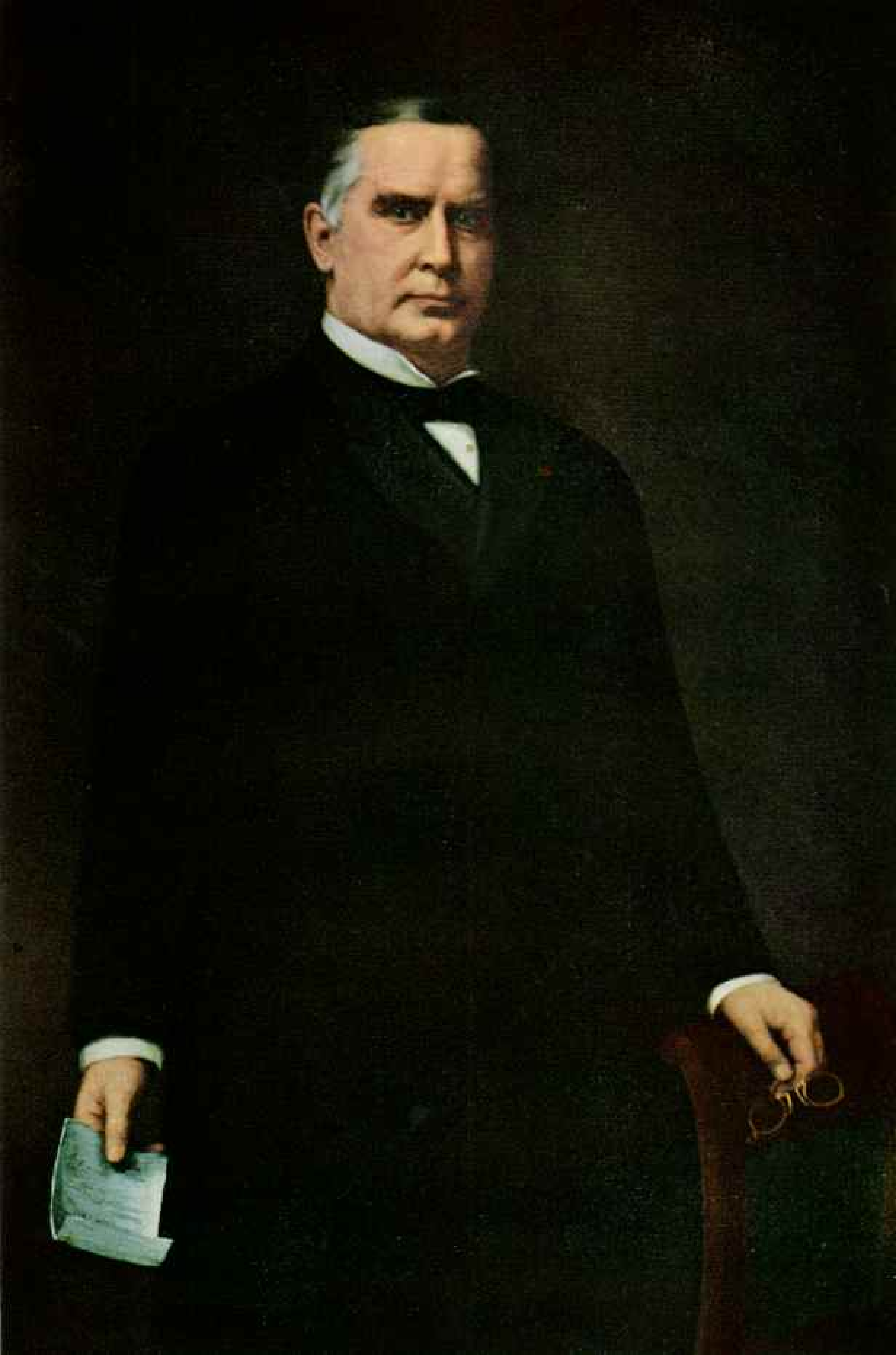
The year 1892 was a bleak one for Harrison. His wife died in October. In November, abandoned by his party leaders, he was defeated by Grover Cleveland.

Back home in Indianapolis, Harrison became a notable speaker and writer, and he brilliantly upheld Venezuela's claims against Great Britain in a boundary dispute with British Guiana. In 1896 he married a widow, Mary Lord Dimmick, niece of his first wife. Five years later he died.

**Centennial President, Harrison in 1889 stands on the site of old Federal Hall in New York City to re-enact the Inauguration of George Washington. Show of flags dressing Wall Street so impressed Harrison that he started the custom of flying the national colors from all public buildings.**







William McKinley  
TWENTY-FIFTH PRESIDENT 1897-1901

**W**ILLIAM MCKINLEY was a transitional figure as Chief Executive. Last in a long succession of Civil War veterans to hold office, first of the 20th-century Presidents, he witnessed a new order, born of the vast economic changes and developments of the 19th century. He launched the Nation, now a power, into world affairs, saying: "Isolation is no longer possible or desirable. . . . The period of exclusiveness is past."

At home, trusts proliferated and prosperity returned. Overseas, the United States defeated Spain and acquired a tropical empire, which it retained for a few decades.

McKinley rode the crest of the Republican "full dinner pail" popularity and easily won a second term. But before a year had passed, he was dead from an assassin's bullet.

McKinley was born in 1843 in Niles, Ohio, where now stands a memorial library and museum. The son of an iron founder, he briefly attended Allegheny College, and was teaching in a country school when the Civil War broke out. He enlisted as a private in the Union Army at the age of 18, and was mustered out as a major.

He studied law, opened an office in Canton, Ohio, and married Ida Saxton, daughter of a local banker. His attractive personality, exemplary character, and marked intelligence

enabled him to rise rapidly in the U. S. House of Representatives, where he took his seat at 34. Within three years he was appointed to the powerful Ways and Means Committee, of which he was later chairman.

Robert M. La Follette, Sr., of Wisconsin, who served on the committee with him, recalled that he "represented the newer view," and "on the great new questions . . . was generally on the side of the public and against private interests."

During his 14 years in the House, McKinley became the leading Republican tariff expert, giving his name to the measure enacted in 1890. In the election a few weeks later, the Republicans were voted out of control of the House, the public feared the bill would increase retail prices. McKinley, also a victim of a Democratic gerrymander in his district, lost his seat along with the other Republicans. But he was promptly elected Governor of Ohio and served two terms, gaining national prominence as an administrator.

