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Forty Pages of Illustrations in Full Color

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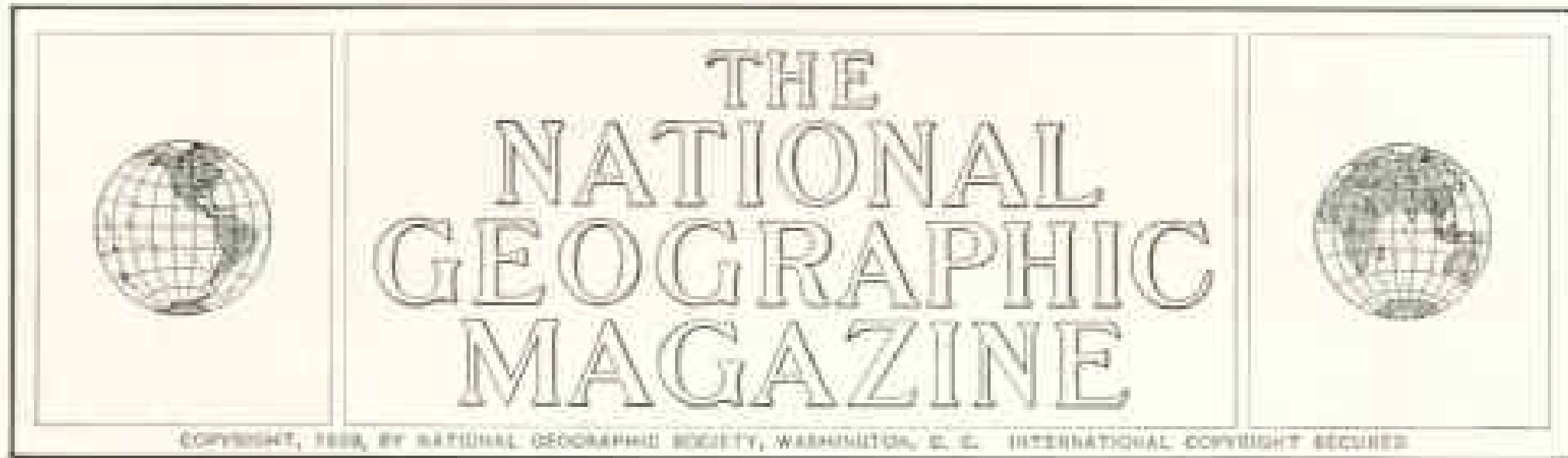
With 26 Illustrations

WILLIAM and ALICELIA FRANKLIN

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BUENOS AIRES: QUEEN OF THE RIVER OF SILVER

BY MAYNARD OWEN WILLIAMS

SNOWDRIFTS behind us, tropic seas ahead, we skirt Manhattan's mountainous silhouette, pay mental tribute to Liberty, and go rolling down to the Rio de la Plata—the River of Silver—whose queen is Buenos Aires.

Once safely in the Southern Hemisphere, we entered Rio's majestic harbor, watched Santos pour coffee into yawning hatches, visited Montevideo's swarming beaches and lo! we were plowing the muddy waters of the Rio de la Plata. Then journey's end as Buenos Aires, largest city in the Southern Hemisphere, grew against the flat, fertile land (map, page 565).

Skyscrapers notch the sky line, many ships line the busy docks, trim sailboats ride at anchor. This unimposing and hard-won site has become a center of restless energy, an enviable trade, and an enjoyable life.

Pleasant it is, this Argentine metropolis, and pleasant it intends to be. Having started as an ugly duckling, and glorified itself by sheer courage, talent, and determination, Buenos Aires is replacing antiquated warehouses with lush new parks and opening up wide traffic lanes through congested districts.

ONE OF EVERY THREE ARGENTINIANS
LIVES IN THE CAPITAL

Once a mud-walled stockade which repelled the Indians but experienced famine, the city and its suburbs now house nearly three and a half million inhabitants, one person out of every three in the Republic. As former President Sarmiento said of a city a

tenth its present size, "When Buenos Aires has a cold, the whole Republic sneezes."⁷

Far-sighted men, seeking to curb its incongruous towers and govern its industrial fervor, point out that if Buenos Aires were to build up to the level now approved by law it could house 30,000,000 overcrowded citizens. Present efforts are to make it not bigger but better, not greater but greener.

Cartographers and heavenly bodies conspire to make the capital confusing to the stranger. Local maps, starting from the river, have east at the bottom and north at the right. The sun, swinging across the northern heavens, moves in a counterclockwise curve. Not the Big Dipper but the Southern Cross is the chief sky-mark.

Street names and statues outline the city's history. Juan Díaz de Solís, who discovered the Mar Dulce in 1515, is honored by a plaza in the Boca,* and Sebastian Gaboto, or Cabot, by a street.

Backed against a modern megalith suggesting ancient Egyptian art, Pedro de Mendoza stands with sword in hand, facing the city he founded in 1536 but could not hold. Not for many decades was Buenos Aires as populous as when his 50 grandees, 2,500 Spaniards, and 150 Germans stretched first their legs and then their famished bodies on this shore.

Facing the Casa Rosada, or Pink House (Color Plate VI), which stands where his fort was built, Don Juan de Garay surveys the site he chose when he came down from the refugee colony at Asunción to

* As the port on the Riachuelo is called.



Photograph by Maynard Owen Williams

AIR DRILLS BEAT A TATTOO FOR A SUPER HIGHWAY TO TIGRE

The Argentine Automobile Club maps the ambitious road-building scheme behind the workers. The new road will add another section to the network which centers in Buenos Aires.

re-founded Buenos Aires in 1580. The development graph since that time would cheer a pessimist. Three hundred inhabitants then; 46,000 in 1810; 305,000 in 1880; 2,463,269 on February 1, 1939.

THE TOMB OF A HERO

At the doors of Government House and beside his impressive tomb in the Cathedral, guards, wearing the uniform of the Grenadiers, keep alive the memory of San Martín (Plates VII and VIII).

The monument to this champion of Argentine, Chilean, and Peruvian independence is surrounded by fine old residences which house the Ministry of Foreign Affairs, the Military Club, and the National Parks Administration. Beside the Plaza Hotel is the Kavanagh Building whose penthouse apartments recently won the South American altitude record from the

Palacio Salvo, diagonally across the river in Montevideo (Plates III and X).

In the Plaza San Martín nursemaids and children, lads and sweethearts, sailors and señoritas gather at twilight while the British clock tower glows and twinkling lights outline the harbor (page 569). Where the slave market and bull ring stood, soft slopes of greenery greet the foreign visitor or the hurried suburbanite.

In the Plaza de Mayo, historic center of urban life, a white obelisk bears the magic date, May 25, 1810. Like the July 4, 1776, which did much to inspire it, this was not the day of a military victory but of a Declaration of Independence, confirmed on July 9, 1816, by the Congress of Tucumán.

From this spot starts an avenue worthy of any metropolis, bright and shiny Diagonal Norte.



Photograph by Maynard Owen Williams

TALL APARTMENT HOUSES RISE, ROW ON ROW, WEST OF AVENIDA ALVEAR

Modernistic buildings, like "dressers with their drawers pulled out," are crowding out old houses and back gardens. Homes of the well-to-do are in the most thickly populated sections (page 576).

Although Buenos Aires covers more space than Paris, hurried visitors may see much.

They gaze at the Government House Grenadiers, colorful as the Horse Guards in Whitehall; note the obelisk of freedom; see the yellow Cabildo, before which independence was declared; enter the Cathedral to visit the tomb of San Martín, and hear how the pediment was done by an Italian prisoner in the Cabildo who thus earned his freedom.

Up the tree-lined Avenida de Mayo they ride to Congress Hall, where they hear a jangling alarm. When debates become overheated, this aid to legislative procedure engulfs the verbal fire in waves of sound.

Backstage at the Colón Theater, or Colón Opera House, which paid the top price for Caruso's top notes, the visitor imagines what a public place this would

be for stage fright or sits in a box behind whose concealing grill conventional mourning, now shortened, observed the proprieties while the ear delighted in grand opera or the eye in a bright ballet.

Close to the Opera and twice as wide as the highway in the Champs Élysées in Paris is the Avenida 9 de Julio, whence one drives to the fashionable Calle Florida, closed to automobiles from four to eight in the evening (page 567). The pedestrian throng is colorful, spirited, and gay.

INCREASING INTEREST IN SPORT

Another attraction is the swift ride to that island recreation spot known as the "Tigre," with passing glances at the Palermo Parks; the two famous race tracks at Palermo and San Isidro; a few of the thirty-odd athletic clubs, emerald pools, and red tennis courts; the gray hulking stadium



Photograph by Maynard Owen Williams

HE RULES OVER TRAFFIC FROM A LOFTY,
PARASOL-CAPPED PEDESTAL.

Beside the busy Plaza de Mayo (page 562), the policeman takes his elevated stand, which gives him unobscured vision, even at the height of rush hours.

where 90,000 soccer fans watch a bounding ball, and enough cricket, golf, and polo fields to indicate young Argentine's increasing interest in sports.

A launch ride through the Paraná Delta evokes memories of the canals opposite Bangkok, and twilight tea on the Casino terrace, with white-clad girls in shorts rowing male ballast about and motorboats parading the river below, reminds one of the Thames at Maidenhead or Henley.

In the midsummer heat of Christmas morning, after the *Uruguay* left, I walked

under massive magnolia trees to the old Pilar Church, whose windows are alabaster instead of glass.

Shiny motors rolled up and flower sellers provided armfuls of gladioluses, hydrangeas, or *estrellas federates* (poinsettias) with which to decorate the close-packed tombs of the Recoleta Cemetery. The last flower, red, as was the ink of his documents, keeps the memory of Rosas alive among those by whom his memory is most hated (Plate VIII).

A LUXURIOUS CEMETERY

Here wealth, genius, and political power are memorialized in family mausoleums which stand on soil costing \$1,000 a square yard (page 569). The bodies lie in tiers, with the richly carved coffin of the father and mother in the main chapel and other members of the family in the vault where fresh flowers glow in the light of tiny lamps.

The gray-suited, straw-hatted guardians are ever at work, washing vases, arranging bouquets, polishing brasswork. All day long there is a procession of relatives bringing new floral offerings.

Children toddle along. Aristocratic señoritas come in bright dresses, once barred from church and cemetery. Men bare heads to the summer sun.

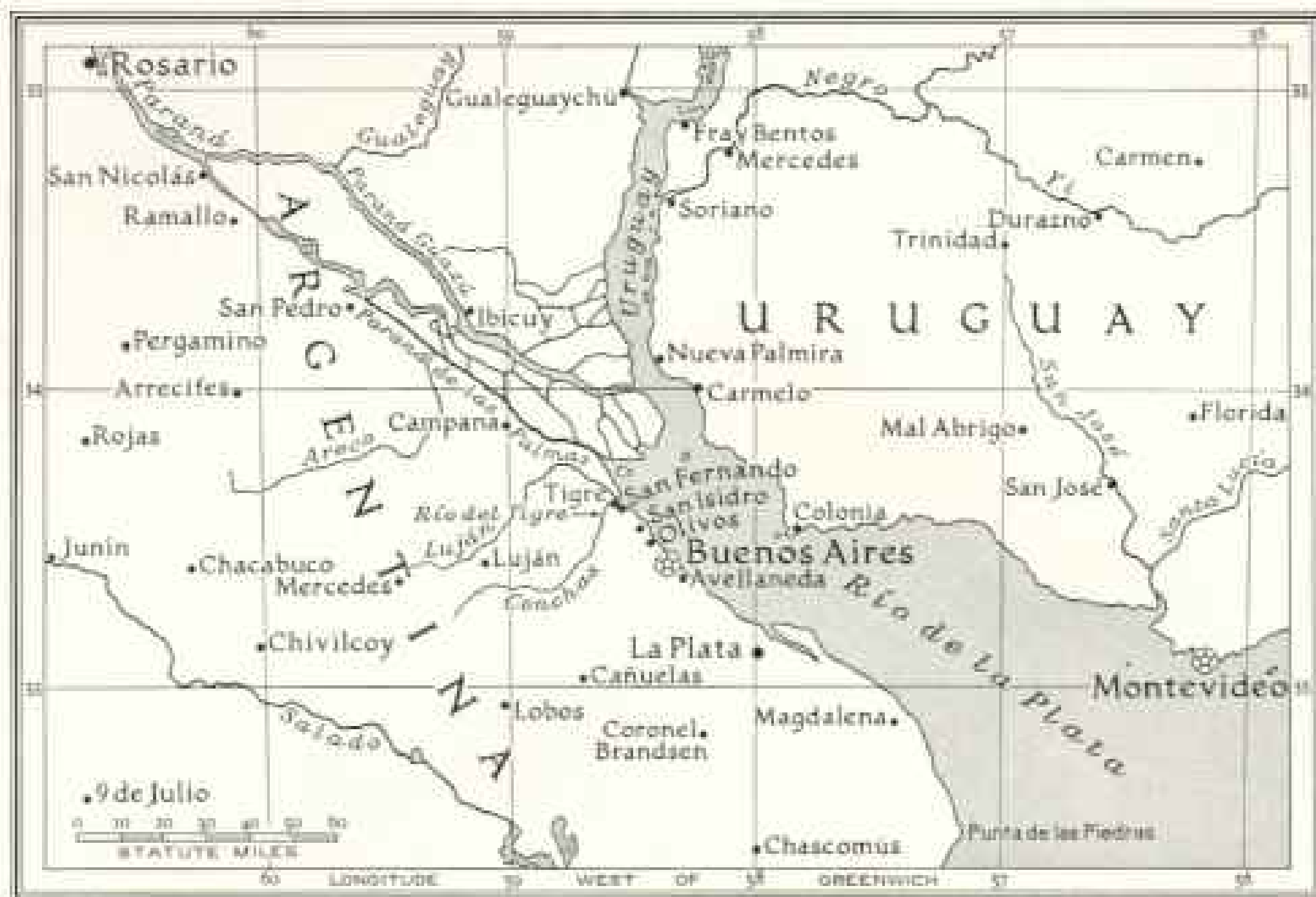
Early in the afternoon the Recoleta is almost deserted. The guards, who look to Americans like farm hands in their straw hats, snooze in the cypress shade or gossip near the ship-topped shaft of Admiral Guillermo Brown, "father of the Argentine Navy," beside Falguière's eloquent figure of Life protesting at the call of death, or Father Time's patient survey of the sand in a monumental hourglass.

However, on Christmas morning the Recoleta is less a place of gloom than welcome rendezvous with loved ones who are not forgotten in death.

Plans are afoot to make the dead help the living. Because of the high price of grave plots, the street to the north could be sold for enough to buy a triangle of buildings and turn their sites into a rolling green connecting upper Pueyrredón with the riverside parks.

The manager of my hotel, long a National Geographic Society member, took a keen interest in my work.

"Buildings? A skyscraper is the same as in New York, only the New York ones



Drawn by Ralph E. McAleer

ARGENTINE LIFE RADIATES FROM BUENOS AIRES, HEART OF THE NATION

The giant largest city in South America sprawls over the flat pampas at the vast estuary of the Río de la Plata. Through its harbor and the port of its near-by sister city, La Plata, passes the bulk of the trade of Argentina's wealthy northern and western provinces. Situated about as far south of the Equator as Atlanta, Georgia, lies to the north, Buenos Aires experiences winter weather in June, July, and August; summer temperatures in December, January, and February.



Photograph by Luis Marden

"GAUCHO" TROUPERS PERFECT THEIR TANGO IN PALERMO PARK

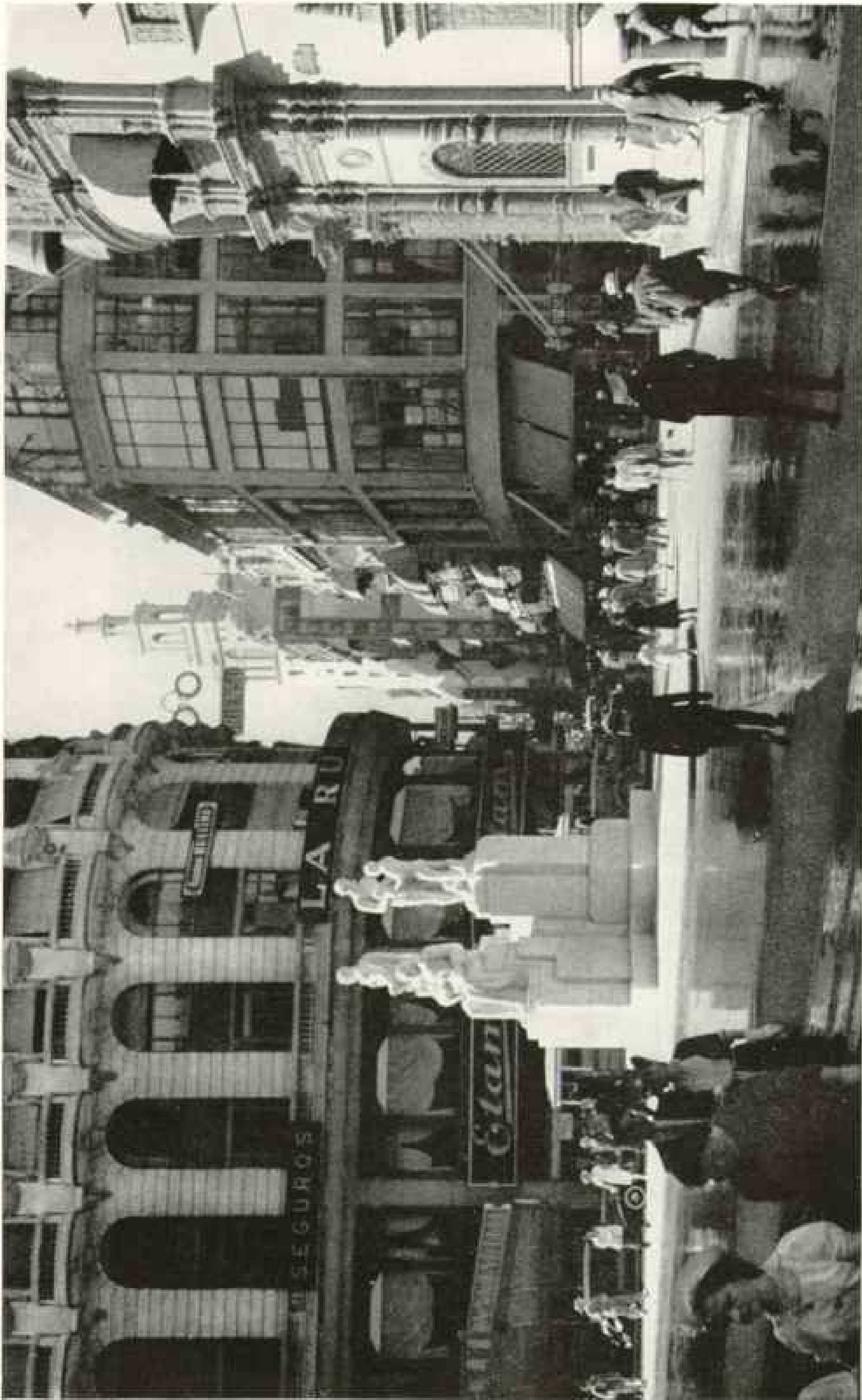
Members of a theatrical group from a café in the Avenida de Mayo rehearse to the tune of an accordion (page 585). The baggy trousers of the man are modern cowboy attire.