For several years wealthy Marcus Alonzo Hanna of Cleveland promoted McKinley for the Presidency. At the 1896 Republican Convention, in time of depression, Hanna ensured the nomination of his friend William McKinley as "the advance agent of prosperity." The Democrats, advocating the "free

"He resembles a young Napoleon," said journalists of the pale, short, and purposeful William McKinley. To enhance his dignified deportment, the President wore a boutonniere and reading glasses suspended on a black cord.

**Horrendous blast** hurls bodies and debris skyward as the U. S. battleship *Maine* explodes in Havana, Cuba; a contemporary print portrays the fiery scene.

Aroused Americans cried, "Remember the *Maine*," and pressured McKinley to punish Spain for the disaster. Congress declared war April 25, 1898. At the end of the hundred-day hostilities, the United States acquired its first overseas possessions: the Philippines, Puerto Rico, and Guam.





and unlimited coinage of both silver and gold" at a ratio of 16 to 1, nominated 36-year-old William Jennings Bryan, the silver-tongued orator from Nebraska, who created feverish excitement wherever he spoke. Hanna used large contributions from eastern Republicans frightened by Bryan's views on silver. McKinley—meeting delegations on his front porch in Canton, Ohio—defended the gold standard of the Republican platform. On election day, McKinley defeated Bryan and both Houses of Congress were Republican.

#### Cuban Plight Stirs the Country

When President McKinley took office, the depression had almost run its course and with it the extreme agitation over silver. Deferring any action on the money question, McKinley instead called Congress into special session to enact the Dingley Tariff, at that time the highest in history. It remained in force during 12 ensuing years of business expansion.

In the friendly atmosphere of the McKinley Administration toward industrial combinations, "trusts"—as they were popularly called—came into existence at an unprecedented pace. In the six years beginning with 1898, no fewer than 236 "important and active Industrial Trusts" were incorporated, so that by 1904 there were listed 318 trusts with capitalization exceeding seven billion dollars.

Newspapers caricatured McKinley as a little boy led around by "Nursie" Hanna, representative of the trusts. Actually, McKinley was not that greatly dominated by Hanna; he firmly condemned the trusts as "dangerous conspiracies against the public good."

Not prosperity, as anticipated, but foreign policy became the dominant concern of the McKinley Administration. Americans became increasingly indignant as the protracted, stalemated struggle between Spanish forces and the revolutionaries in Cuba brought disease and starvation to the Cuban people.





Assassin fells the President, scream headlines in 1901. McKinley was shot September 6 at the Pan-American Exposition in Buffalo, New York. He died eight days later.

Bustling young giant: A cartoon captures the brisk pace at the turn of the century as the Nation becomes a world power. McKinley prepares to dig a canal across Nicaragua, but pauses to consider a shorter route through Panama.

With the sinking of the battleship *Maine* in Havana harbor (page 709), public indignation brought upon the President a pressure for war. Unable to restrain Congress, McKinley delivered a message of "neutral intervention" in April, 1898. Congress thereupon voted three resolutions tantamount to a declaration of war for the liberation and independence of Cuba.

#### Nation Acquired Lands Overseas

In the hundred-day war that followed, the United States intercepted the Spanish warships fleeing out of Santiago Harbor, Cuba, and completely destroyed them. Ashore, "Rough Rider" Theodore Roosevelt became a hero at the battle of San Juan Hill. Puerto Rico was also occupied, and strategic Hawaii annexed. In the Philippine Islands, Commodore George Dewey had defeated the Spanish in Manila Bay. The United States, as decided by the Treaty of Paris of 1898, annexed the

Philippines as well as the islands of Guam and Puerto Rico.

Rebelling Filipinos, who had fought with the U. S. forces against the Spanish, in 1899 precipitated the United States into a conflict longer and bloodier than the Spanish-American War. Decades later, in 1946, the Philippines gained independence, and in 1952 Puerto Rico achieved commonwealth status.

In 1900 McKinley again campaigned against Bryan, who inveighed against imperialism and the Republican candidate for Vice President, Theodore Roosevelt. McKinley quietly stood for the "full dinner pail."

His second term came to a tragic end in September, 1901. Standing in a receiving line at the Buffalo Pan-American Exposition, he had just given a little girl the red carnation from his buttonhole when an anarchist named Leon Czolgosz, his gun concealed in a handkerchief, shot him twice. McKinley died eight days later.

THE END





Fingers of lightning rake a column of steam and ash seething with massive charges of static electricity. The island of Surtsey, result of volcanic birth off Iceland, provides scientists with a rare opportunity to study the emergence of life on sterile land.

# Surtsey: Island Born of Fire

By SIGURDUR  
THORARINSSON, Ph.D.

**A**N ERUPTION? Off the Westman Islands? I found myself shouting with excitement into the telephone. "Are you certain it wasn't just the blowing of a whale?"

A meteorologist on duty at the Reykjavik Airport had jolted me from deep sleep with the call in Iceland's gray subarctic dawn. On that morning, November 14, 1963, the crew of a fishing vessel had reported a tremendous spouting in the sea—an upheaval so violent that they felt it must be volcanic activity.

"Try to get further details and call me back," I said, fully awake and reasoning now.

## Iceland Sits on Volcanic Belt

News of the eruption should not have taken me, an Icelandic volcanologist, by surprise. A zone of youthful volcanic activity cuts right across the country. Iceland constitutes the largest above-sea section of the 10,000-mile-long Mid-Atlantic Ridge, the mostly subsurface mountain chain that reaches from Bouvet in the South Atlantic to Jan Mayen north of the Arctic Circle (map, next page).\*

In recent years the submarine ridge has

\*See, in NATIONAL GEOGRAPHIC: "Exploring the Mid-Atlantic Ridge," September, 1948; and "New Discoveries on the Mid-Atlantic Ridge," November, 1949, both by Maurice Ewing.





EXPLORER BY MAGNUS HALLGRIMSSON, SOLBREYI/WW © NATIONAL GEOGRAPHIC SOCIETY

been restless. A new volcano emerged and grew up in 1957 and 1958 in the Azores. The inhabitants of Tristan da Cunha, in 1961, had to abandon their island (though many were later to return) because of an eruption.\* And in 1961 Askja volcano in Iceland leaped up in fiery outburst.