Photograph by Maynard Owen Williams

MIGHTY STEAMERS CAN ENTER BUENOS AIRES DOCKING BASINS BECAUSE THIS HUMBLE DREDGE IS NEVER IDLE

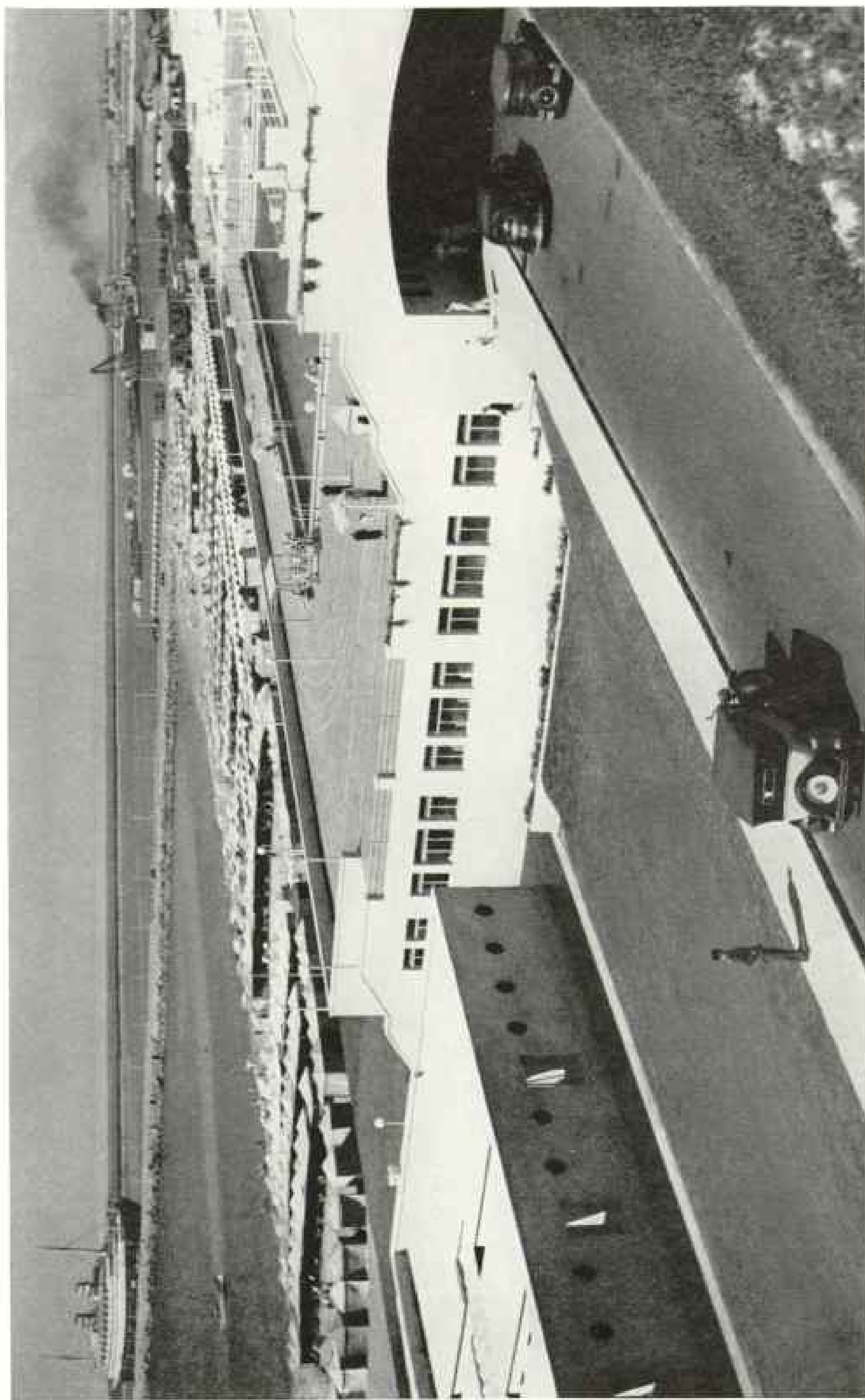
The elaborate docks are built from mud flats. Constant operations by a fleet of these powerful work boats keep the channel open and permit easy berthing of transatlantic liners in the Río de la Plata, close to the heart of the city. The old harbor to the south (Plate V) is the center of Buenos Aires manufacturing (page 374).



Photograph by Maynard Owen Williams

FROM BROAD DIAGONAL NORTE PROMENADERS CONVERGE INTO NARROW, BUT GAY, FLORIDA

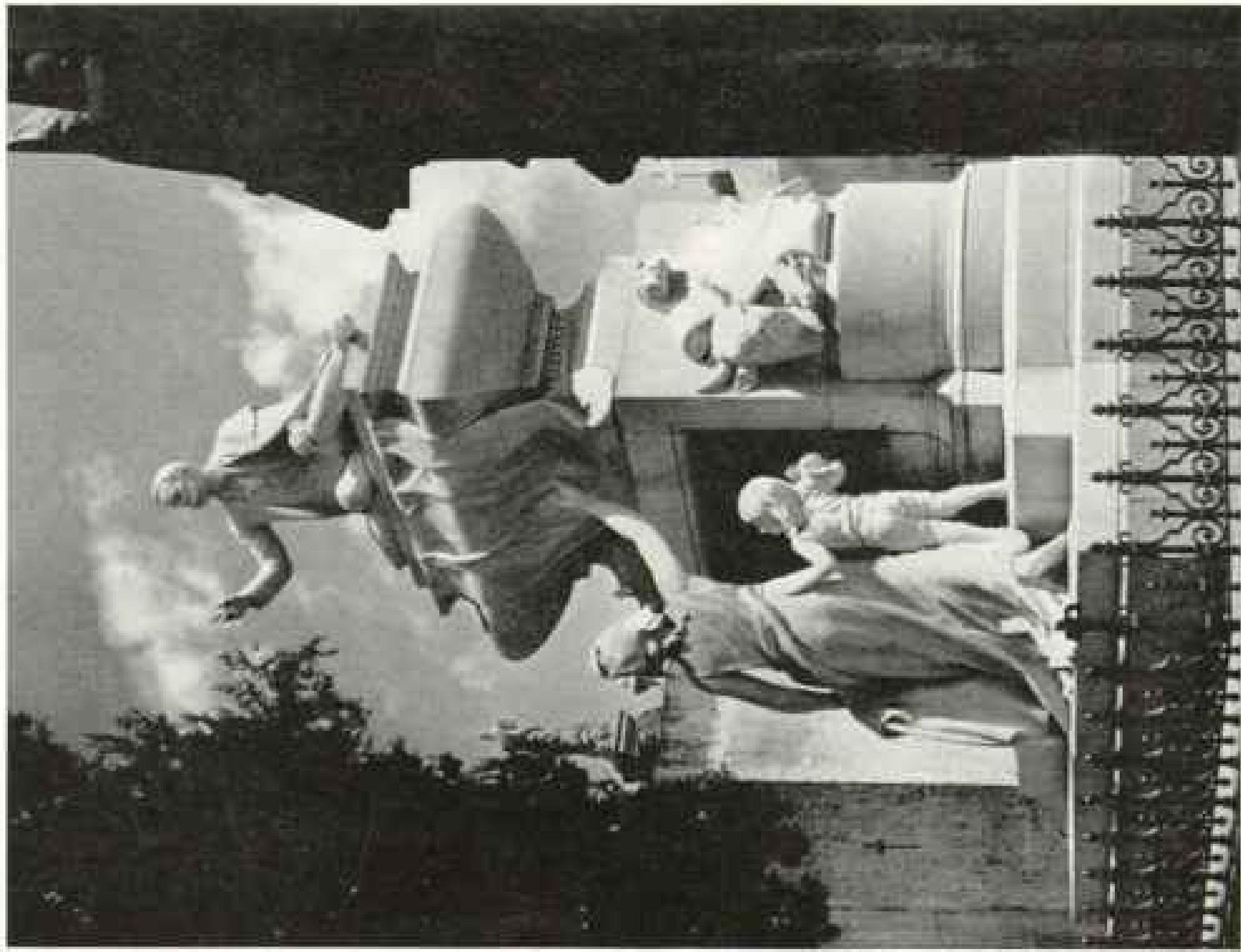
The official name of the wide thoroughfare in Avenida Roque Sáenz Peña, after the Argentine statesman who was President from 1910 to 1914. The sculptured group, center, is a memorial to him. Florida, only 10 blocks long and about 20 feet wide, is a historic street, as much a favorite with merry-makers as Broadway in New York or the boulevards in Paris. From 4 p. m. to 8 p. m. it is closed to all vehicles (pages 562-3.).