No, I should not have found it surprising at all that the crust of the earth had opened up near the Westman (Vestmanna) Islands, off Iceland's south coast.

### Smoke Baffles Fishermen

My telephone rang again.

"It is a submarine eruption, all right. There is no longer any doubt," said the meteorologist. He went on to explain what had happened.

At 7:15 a.m. Olafur Vestmann, cook of the fishing boat *Isleifur II*, was standing watch while the rest of the crew had gone to their bunks after laying their 12-mile-long cod-fishing line. Suddenly Olafur felt the boat take an odd twist, as if she were caught in a whirlpool. It was barely light, but the fisherman could see dark smoke rising from the sea to the south.

Vestmann thought a ship was on fire and woke the captain, who called

\*See, in NATIONAL GEOGRAPHIC: "A New Volcano Bursts From the Atlantic," by John Scofield, June, 1958; "Death of an Island, Tristan da Cunha," by P. J. F. Wheeler, May, 1962; and "Home to Lonely Tristan da Cunha," by James P. Blair, January, 1964.

Drenched author (right), with assistant Gunnar Gudmundsson, empties his boot after capsizing off Surtsey. Iceland stands on an oceanic ridge of volcanoes that includes the Azores, Tristan da Cunha, and Bouvet, sites of recent volcanic activity.



PRODUCED BY NATIONAL GEOGRAPHIC SOCIETY © GEOGRAPHIC ART DIVISION  
MAPS BY JOHN W. LOTHENS AND EUGENE W. SCHILL  
DESIGN BY DAVID MELTZER



the nearest coast guard station on the radio-telephone. No SOS had been received. The *Isleifur* steamed closer to the smoke. The men saw that the outburst was a mixture of vapor, ash, and bombs—solidifying lumps of lava—from a subsea volcano.

Three hours later, when I first flew to the area, the eruption column had reached a height of 12,000 feet.

The following night a narrow black ridge broke the surface of the sea. That was November 15, 1963, nearly a year and a half ago—and the island is still growing (below).

Before the first land appeared, a considerable mass of material had built up here where the ocean is 425 feet deep. The new land consisted of loose and porous material, its texture resulting from hot lava meeting cold water far below the surface of the sea.

During the days that followed its first appearance, the eruption column occasionally rose to an awesome 50,000 feet. Its turbulent top could then be seen from Reykjavik, capital of Iceland, 75 miles away.

Throughout the first four months of the volcano's life, the sea kept flooding the eruptive vent or vents through breaches in the crater wall. The wet explosions were relatively quiet; vapor muffled the noise.

After such an explosion, tephra—ash, cin-

ders, and pumice—rushed up in a heavy, dark mass. Out of it shot a rain of bombs, each with a black tail of ash. These tails rapidly turned grayish white and furry as the superheated steam, the driving force, cooled and condensed. Huge hailstones formed around nuclei of pumice; these bombarded sightseeing ships and aircraft.

Now and then eruptive material closed the breaches in the crater walls, blocking out the sea water. Then a dull, rumbling roar accompanied each explosion. The eruption column took on an even more sinister aspect, ash-laden and dark.

### Dramatic Spectacle Dispels Seasickness

Few hours of my life do I treasure as much as those of an afternoon in late November, 1963, during one of my periodic trips to observe the island. A gale was blowing, and the sea washed our patrol boat from stem to stern.

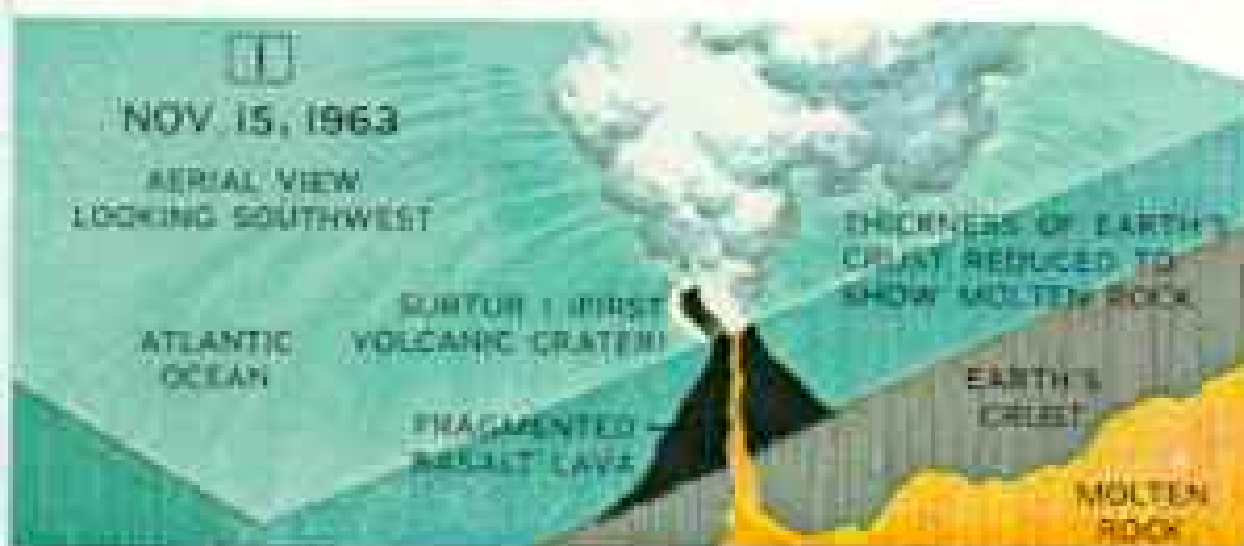
My face was turning green, but I soon forgot my seasickness. As we approached, the volcano seemed to redouble its activity (next page). Bombs and pumice flew upward.

When darkness fell, the entire cone glowed with bombs, which rolled down the slopes into the white surf. Lightning ripped the eruption cloud with purplish bolts, and thunder cracked above our heads. Racing clouds rushed headlong past the crescent moon.

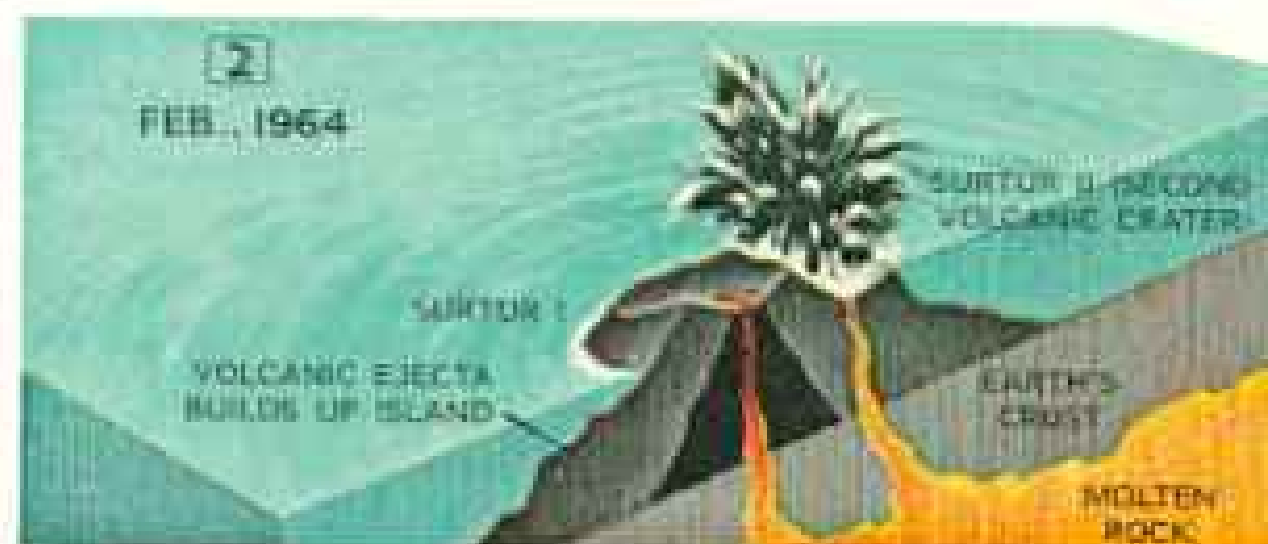
During this early violent phase, the infant volcano expended its energy on a prodigious scale. Its enormous output of steam, if harnessed, would surpass the energy produced by Niagara Falls 100,000 times.

715

**The Author:** Iceland's paradoxical terrain constitutes a living laboratory for Dr. Sigurdur Thorarinnsson, noted geologist, whose specialties include volcanoes and glaciers. Among his books: *The Thousand Years Struggle Against Ice and Fire*, and *Surtsey—The New Island in the North Atlantic*.



Surtsey breaks the surface for the first time.



New vent opens near original fissure, now dormant.



Lava pours from crater as explosions subside.



Nearly 1/4 square miles, Surtsey adds one acre daily.

For the Westman Islanders the eruption was not merely a grand spectacle. Being neighbors to a volcano was rather nerve-racking. The ashfalls posed a serious problem to the 4,800 people of Vestmannaeyjar, the most important codfishing center of Iceland. I strolled through Vestmannaeyjar after the first ashfall and saw the brightly painted houses transformed to dark, dull shapes.

The quarter-inch deposit of ash was the talk of the town. Because the islands are composed of highly porous material, the inhabitants must collect rain from house roofs.

Now water became the housewives' main worry. Might not this water, because of the fluorine in the ash, be dangerous to drink? And how could they wash clothes in the muddy, sulphurous-smelling stuff that dribbled from the roofs?

The men were even more concerned about the effect on their fishing grounds, among the best codbanks in the North Atlantic. Vestmannaeyjar lives almost entirely on its fishing.

"There might be some good in this eruption," one Westman Islander remarked to me. "But unfortunately we have not yet hauled aboard a codfish already boiled."

It was a great relief when, some days after the first deluge, a fishing boat got good catches of cod near the erupting island. As a matter of fact, the fishing season of 1963-64 proved one of the best on record, and never in memory had the summer grass grown so green.

The islanders solved their water problem, too, readily enough. They washed down their roofs with fire hoses, using water pumped from the sea, then waited for rain.

#### Island Changes Shape With Growth

Gradually Iceland's new outpost grew. On November 16, 1963, the volcano's height was 130 feet, its length 1,800 feet. It had grown as a long, narrow ridge. But soon it became elliptical, and subsequently almost round. By December 30 the pumice and ash cone had risen 500 feet, while the island's diameter had stretched to more than half a mile. At the end of last March, Surtsey had grown to one square mile, or more than half the size of Central Park in New York City.

The onslaught of the sea usually notched

**Steam hisses skyward** as sea water meets scalding magma. Darker clouds loft bombs and pulverized lava. Here on five-day-old Surtsey, three main vents cough every few seconds, spewing 400,000 tons of ash and smoke-plumed bombs an hour.







the island on the southwest; prevailing winds blow from that direction.

During the volcano's early life, we wondered if it would suffer the fate of an island born in 1783 about 65 miles southwest of Reykjavik. That eruptive jack-in-the-box received the name Nyey, "New Island." The Danish king, who was also king of Iceland, planned to commemorate his official possession of this virgin territory by erecting on it a stone six feet tall, bearing his personal insignia. This monument never got to its destination. The island had vanished by the time the king's ship came on the scene.

First people to land on the newest neighbor to the Westman Islands were three French

daredevils. They went ashore on December 6, 1963, under auspices of the French weekly *Paris-Match*, and got away unscathed.

Soon afterward, the Government of Iceland officially named the new island. The Icelandic Place Name Committee decided that the volcanic vent should be called Surtur, and the island Surtsey (the island of Surtur). In old Icelandic mythology, Surtur was a giant who brought destructive fire from the south and fought against Frey, god of fertility.

This was too much for the Westman Islanders. Though Icelanders, they are highly independent. They even have their own national holiday in early August, when young and old spend two days in Herjólfsdalur, a



ERUPTION BY SIBIRIEN EINANGI, SELASTILNA, FOSCHYDNE (RIGHT) FROM SELASTILNA © R.S.S.