© Charles d'Kimmy

CARS PARK UNDER THE SWIMMING POOL IN MARI DEL PLATA, "NEWPORT" OF BUENOS AIRES

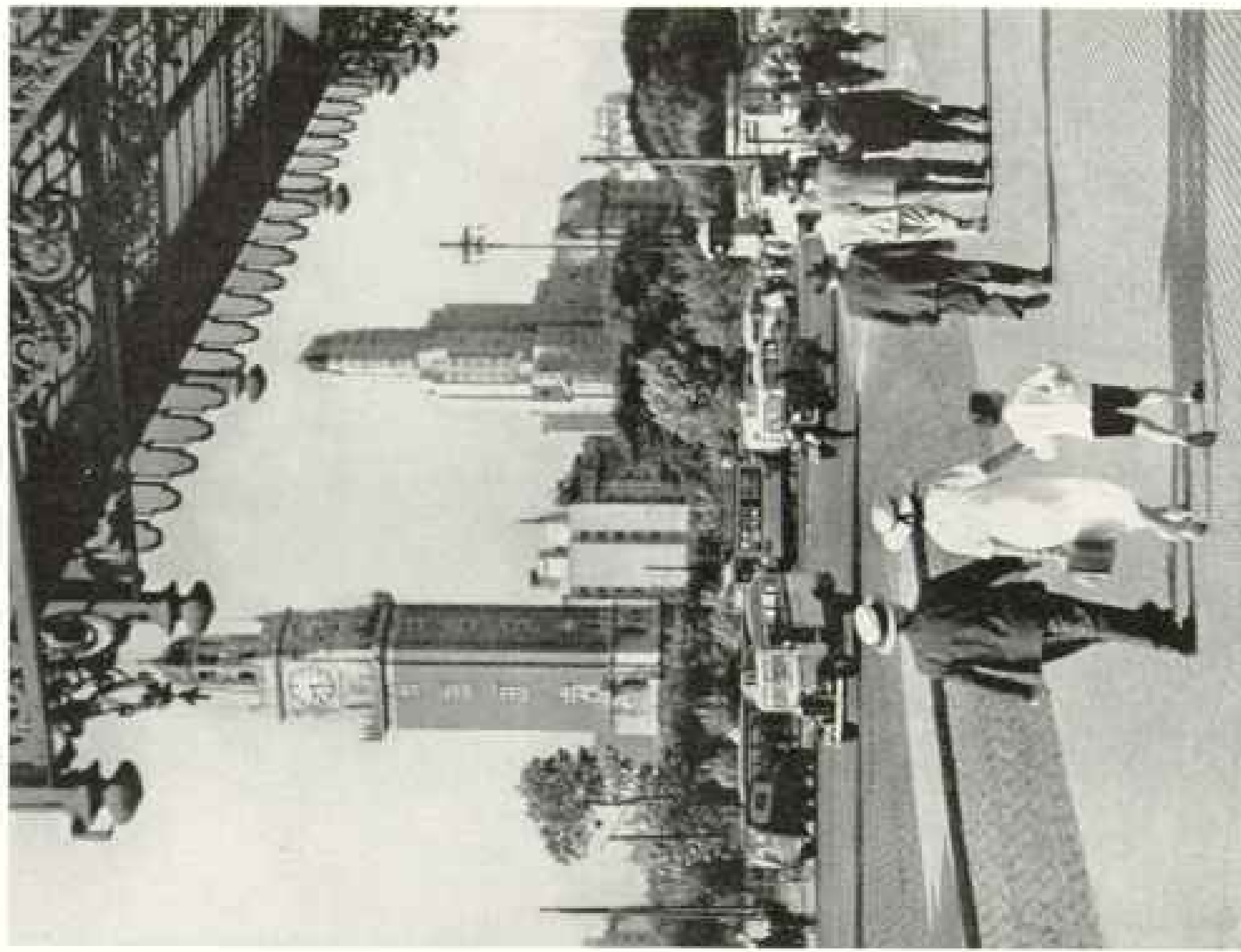
The modern summer resort, on the Atlantic Ocean 250 miles south of Argentina's capital, was begun as a real estate venture in 1874. Until then it consisted only of a few cottages. Today nearly a quarter of a million people may be found here at the height of the season, enjoying the bathing and gathering about roulette tables. Hundreds of "bathhouses" dot the beaches. So crowded is the resort at Carnival time that many celebrants from the capital use their railway sleeping cars for a hotel.



Photograph by Alford T. Palmer

STATUES SURMOUNT THE MAUSOLEUMS OF RIGOLETTA CEMETERY.

Peculiarly Argentine is this burial ground in Palermo Park, where bottles lie in theirs (page 564). They are encased in leaden shells, placed within coffins of carved wood, and these in turn repose on shelves in the stone memorials.



Photograph by Myron Owen Williams

DOON TO COMMUTERS IS THE BRITISH CLOCK TOWER

Standing in Plaza Británica opposite the Central Argentine Railway Station, the 207-foot tower was presented to Buenos Aires by British residents in 1916. The Kavanagh skyscraper apartment house rises in the background (Plate X).



Photograph by Luis Marilou

TRADITIONAL TOP-HATTED CHIMNEY SWEEPS SPEED TO WORK ON A MOTORCYCLE.

Most of the de-sooters in Buenos Aires are of German descent. Their tightly buttoned uniforms are adaptations of old German sweeps' attire. Once there were many members of the profession in Argentina's capital, but modern building has caused a rapid decline in their numbers (page 571).



Photograph by Alfred T. Palmer

"PEANUTS! PEANUTS!"

Although the roaster is concealed in an imitation locomotive to attract attention, a foreigner in Buenos Aires knows what the vendor offers for sale, even without understanding his cries (page 571). The aroma of roasting goobers is unmistakable.



Photograph by S. Sato

NEW YEAR'S EVE CELEBRANTS DON "SUMMER FORMALS" IN BUENOS AIRES

A jazz band plays out the old year for dancers at the Alvear Palace Hotel. The photograph was made especially for *THE GEOGRAPHIC* by order of the proprietor of the hotel, a long-time member of the National Geographic Society.

scrape deeper. People? You can't tell a man on the Avenida from one on the Avenue. But there are a few of the old types left and if you don't get them now you never will.

CHIMNEY SWEEPS AND PEANUT VENDERS

"First, there is the chimney sweep, wearing a high silk hat and riding a bicycle. Then there are the Basque milkman and the Basque market porter in berets.

"Although hot peanuts aren't in demand in summer, you may find a peanut vender, whose 'Mani' you know from the song. His roaster is built like a locomotive, so they call him a 'ferroviario'" (page 570).

"I saw one in the Retiro district last night," I replied. "I'll get him today."

He was not there. But ultimately Marden and I completed the series. As he

left after photographing a chimney sweep, two more sped by on a motorcycle. The bird in hand seemed less worthy than these two, so my *GEOGRAPHIC* colleague started in hot pursuit and got his men (page 570).

Picture hunting in Buenos Aires demands as much patience as ostrich hunting on the great ranches. There the old families escape city crowds and rusticate amid herds of cattle, linseed threshers, and gauchos on *criollo* horses, descendants of barbs imported by Mendoza.

As guests of Spanish friends, Marden and I rode out to visit one of these delightful retreats, to savor a barbecue and see wild ostriches outpace hard-riding herdsmen with lasso and *boleadoras* (Plate XI).

The simple house, with its row of bedrooms along a porch leading to the dining room, has hardly been changed in seventy



Photograph by Maynard Owen Williams

FOOD FOR THE HUNGRY PRESSES OF BUENOS AIRES NEWSPAPERS

Giant rolls of paper, loaded on a truck at shipside, come in from Finland, duty free. Their destination is the pressroom of *La Prensa*, one of the city's internationally known papers. Other large dailies are *La Nación*, and the tabloid, *El Mundo* (pages 573 and 576).

years. Dusty account books still reveal the transactions of a century ago. The showers are modern, but the lights beside the big mirrors are tallow candles.

Formal gardens of aromatic box overlook a lake which would be paradise for a naturalist because of the variety of birds which swarm here at nightfall.

A barbecue is something to write home about, for the ceremony gives one a sense of primitive life in the "camp." The animal, in this case a young lamb, is split open, put on a swordlike spit, and tilted toward a slow fire. After hours of distant roasting, the meat is indescribably delicious.

THE GAY NINETIES—AND TENDER STEAK

After lunch the gauchos brought down an ostrich with the *boleadoras*—whirling balls joined by cords (pages 590-1).

As we walked in the garden with our host and hostess, their joy in the trees and boxwood had a Shakespearean poetry about

it—"And this our life, exempt from public haunt."

Back in Buenos Aires, gilded youths were sipping cocktails in front of gallant frescoes of the naughty nineties with the "bicycle built for two," the cross-gartered bathing girl, and gay blades with handlebar mustaches, paintings showing the antique market place and Cabildo and in virile frescoes the stern strength and beauty of the gaucho and the Indian, the llama and the cactus. Sophisticated art, indeed, the work of these ranch dwellers whose chief delight is to walk at twilight along century-old alleys of box under tall trees, with the dogs about and a sturdy criollo horse whinnying for attention.

With the general manager of one of the large packing houses I rode down to La Plata (page 589).

After two hours of watching the many varied operations of a modern plant, we thoroughly enjoyed such a steak as few are favored to see, much less taste. "Too



Photograph by Luis Marden

CUSTOMERS BUY SOME OF HIS WARES FOR A SONG

The bird vender wheels his cargo in front of the Alvear Palace Hotel. Native cardinals, imported canaries, and Australian parakeets make up most of his stock. Comparatively few songbirds inhabit the gardens of Buenos Aires. They prefer the wild forests and marshes, away from man.

few," say the Argentine cattlemen, who pity our underfed millionaires.

Nor are they entirely blind in their prejudice. What astonishes one is not the cleanliness of the Bulgarian or Czech workers or the care of government inspectors, but the diversity of by-products in a modern packing plant.

Ranging from bone meal to gland extracts, they enable meat from distant ranches to be sold at a reasonable price. The preparation and utilization of the by-products demand large-scale handling and highly efficient methods, which in turn involve a heavy overhead.

Against that overhead, be it in Buenos Aires or Chicago, the packer must constantly fight. If production lags, the overhead does not fall in the same proportion. If more meat is sold the overhead per pound is reduced.

The solution, according to packers, is "Eat more meat," to which others, from Battle Creek to Bernard Shaw, reply "Eat less."

Such juicy steaks as I had at La Plata render an unprejudiced decision impossible. As long as I can get a thick slab of delicious tenderloin with mushrooms for 35 cents, I'm not fit to be a judge.

HOW TO LIVE 24 HOURS A DAY!

Señor José Anesi, who proudly boasts that he got his inspiration from *THE GEOGRAPHIC*, edits the *Revista Geográfica Americana*. As a long-time member of our Society, he gave me ideas for a nocturnal prowl. We had spent the early evening—from 12 to 2—watching *La Prensa's* huge presses cover paper from Finland (page 572) with news from all the world and were walking past the city's most original monument—the Song of Toil.

I had been up and about for 19 hours. So, doubtless, had he. But the thrill of the city's life by night touched us both.

"At three, you should see the newspaper market in the Avenida de Mayo. At four, the railway platforms at Retiro look like



Photograph by Alfred T. Palmer

FREIGHTERS LOAD BULGING CARGOES AT THE OLD PORT ALONG THE RIACHUELO.

Heavy draft horses still pull rumbling drays over the cobblestone quays at the southern end of Buenos Aires. Passenger steamers dock farther north (Plate V and pages 566 and 588).

a flower-blanketed funeral, a block long. At five, the gauchos are driving cattle into the stockyards at Nueva Chicago. At six, the port wakes up. Seven is busy enough, but the suburban clerks, stenographers, and business men won't come pouring in until eight or half past. After that, you won't miss anything but lunch if you sleep till four."

Buenos Aires' energy is traditional.

The early settlers did not squat beside deep water and let their city float in as ballast or cargo. There was only a shallow river on whose muddy bottom a truant lad could have walked out of sight without going over his head (page 566).

Having tamed the river to its use and dredged broad basins with 26 feet of water in them where a dugout canoe would once have grounded, Buenos Aires was able to influence shipbuilders half a world away.

Even the Suez Canal makes its dredges squeal under the tyranny of broader beams and deeper keels. Buenos Aires uses its coveted trade as a spur to marine architects everywhere. There the city stands, exporting meat and grain from the spot where Mendoza's grandees starved. Be-

hind the flash of windshields I often imagined the morions and breastplates of Mendoza's pioneers.

WINDS, NOT TIDES, AFFECT SHIPPING

Though Buenos Aires stands not so much on a river bank as on an arm of the Atlantic, the tide is negligible. What really changes the water level is the wind. Even during my visit heavy steamers canted over in the mud. At times the deep-set waterworks pumps have run dry and thirsty folk have dipped water out of the city's fountains. When a downstream wind combines with the current, the Río de la Plata looks like a well-watered course for a race to Uruguay between Pharaoh's chariots and the Israelites.

Old prints by Emeric Vidal and Ibarra show women doing laundry where big steamers now berth, and Luna Park prize fighters buffet each other where the laundresses paddled soiled clothes. Not until 1855 could passengers land on a mole which looked like an amusement pier, and men now living remember the high-wheeled carts in which travelers were carried from small boats to the shore.



Photograph by Alfred T. Palmer

LLAMA-BACK RIDES ENTHRALL YOUNGSTERS AT THE BUENOS AIRES ZOO

Some of these South American "camels" with a few of their larger brothers, the guanacos, came to the National Zoological Park in Washington recently. Dr. William Mann, director of the Park, while in Buenos Aires with a small stock of bison, Texas red wolves, eagles, and raccoons, negotiated a trade with the Argentine zoo.

I never tired of roaming the port, dodging crude-shaped bundles of smelly hides, watching the half-ton wool bales bounce, seeing golden corn being inspected by men with tubular spears like cheese testers, pondering on what world news would blacken the pages of those giant cylinders of print paper, seeing Tricolor and Swastika flags flutter side by side, or catching a sentence in Arabic where a Syrian from the Reconquista chatted with a deck hand from Aden.

HERE COME THE WORLD'S GOODS

Here came bananas, oranges, and pineapples from Brazil. There American motorcars were being dropped overboard to touch Argentine soil before import restrictions became effective.

Twilight fell as Japanese chambermaids came down to pick up bright pebbles dropped from a gravel truck and blond Teutons gazed on this great city where Germany barter for food.

The passenger liners of Italy and Germany were years a-building. Here is the

30,417-ton *Augustus*, 16 days out of Genoa, or the trim *Neptunia*, two weeks from Gibraltar.

Germany's pride is the *Cap Arcona*, 27,560 tons, 17 days from Hamburg, a fortnight from Lisbon. The French ship *Massilia* makes the 6,150 statute miles from the Tagus in a day less. Our own ships, the 18,000-ton *Argentina*, *Brazil*, and *Uruguay*, take 18 days from New York.

Our passenger service to the east coast of South America is much improved and bookings are heavy. The accommodations are luxurious, the food of the best, the service excellent. There are plans for faster ships of lighter draft to bind the Americas more closely, although we have fewer family ties than Argentina's large European population.

Many a liner on the River Plate flies the Union Jack. With 3,750,000 tons against Germany's 931,000, Britannia pretty well rules the coffee-colored waves of the River of Silver.

With only 12,760,000 inhabitants, whose per-capita income is high, Argentina is the

world's largest exporter of corn and beef, sometimes ships more wheat than Canada, and exports enough mutton to rival New Zealand.

Looking down on Argentina's lush alfalfa fields, a returning airplane passenger says, "Put a bit of salt and vinegar on it and you could eat it yourself."

From my window on the Avenida Alvear I can look down on the back gardens of Renaissance homes, gabled and turreted like castles in Touraine, some heavily decorated by imitators of Jean Goujon. Within are rooms that are seldom used, huge copper bathtubs set in hand-rubbed wood, marble Venuses hiding under broad, sweeping stairways.

But crowding in on these green gardens are modernistic apartment houses, like "dressers with their drawers pulled out," designed to hold as many people as decency and comfort allow (page 563).

Marble Venuses are replaced by bright bowls of fresh flowers, reflected in amber mirrors and black-glass tiles, and the tenants change almost as often as the flowers.

Leisurely old Buenos Aires, with its palm-filled observatories and quiet gardens, is piling up and filling in.

The most thickly populated sections of Buenos Aires are occupied by the well-to-do. Partly because of swampy terrain, and partly because of one-story construction, the working class quarter, between the Nueva Pompeya and Liniers sections, contains only one-tenth of the urban population. Behind Congress Hall the density of population is nearly ten times as great.

The Recoleta section, for all its parks and spacious old mansions, now invaded by interior decorators, dressmakers, hat and flower shops, has more inhabitants to the acre than the Boca district, once a byword for its moral, as well as its physical, odor.

City planners now fight for breathing spaces for tired mothers and playgrounds for restless children. Not monuments but men are their goal. And even the casual visitor soon realizes that its citizens, even more than its parks, are the chief charm of the Argentine capital.

A Scotsman sits in the City Council; an Englishman with an Oxford accent says "We"; an Italian drops a letter from his name to conform to Spanish spelling; a Spaniard orders a "Criollo" (native) dainty; an Irishman tells of the death from yellow fever, in 1871, of Father Anthony

D. Fahy, beloved member of the Irish community. All of them are proud *porteños*—citizens of Buenos Aires.

This cosmopolitan quality of the people gives Buenos Aires its distinction. Proud of his city, the porteño is served by many lands. His car is American, his woollens and pipe British, his watch Swiss, his camera German. He prefers American movies, Italian ravioli, French neckties, and Japanese silk shirts. In his American motorboat he has a German motor and a Dutch radio.

His defense of such cosmopolite tastes is that he is an Argentine, with the world's goods, cultures, and philosophies to choose from, and that he would be a fool to restrict his power of choice.

Not only is he served by a native press, including such world-famous sheets as *La Prensa* and *La Nación* or the highly popular tabloid *El Mundo*, but he buys many foreign journals and books. A newsstand or library table in Buenos Aires is as cosmopolitan as the harbor.

Among the city's many scattered libraries my favorite haunt was that of the Jockey Club, on whose table *THE GEOGRAPHIC* was grouped with the *Revue des Deux Mondes*, *Das Innere Reich*, *Le Vie del Mondo*, *The London Mercury*, *Present-day Nippon*, *The Saturday Evening Post*, and many another.

I dare not give the name of one of my best friends in Buenos Aires, a Kilmarnock Scotsman, lest his fellow members in the United States invade his old-fashioned high-ceilinged office in a former presidential palace and impose upon him—as I did myself.

PARK BENCHES FOR READING

After his clerk had brought in a pile of *GEOGRAPHICS* with white slips of paper marking my articles (you don't put much over on the Scots), we went places and saw things—the Jockey Club, where he got me a much-envied guest ticket and a badge for the San Isidro races; the Navy and Military clubs; the Gas tearoom, so named because it was the first in Buenos Aires to imitate Paris, then the gas-jetted "City of Light"; the tower of the City Council Building; and finally a huge tree near the Colón Theater which he saved from destruction. He had passed me free into the subway he helped build (page 587), and into many exclusive spots, but what he