Signaling the eruption, billowing steam drops an ominous veil of ash. The four-mile-high column rises 14 miles from Vestmannaeyjar on Heimaey (right); it soon changed direction and blackened the town's bright face. Extinct volcano Helgafell (foreground) slopes near the island's eastern side.

Before the eruption, Heimaey's houses sparkled in the sun. Surtsey-style eruptions, ending about 8,000 years ago, created this treeless isle. Center of Iceland's codfishing, it has a population of 4,800—the only inhabitants of the Westman Islands. Boat slips from the harbor near green-patched cliffs. Surtsey's emergence could extend territorial fishing waters, which Iceland defines as reaching 12 miles offshore.



valley near the only village, living in tents and enjoying alfresco entertainments. Naming the new landmark, in Westman opinion, was no business of the mainlanders.

On December 13, 1963, seven brave men of Vestmannaeyjar landed on Surtsey and put up a marker with the name Vesturey (West Island). But the giant Surtur reacted violently to this brash intrusion: He showered the visitors with pumice and ash. They barely escaped with their lives. The name Surtsey stuck.

Just three days later I first landed on Surtsey, with an Icelandic physicist. Our aim was to collect xenoliths—old rocks torn from the sea floor by the explosions. We got pieces of old lava and chunks of ocean-bottom sedi-

mentary rocks studded with shell fragments.

It was thrilling to stand on a new volcanic island, not knowing how it would behave. But Surtur kept quiet; on this visit we met no such adventures as befell St. Brendan some 1,400 years ago.

#### Irish Abbot Sails Close to Hell

An Irish saint, Brendan the Voyager lived in the sixth century and died as abbot of Clonfert Monastery in Galway. Like many Irish monks of the time, he and his brethren set out to sea in a skin-hulled curragh, seeking solitude on remote islands in the ocean. Some scholars believe that religious wanderers may have reached Iceland three centuries before









ERTACHROMES BY MAGNUS HALLGRIMSSON, SOLARFILMA,  
AND AEVAR JOHANNESSEN (ABOVE). © N.G.S.

*GAPING WOUND, a two-foot-wide vent of crimson lava at some 2,100° Fahrenheit, cracks open near the main crater. Surtsey sprang from just such a split in the floor of the sea.*

*BLACK AS GUSHING OIL, gritty volcanic ash roils the air above the crater. Seconds earlier, wind had whipped the inky cloud over the landing party on the beach. The author stands at left in the group that planted the Icelandic flag on the ridge. Soft surfaces make exploration risky. Members of another group, wading the surf toward shore, sank waist-deep in quicksand and nearly drowned.*

the Vikings came from northernmost Europe.\*

A medieval Latin account of St. Brendan's legendary seafaring contains this passage:

"They came within view of an island, which was very rugged and rocky, covered over with slag, without trees or herbage, but full of smiths' forges. . . . They heard the noise of bellows blowing like thunder. . . . Soon after one of the inhabitants came forth to do some work; he was all hairy and hideous, begrimed with fire and smoke. . . .

"St. Brendan . . . said to his brethren, 'Put on more sail, and ply your oars more briskly,

that we may get away from this island.' Hearing this, the savage man . . . rushed down to the shore, bearing in his hand a pair of tongs with a burning mass of the slag, of great size and intense heat, which he flung at once after the servants of Christ. . . . It passed them at a furlong's distance, and where it fell into the sea, it fumed up like a heap of burning coals, and a great smoke arose. . . .

"When they had passed on about a mile . . . the whole island seemed one globe of fire, and

\*See "Vinland Ruins Prove Vikings Found the New World," by Helge Ingstad, *GEOGRAPHIC*, November, 1964.

722 Fiery tongues of lava spill from the lip of the main crater, 200 yards wide. A lava shield, now





the sea on every side boiled up and foamed like a caldron set on a fire well supplied with fuel . . . and a noisome stench was perceptible at a great distance. Then St. Brendan sought to animate the courage of the brethren, saying: 'Soldiers of Christ, be strong in faith unfeigned and in the armour of the Spirit, for we are now on the confines of hell.' "

In the afternoon of February 19, 1964, seven persons, two of them women, stood dripping wet on the shore of Surtsey, their situation distinctly worse than that of St. Brendan and his brethren. Our two rubber landing dinghies

lay upon a shore battered by almost impenetrable surf. The giant Surtur was in no better mood than the savage of the legend, and no saint was present to animate our courage.

We had sailed for Surtsey aboard the 30-ton motor vessel *Haraldur* to inspect the island. The volcano was rather quiet as we approached, but the sea lashed us with unexpected intensity. One of our dinghies capsized, some cameras and instruments were lost or damaged, and everyone got a ducking.

Hardly were we ashore when Surtur fired a barrage of warning shots. Clouds of black ash

covering more than half the island, could withstand the sea's pounding for thousands of years.

723

EPITAPH BY SIGURDUR EYDSSON. VOLCANILWA © NATIONAL GEOGRAPHIC SOCIETY





Author's first landing by helicopter came on his eighth visit. He has scouted the island more than 60 times from the air.

**On the inferno's edge**, the author endures wilting heat and "the awful sulphuric stench" for close-up pictures of these fiery fountains in the main crater.

billowed against the sky, and bombs rained down on the slopes of the crater.

Just off our beach, falling bombs of lava and pumice caused geyserlike splashes in the sea, and now the missiles began to crash into the sand around us. It took a strong effort of will to stand still and stare skyward to watch the trajectory of the bombs. The trick was not to dodge them until a moment before they seemed about to land on our heads.

#### **Pumice Half-fills Dinghies**

Now there was one paroxysm of bomb showers after another. The biggest lava chunks, about a yard through, made uncanny bangs when they crashed to earth. Hollows that they punched in the wet sand soon filled with water, boiling from contact with the glowing bombs. Lumps of pumice showered our parkas and helmets.

The air was warm, but not uncomfortably so. Lack of oxygen in the waves of steamy gas made breathing a little difficult, however.

Between eruption bursts we made our way to the dinghies, already half-filled with pumice. Some time later we were able to launch our battered little craft through the barrier surf and row to the ship.

After that trip to Surtsey I could easily persuade myself that St. Brendan in actual fact had witnessed a volcanic island erupting off the coast of Iceland.

"Will our new island last?"