BUENOS AIRES—METROPOLIS OF THE PAMPAS

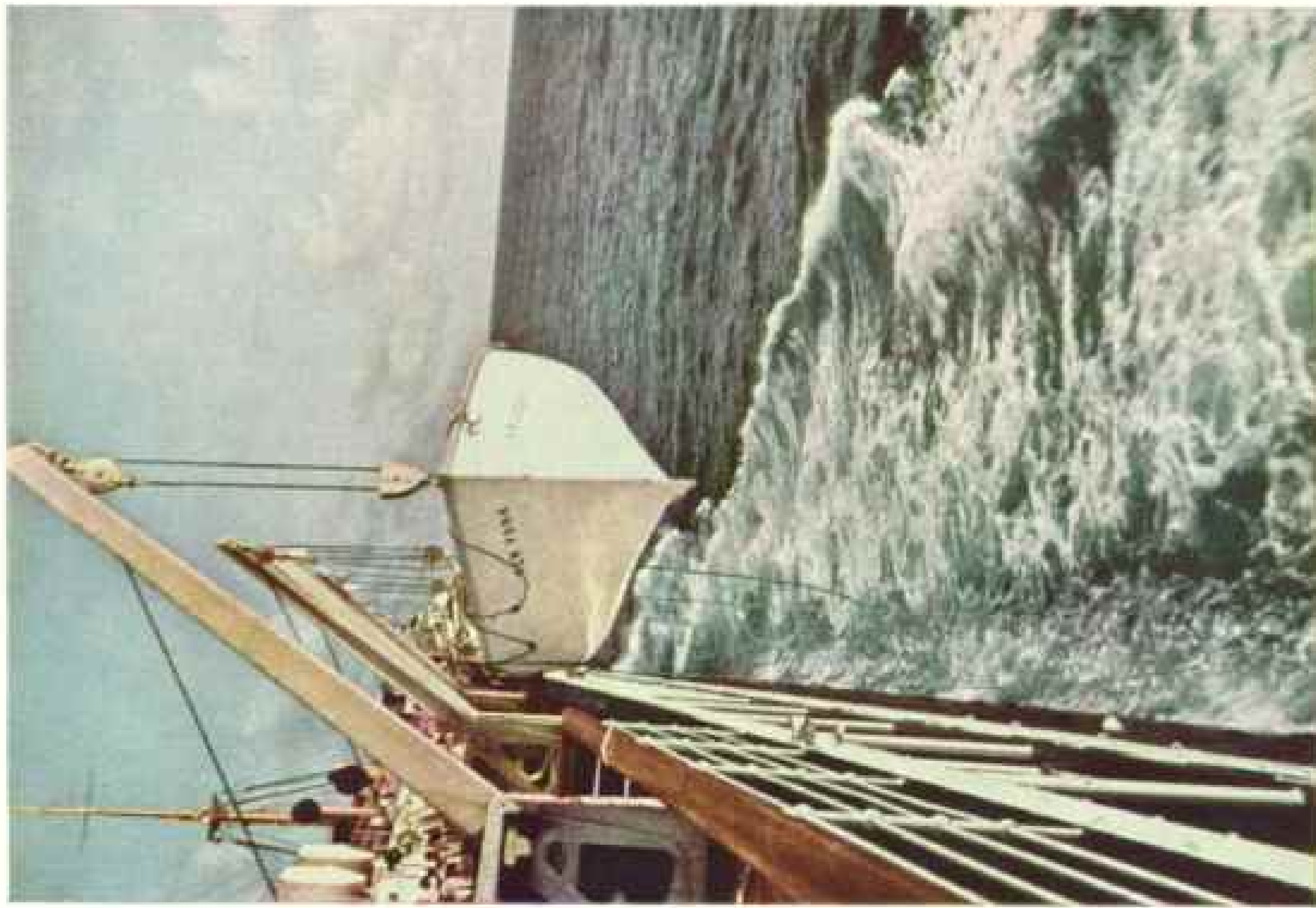


© National Geographic Society

Kodachrome by Lois Marden

IN 80 DAYS BUENOS AIRES CREATED BROAD PLAZA DEL CONGRESO

Four blocks of five- and six-story buildings were razed, a lake created, walks laid out, and trees and lawns planted, to complete a park in time for the centennial celebration, in 1910, of the Argentine Declaration of Independence. Upon the memorial to liberty falls the shadow of Congress Hall (Plate XIV), Avenida de Mayo, the capital's "Gay White Way," leads out from the eastern end of the plaza (background).



Kodachrome by Myrral Owen Williams
S.S. "URUGUAY" PLOWS THE BLUE CARIBBEAN ON HER WAY SOUTH



Kodachrome by W. Robert Moore
THE ACTION AS KING NEPTUNE, WITH A BRAZILIAN "QUEEN"



Kodachrome by Maynard Owen Williams

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BUENOS AIRES' CHICAGO-LIKE SKYLINE LOOMS ON THE HORIZON AS THE "URUGUAY" NEARS THE NORTH BASIN

The pilot boat has escorted the steamer up the channel of the broad Río de la Plata. Soaring above all other buildings in the city is the 28-story Kavanagh apartment house (Plate X). Small boats at left cluster about the Yacht Club, beyond which (extreme left) rise towers of the Customhouse.



© National Geographic Society

Rephotograph by Luis Marshall

WITHOUT WARNING, SUDDEN WINDS MAY DRIVE BREAKERS TO THE TOP OF THE STEPS, SEND BATHERS SCURRYING

Lifeguards keep Buenos Aires swimmers at Municipal Beach reasonably close to the shore because of this danger. So shallow is the water that venture-some spirits, if they were permitted, could wade out almost to the dredges and tugs in the background, some four miles away. Tides are not strong this far up the Río de la Plata. On pleasant days beach crowds exceed 15,000. Admission costs only two and a half cents.

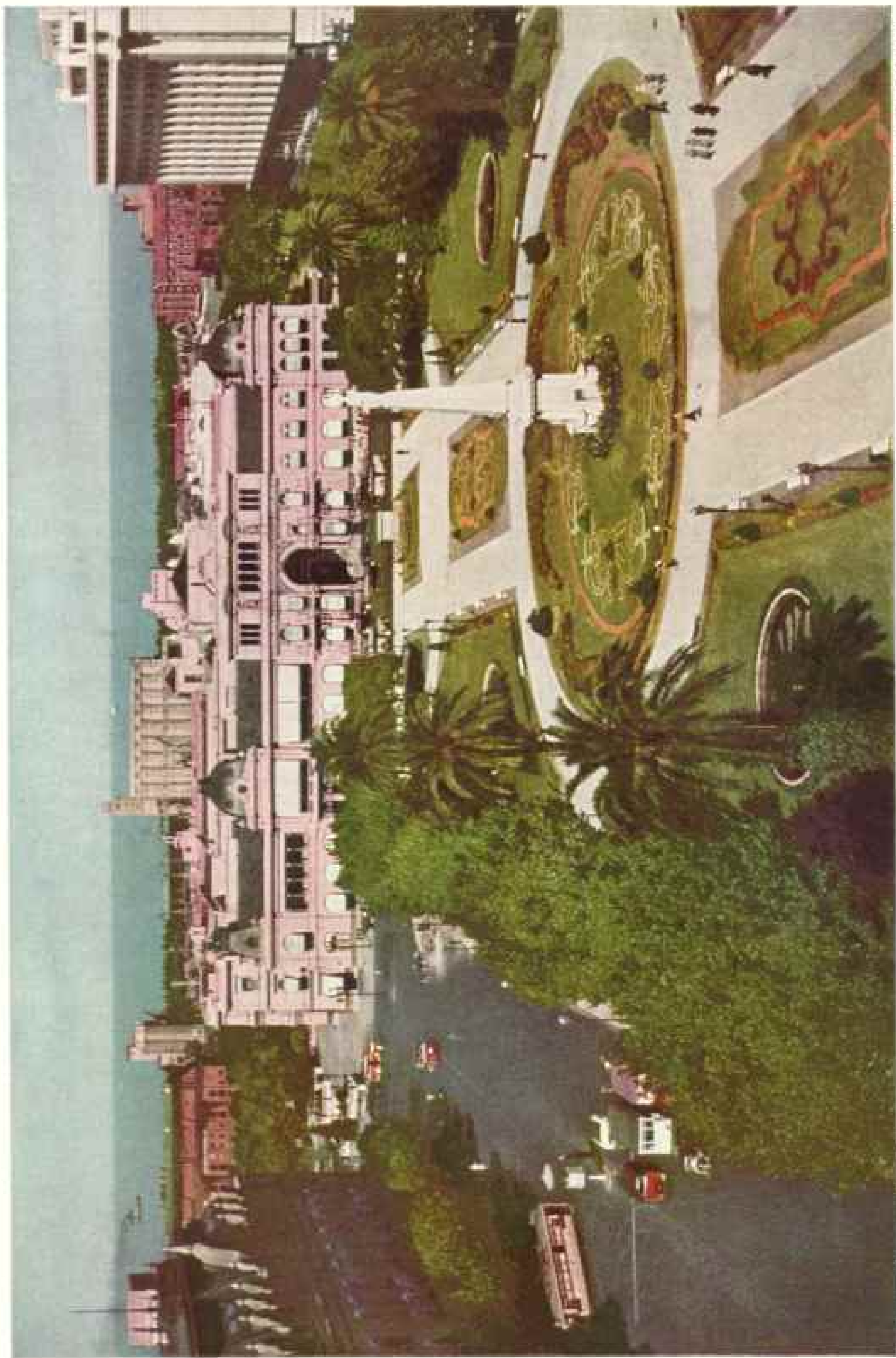


Reproduction by Luis Marden

ON THE BANKS OF RIACHUELO RISES ARGENTINA'S GREATEST INDUSTRIAL CENTER

The stream separates Buenos Aires (right) from the rapidly growing manufacturing city of Avellaneda to the south. The photograph was made from the top of a swing bridge overlooking the old original port. In the last 80 years Buenos Aires has extended its harbor far north of this point, creating out of mud flats one of the world's largest dock systems.

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© National Geographic Society

FROM PLAZA DE MAYO, HEART OF BUENOS AIRES, CITY AND SUBURBS RADIATE IN A SEMICIRCLE.

In the center of the park stands the "Pirámide de Mayo," commemorating Argentine independence. The Presidential Palace, facing the memorial, is known as "La Casa Rosada" because it is painted rose color. Beyond the building huge grain elevators rise along the Río de la Plata docks. At right stands the new Ministry of Finance building and, at left, the Bank of the Nation.

Kodachrome by Louis Monden



© National Geographic Society

Kodachrome by Maynard Owen Williams

ESKIMO FLE IS A "SMAK" IN BUENOS AIRES

Uniformed salesmen with little red carts are everywhere. Frozen bars, sold by the millions annually, are two and a half cents each. Cardboard cups of ice cream are five cents.



Kodachrome by Luis Maydon

HISTORIC UNIFORMS GARRI PALACE GUARDS

They wear the dress of the Mounted Grenadiers, favorite troops of José de San Martín, South American hero who helped Argentina, Chile, and Peru gain independence (Plate VIII).



THROUGH SILVER TUBES, NOT STRAWS, THEY SIP THEIR HERB TEA.

The hot, aromatic mate is not usually sold in restaurants, but is brewed in the home or on picnics. The gourd container also is called a "mate" (Plate XI).



© National Geographic Society

Kodachromes by Luis Marden

HAND-TOOLED LEATHER ENCASES HISTORIC DEEDS OF TYRANT AND HERO

Constant warfare marked the dictatorship of Juan Manuel de Rosas from 1835 to 1852. To José de San Martín, co-hero with Simón Bolívar, Argentina gives principal credit for gaining the Nation's freedom from Spain.

seemed most proud of was that widespread tree in the heart of Buenos Aires.

Hidden away in Lezama Park, which a beloved philanthropist bequeathed to the city where he won his wealth, another tree, its outthrust roots polished by many youthful feet, furnishes shade for one of the most charming of Buenos Aires institutions—a tiny branch library for park-loving readers.

Around this kiosk, under this great tree, the benches are reserved for patrons of this free library. "Silence" is the unwritten rule, and he who rests must read.

There are 1,527 National Geographic Society members in Buenos Aires, and scanning their names gives one a graphic idea of the many lands from which our fellow members, or their ancestors, came to the Argentine.

The eclectic quality of Argentine thought is also reflected in its funny papers. "Humorismo Español, Italiano, Francés, Alemán, Inglés, y Yankee," each has its own page showing the comparative anatomy of international wit.

An English tearoom; Viennese coffee shop; a German saloon; Chinese, Russian, and Italian restaurants; a Parisian cabaret; Spanish and Syrian grocery stores; a Swiss pharmacy; an Indian rug store; a Turkish silk store; a Japanese dry-cleaning shop; a Polish newspaper office; Jewish theater, and Greek Orthodox church—all normal ventures in Argentine city life.