The question was put to us repeatedly during the winter of 1963-64. The answer we gave as geologists had always to be the same: Permanence would depend on the outflow of enough







lava to blanket the island with a hard crust. Week after week only ash and pumice built up on Surtsey. The sea poured into the crater, preventing molten lava from flowing out.

We reserved judgment—until April 4 of last year. At 2:50 p.m. that day, on a reconnoitering flight, we saw a column of intensely white steam rising at the northeastern edge of Surtsey. What was happening now?

#### Island Builds Protective Shell

When we came over the island, the origin of the steam was evident. A lake of molten lava had formed in the crater. From it a glowing stream flowed into the sea. The meeting of fire and water was marked by a wall of billowing steam. In the lava lake, golden fountains played.

A beautiful sight! With a feeling of triumph we sent a message to Vestmannaeyjar Radio: "A lava eruption has begun. The permanence of Surtsey is assured."

We had witnessed the beginning of a lava eruption of the Hawaiian type, starting the formation of a shield volcano.\* This is a volcano built up by repeated outpourings of thin-flowing lava emitted from a circular vent. Such action forms a regular dome with gentle slopes atop the tephra base. Iceland, like Hawaii, bears the huge humps of many shield volcanoes, best known being the symmetrical Skjaldbreiðhur (Broad Shield), which gave the name to this kind of volcano. Until Surtsey, no one, anywhere, had ever recorded the birth of such a volcano.

Except for a lull from the end of April to early July, the boiling lake has gushed lava at a remarkably constant rate, averaging 180,000 tons an hour.

Now and then the lake level rises and overflows the crater rim. Lava rushes down the slopes at speeds as high as 25 miles an hour. Frequently the liquid fire forms a branched network throughout the area of the flow, giving it the appearance of a living limb with red blood coursing through its veins (pages 722-3).

As the island extends itself into the open ocean, the southernmost point of Iceland is every day different from what it was the day before. It has been adding an acre daily.

The apparent permanence of Surtsey is a boon not only to geologists, but to biologists and ecologists as well. A volcanic island newly emerged from the ocean is completely

devoid of life. When, how, from where, and in what order does life invade such an island? Icelandic and American scientists promptly planned a long-term biological research program, supported by funds from the United States Office of Naval Research.

During its early weeks, Surtsey was entirely sterile, its slopes completely covered at times by red-hot bombs and slag. Much of the island's surface is now cold, and invasion by various life forms has already begun.

Observers have found a moth and a live mussel. Grass and rush seeds, leaves, flower stalks, and even a few rooted plants have washed ashore, though they have not yet established themselves.

Abundant bacteria and certain molds now occur on the island, brought by air currents or perhaps airlifted by visiting gulls and other sea birds, as well as wandering land birds. Seaweed and green algae have taken hold.

As soon as explosive activity ceased, it became quite safe for scientists to go ashore on Surtsey. Many have come by sea, and a helicopter from the U. S. Naval Air Station at Keflavik has provided transport to the island.

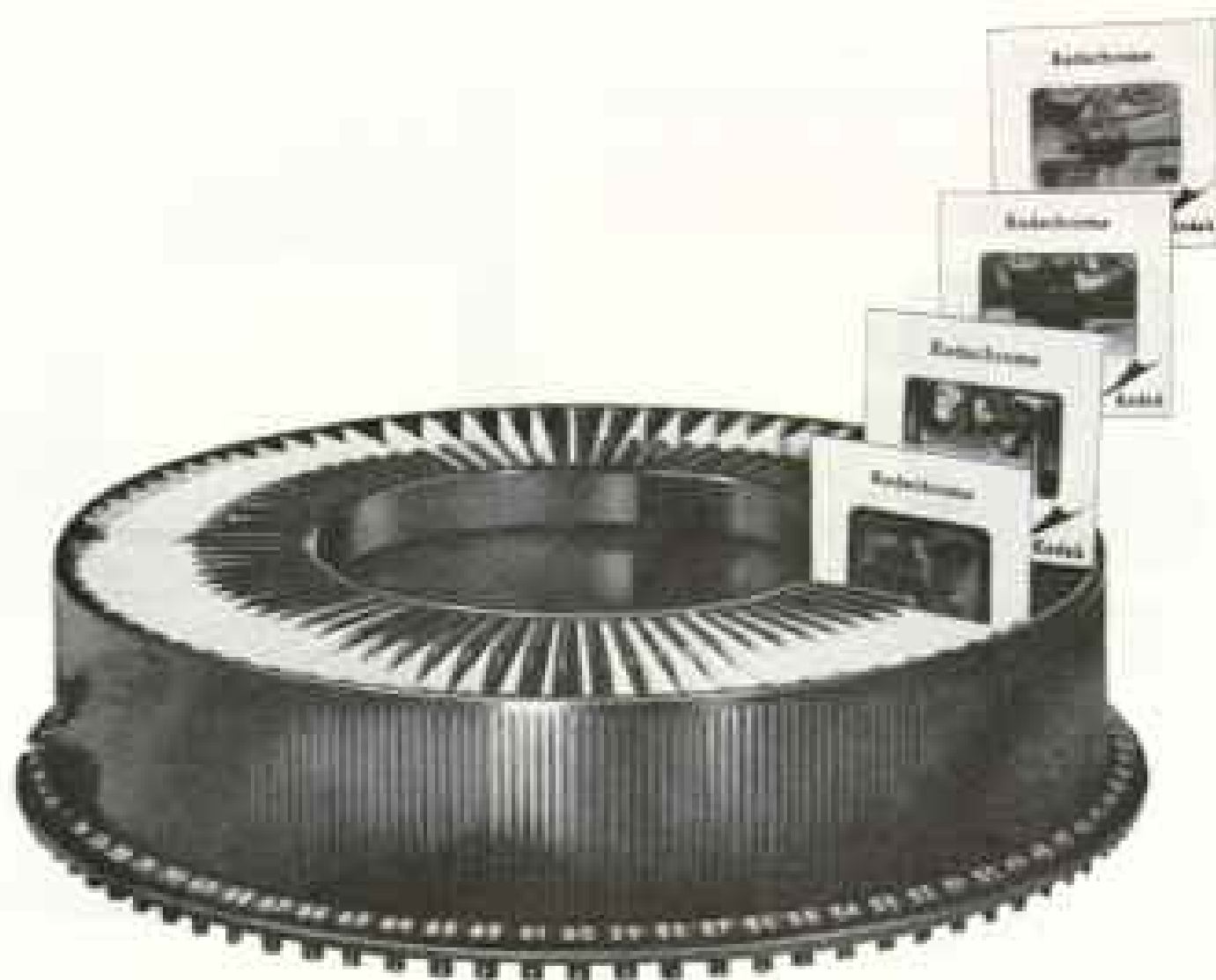
For geologists and geomorphologists it is a great adventure to explore this new island. Contours shift from day to day, and in one week's time we witness changes that elsewhere might take decades or even centuries. We observe gravel downs, calm lagoons, and bluffs so whitened by brine that they recall the chalk cliffs of Dover. Despite the extreme youth of the growing island, we now encounter there a landscape so varied that it is almost beyond belief.