"POPEYE" AND "BETTY BOOP" POPULAR

Not only the English-language *Herald* and *Standard* but also the Argentine newspapers carry comic strips. "Mutt and Jeff," "Henry," and "Barney Google" are as well known on Rivadavia as in Times Square. Soglow's pompous "Little King" amuses Italian-Argentines. Buenos Aires movie fans never tire of Popeye's perennial proof of the virtues of spinach or Betty Boop's ball-bearing eyes and hips. Donald Duck and Mickey Mouse are uncrowned kings of the River of Silver.

German radio dominates the short-wave field, but the average Argentinian, as does the average American, listens to local programs, supported by advertising. "Commercials" are restricted to 100 words every three minutes and politics are completely barred. More than a million radio sets comb the Argentine ether, principally for music rather than thought.

In 1829, Samuel Haigh wrote: "The gentlemen of Buenos Ayres dress as well as those of the same class either in London or Paris," a statement which still holds.

The key to the porteño's character seems to be that he thinks of himself as a gentleman. His cordiality and resentment at being forced or hurried; his frankness and sensitiveness spring from the fact that he considers himself a man of honor, jealous of his good name, and would like to have you share that opinion. Since the international character of his circle of friends makes for tact, lack of it is the more noticeable.

Haigh also looked on the señorita and found her good, with "a very small foot and a neatly turned ankle."

Seeing a young man alone may still be difficult and dueña days still leave their mark, but the rake of the señorita's hat suggests independence, awareness, and daring.

TANGO THE "NATIONAL DANCE"

Despite the innovations sought by society youths, the tango is the most popular dance in Buenos Aires. And the place to see it is on the Costanera Drive, a mile-long concrete dance floor served by municipal radio through a series of loudspeakers. On hot nights the wide promenade is crowded. Motorcars, their war cries hushed, creep along in Indian file, painted clowns crack wordy jokes, and Coney Island thrill rides squeeze squeals of pleasure from their patrons.

Here are thousands of happy folk enjoying the promenade or a balustrade to lean on, while the rising moon does give a silver touch to the brown river. But the main event is the tango and the main tango "La Morocha" or "La Cumparsita."

After 22 years the world-famous work of Gerardo Matos Rodríguez brings "Ahs" from the crowd. Marden, a keen tango taster, sought out the composer of what has been facetiously called the "National Anthem of Argentina."

As a student in Montevideo, Señor Matos Rodríguez was a member of a jolly group who called themselves "La Cumparsita," the Mummies. He sold the composition outright and his only royalties now come from words he wrote to replace the original ones.

In the southern flats near the Stygian Riachuelo there formerly lived tough citi-



Photograph by Luis Marden

PARKING IS FREE IN THE UNDERGROUND GARAGES OF AVENIDA 9 DE JULIO

When the Buenos Aires suburban resident drives in to his office in the morning, in this section of the city, he merely passes below the street level and backs his car into one of the stalls between the columns, out of the driving lane. This subterranean parking lot, one of two along the avenue, has a capacity of 600 automobiles (page 587).

zens who, from their swampy surroundings, got the dread name of "Frogs" (pages 565 and 588). This unsavory region is still pointed out as the birthplace of the tango, a dance whose style was fashioned by gaucho boots.

With such an ancestry the tango was ignored by the polite society of Buenos Aires, now devoted to the thigh-slapping of the Lambeth Walk and the chorus-girl strides of "You Can't Marry Ten Pretty Girls." But it emigrated to Paris, stalked across shiny floors there, and came home to Buenos Aires, changed but improved, like a sweet girl graduate, by its sojourn in France.

GAUCHOS—IN THE MOVIES

Gauchos, with their wide trousers, silver-studded belt, and tinkling spurs, are about as common on the Diagonal Norte as Indians on Broadway (page 590). The height of naïveté would be to mention "gaucho" to the man on Corrientes as he takes his señora to see "The Cowboy and the Lady" at an air-conditioned theater.

But the gaucho has been a challenging

figure since the days when Darwin described his splendid horsemanship.*

To know the heart and feelings of this figure of the Pampa, variously described as the son of a white father and an Indian mother, or merely as a country bumpkin, one must read the epic poem *Martin Fierro* by José Hernández.

When Luis Marden dropped in by air from São Paulo, he demanded gauchos. Luckily I could fill the order, for on the Avenida de Mayo, where Argentines from the provinces have their hotels, sip their coffee, and savor urban life, I had spotted a gaucho troupe in a humble cafe.

The next day we matched *bandoneón* (which somewhat resembles a concertina) and soft boots with camera bellows and tripod leg before an admiring throng.

To help out local color, my colleague of the lens sought brightly decorated gourds (matés) and silver bombillas, or tubes, to show how yerba maté is drunk.

This delicious and stimulating brew from

* See "Life on the Argentine Pampa," by Frederick Simpich, NATIONAL GEOGRAPHIC MAGAZINE, October, 1923.



Photograph by Luis Marden

"CHADOPYF," BUENOS AIRES CALLS ITS NEWEST SUBWAY

The peculiar name comes from the initials of the managing corporation, just as New York City knows two of its subways by the names of "IRT" and "BMT." Scenes painted over entrances and exits are lighted in soft tones of harmonizing colors. "Salida" means "exit." "Plaza Italia," where the Zoo is located, is the destination of the train.

the leaves of the *Ilex paraguayensis* has the reputation of providing such vitamins as are lacking even in the juiciest steaks, but maté is not generally obtainable in the city's cafés.

Herb tea, compressed into burlap cylinders which look like gun charges for heavy artillery, commands a wide sale and the visitor who escapes without taking a silver "straw" and a gourd bearing the clasped hands and Phrygian liberty cap of the Argentine coat-of-arms is a rarity. Maté drinking, as virtuous as deep breathing, is usually as secret as a vice. But motorcars, facilitating the transport of maté equipment, enable one to see it at picnics.

HERE TRAFFIC IS A PROBLEM, TOO

Of the 265,000 motorcars in the Argentine Republic, more than 90 per cent were made in the United States, but Argentina produces more than half of its own oil.

Gasoline is cheap, about 18 cents a gallon, so when the Argentine goes for a spin he doesn't count the cylinders or spare the gas. His tires bear the familiar "Industria Argentina" label which is found on many

products from textiles to perfume, beer, and plastics.

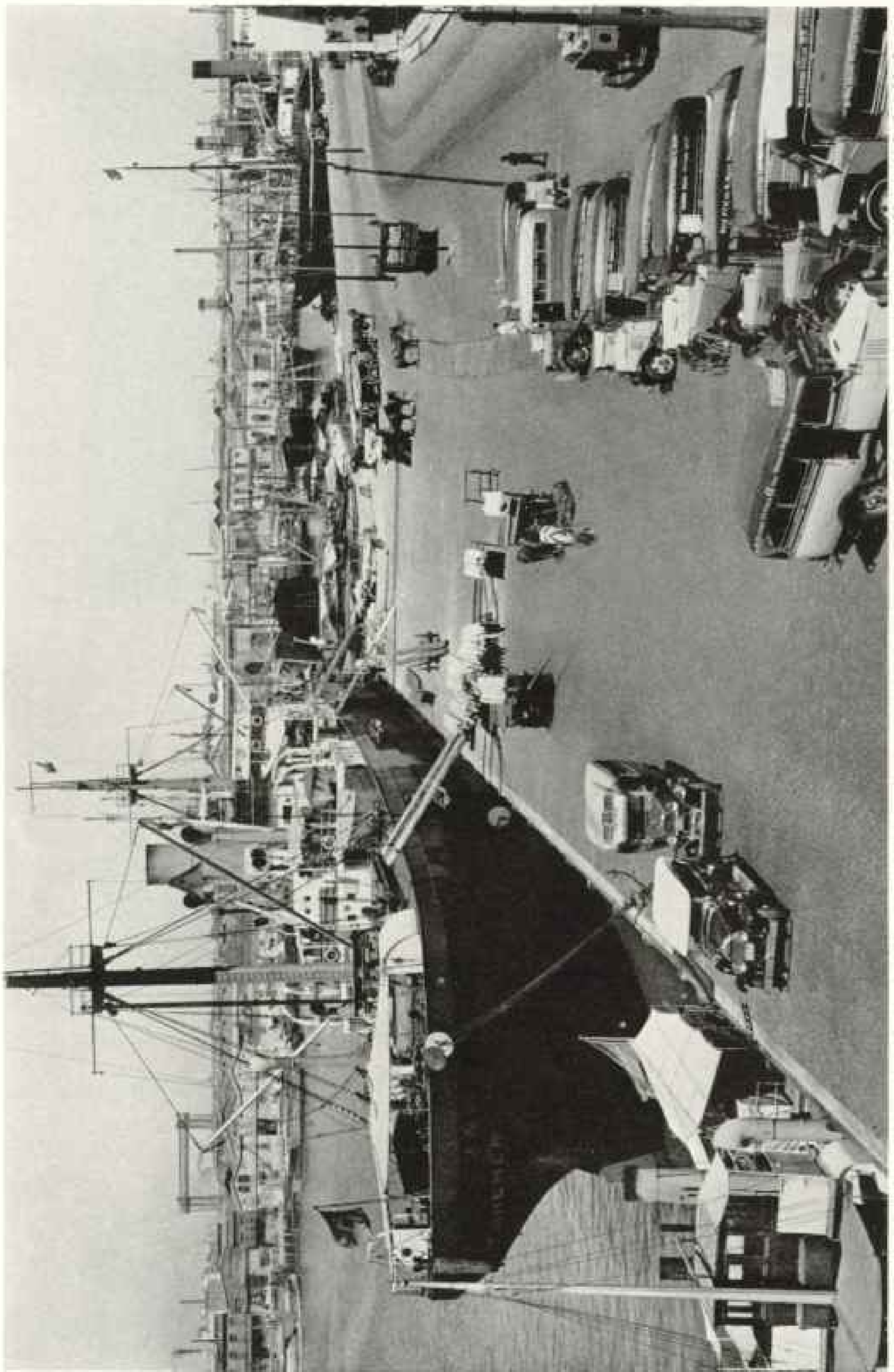
Traffic in Buenos Aires is hectic. Whoever gets his fender in first has the right of way. The local jitneys, which carry one-fourth of all traffic, dash about with their hoods raised like the wings of a setting hen.