#### Man-made Fireworks Take Priority

But novelty wears away, even that of a stunning volcanic eruption. Many Westman Islanders used to climb every day to a high point just outside town to watch the extraordinary event. But one August day last year, I telephoned a friend on the islands to ask about hiring a boat to take me and some other scientists to Surtsey. The weather was beautiful and the volcanic activity was particularly intense. An airplane crew en route from England had reported seeing the volcanic fires 200 miles away.

"Go to Surtsey? Impossible!" said my friend. "No boatman can be persuaded to go to Surtsey today. You have forgotten that it is our national holiday. We are having a festival in Herjólfsdalur—with fireworks!"

\*See "Volcanic Fires of the 50th State," by Paul A. Zabl, NATIONAL GEOGRAPHIC, June, 1959.



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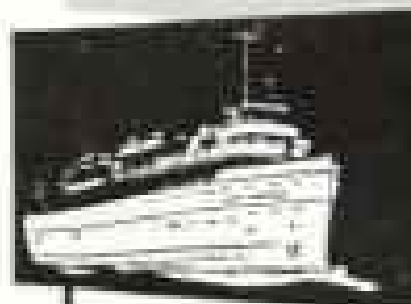
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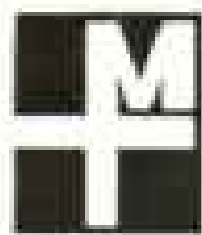
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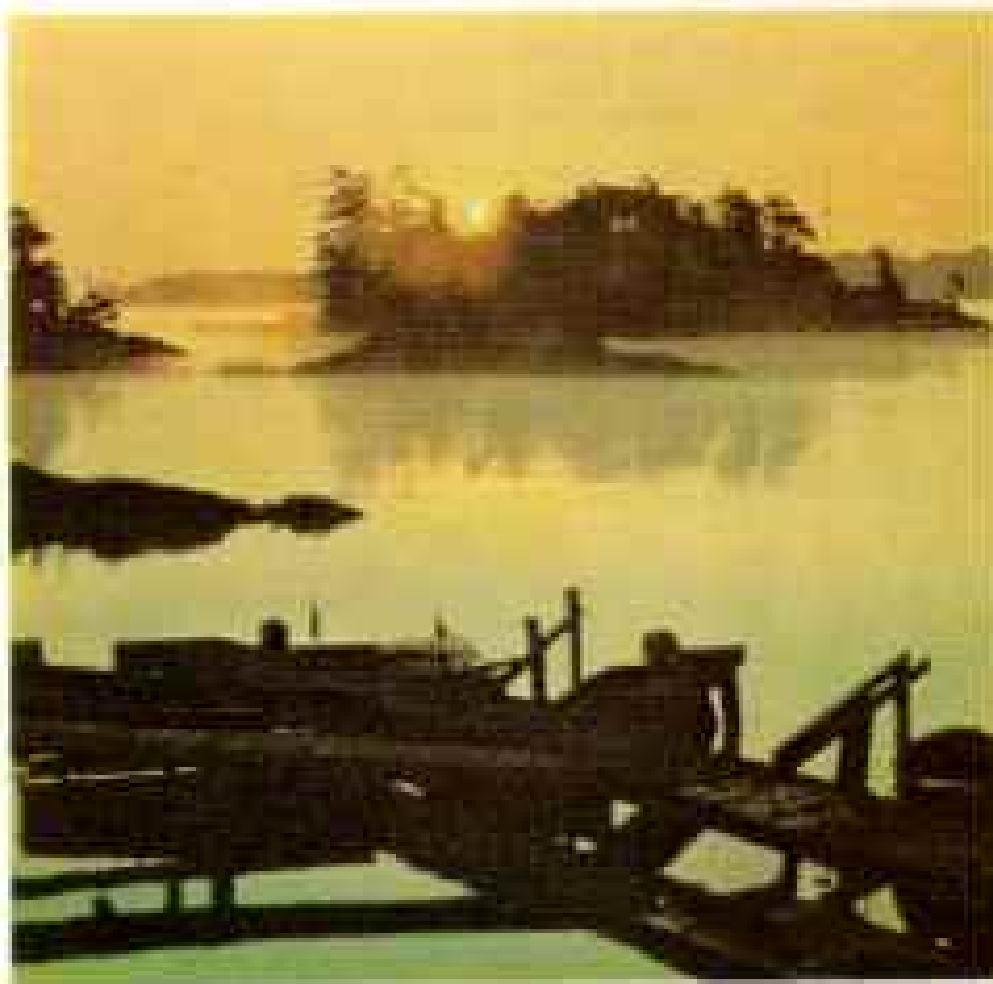
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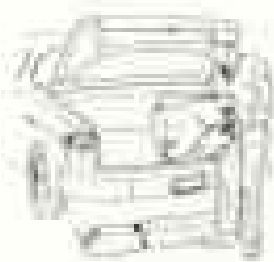
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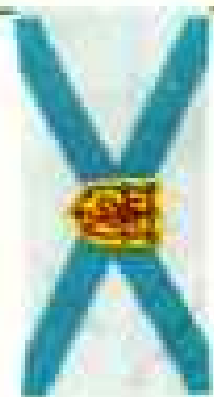
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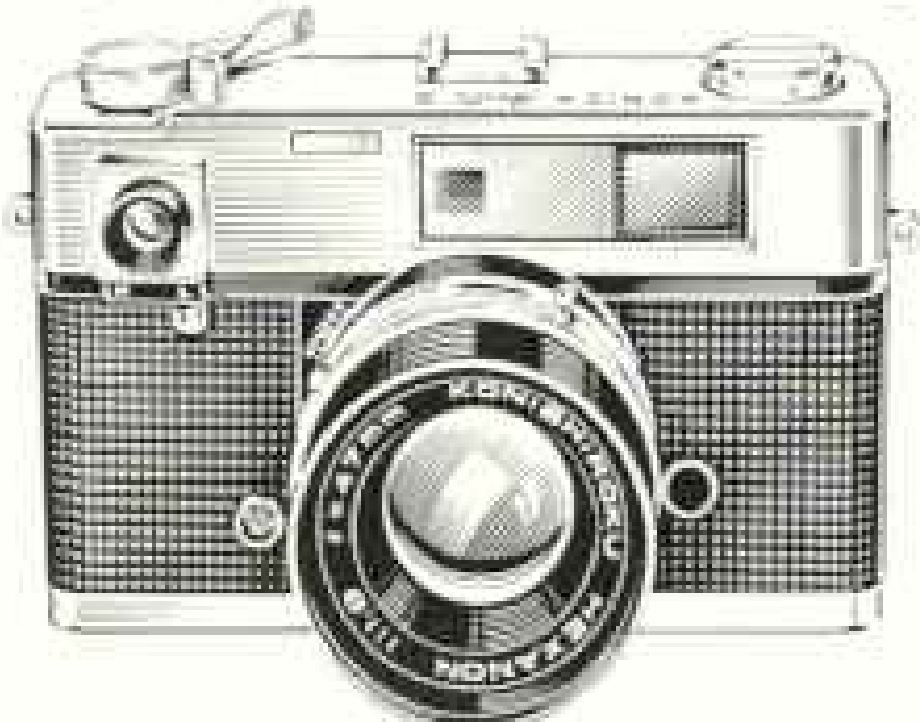
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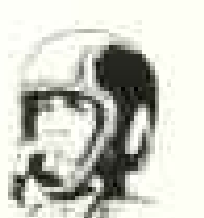
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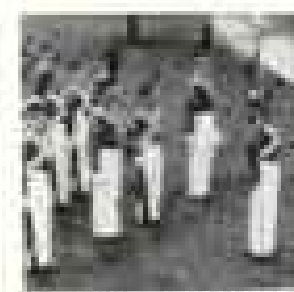
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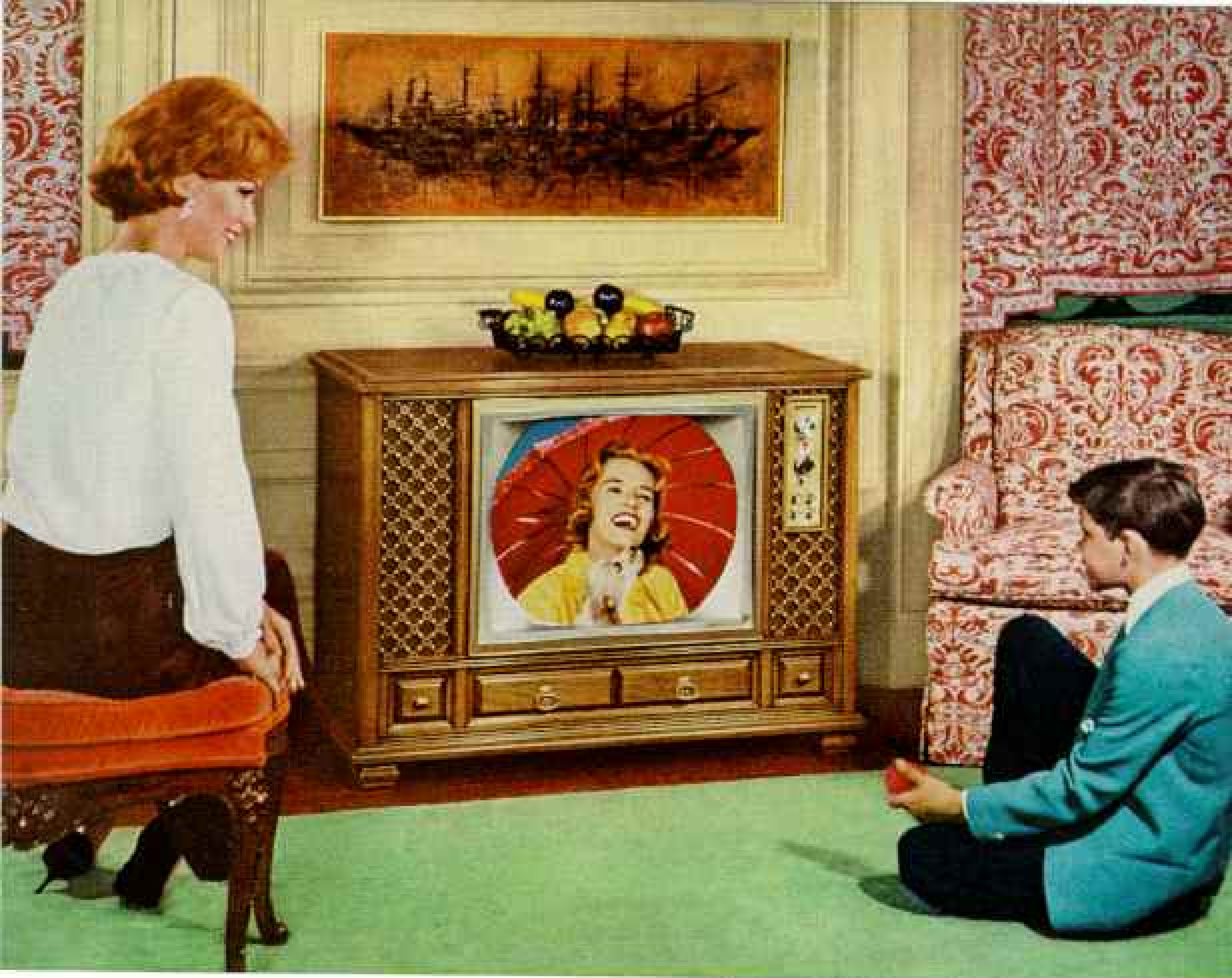


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