Buenos Aires is making a serious attempt to provide parking places without occupying space on or above the street. Theaters and apartment houses are encouraged to provide basement parking despite the confusion of driving across the sidewalk at rush hours.

Under the Avenida 9 de Julio, which its planner points out to be not only the widest but the most necessary of avenues, there are already underground parking spaces, amply accessible over wide, easy ramps, for a thousand cars (page 586).

As the avenue is extended, this capacity may be trebled and opera- and theater-goers, leaving the Colón and Cervantes Theaters, will be whisked home before fashion pirates can copy their clothes.

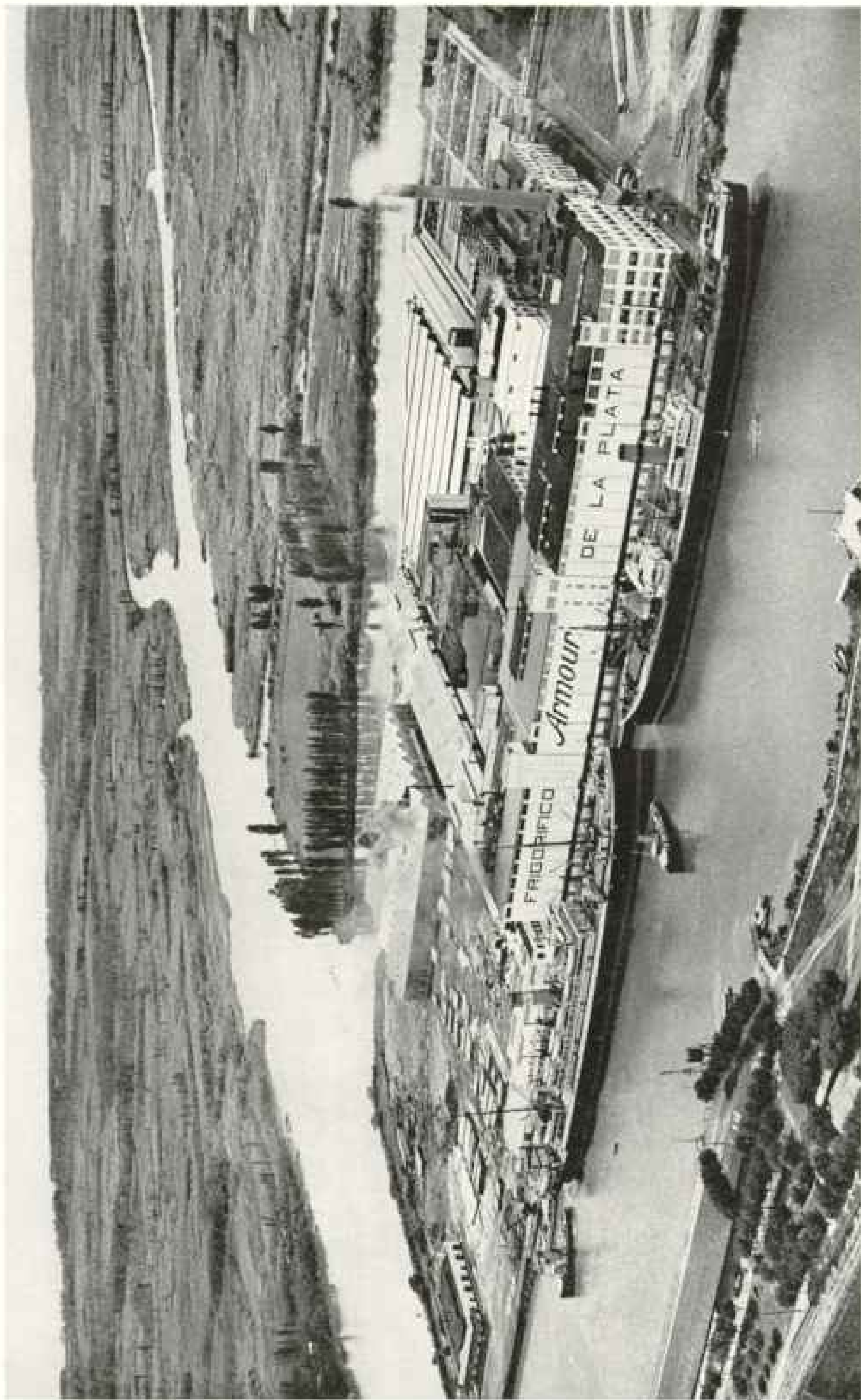
I drove north along the new Costanera Drive, past powerful light plants whose feet



Photograph by Louis Marden

NEAR BUSTLING DOCKS OF THE BOCA, THE TANGO WAS BORN

A few decades ago, before industry invaded these southern flats along the Riachuelo, the famous Argentine dance originated in dance halls here. Polite society in Buenos Aires ignored the tango, but it went to Paris, then came back to its native city, and today is the most popular dance in the capital (page 585).



Photograph by Arthur Hornet

FROM AN ARMOUR PACKING PLANT AT LA PLATA, JUICY ARGENTINE BEEFSTEAKS GO TO SEA

United States and British capital are heavily invested in the Nation's meat industry. This packing plant, 30 miles from Buenos Aires, is one of a dozen which handles the bulk of stock raised on the broad pampas. Agricultural surveys put the number of cattle in Argentina at 35,000,000 head. Most popular breeds are Shorthorn, Hereford, and Aberdeen Angus (pages 572-3).



Photograph by Luis Marden

WHIRLING HIS BOLEADORAS, A MODERN "GAUCHO" CHARGES DOWN
ON A FLEET OSTRICH

When the cowboy lets fly, his aim must be perfect to trip his quarry (Plate XI). He is roping the bird for sport (page 591). The South American ostrich, or rhea, is not as valuable as its Arabian or African relatives and its inferior plumes usually adorn only feather dusters.

are set in coal ports, toward the splendid waterworks.

An early writer says, "The waters of the River Plate, when drunk by Europeans, are in many cases fatal." Ox carts went far out into the stream and brought back water which cost a cent a gallon, delivered to the door. Today, thanks to its efficient filtration plant, the purity of Buenos Aires water is admitted even by the wine waiters in the best hotels.

The concrete "boardwalk" is being pushed ahead and the day may not be far

distant when promenaders, cyclists, roller skaters, and tango teams can disport themselves along the river front all the way from La Plata to the Paraná Delta.

One of the anomalies of Buenos Aires is the Barranca overlooking the river, a section of the bluff which parallels the Paraná and the Rio de la Plata for hundreds of miles.

In a land so flat that even the water finds difficulty in running downhill, Buenos Aires has several streets so steep that only a powerful automobile can climb them in high gear and streetcars slam on their brakes as they go over the crest.

High buildings mask this steep bank, but Lezama Park owes much of its beauty to its high position above the Riachuelo. The

green between the San Martin and Canning monuments has a noble slope to it; the hillside park at Belgrano is the pride of that fashionable section. At Olivos and San Isidro, once reached by chairs or coaches, the edge of this noble undulation in an otherwise featureless landscape was utilized as the site for a long row of country houses before whose doors wide lawns with formal gardens, shady branches, and crouching Venuses stretched down toward weedy pools at the river's edge.

Still farther upstream, the waters of the



Photograph by Luis Marden

TIGHT AS A SAILOR'S KNOT, THE BOLEADORAS TIE UP AN OSTRICH

When the whirling balls (page 590), wrapped the rope around the legs of the bird, its swift race came to an abrupt halt in a cloud of dust. On the ranch where the photographs of chase and capture were made, the birds are protected by the owner, an Argentine painter. They repay his kindness by destroying myriad locusts.

Paraná de las Palmas are joined to those of the Luján, the Tigre, and the Río de la Plata by a network of streams and canals on which trim motorboats carry the rich to their summer homes and well-filled launches chug humbler folk to a score of al fresco restaurants and playgrounds.

VENICE OF THE SOUTHERN CROSS

Rowing clubs are here, with canoes whose occupants swing a rudder with their feet to compensate for the thrust of their paddles. Slender shells skeeter-bug along and heavy barges of lumber or fruit proceed to market.

Fruit and vegetables in quantity come from the Delta orchards and gardens. January and March are the busy months, with lemons, plums, peaches, pears, and quinces the major items.

There is a plan on foot to colonize a portion of the Delta with farmers from the Netherlands, such workers as tamed Kala-

mazoo's black muck to celery growing.

It might not be necessary to wait for the Netherlanders, for in Buenos Aires there are many who like nothing better than to feel black muck squdging up between their bare toes:

They are the ones who go "camping," a disorderly and unbelievably enjoyable procedure which consists of bogging down a child-draped motorcar in mud, decorating its level surfaces with the more common types of food, stretching a sway-backed canvas from tree to tree, and leading a backwoods life on the urban threshold.

One of my favorite luncheon spots is the Zoo. During the noon hour the gates are closed, but anyone already inside is privileged to stay for lunch.

In the midday quiet the pelicans cease scraping the pool walls with side-turned beaks, give one great yawn, and pillow their huge pouches on soft breasts.

The capybaras, with the bodies of hogs and the heads of guinea pigs, loll in the dust and grunt. Storks, standing on one leg, fix the visitor with a one-eyed stare.

The zebras seek the shade; the hippos submerge; a jealous llama blows his nose at a rutting rival; the flamingos rest; heavy-bodied Patagonian hares stretch out their delicate legs on the cool grass; the ostriches cease their begging.

Jumbo and his mate withdraw into their Hindu temple, and a solitary penguin waddles past, exuding dignity despite his comical gait. Swan and goose, parrot and condor, tiger, bear, and lion cease their posing and welcome this hour of peace.

BUENOS AIRES, LIKE WASHINGTON, D. C.,
IS A CITY OF MANY TREES

Nor should it be forgotten that none of the city's trees is native to this soil. All were planted here. Buenos Aires thinks nothing of tossing full-grown trees about and verdant plazas follow obsolete or encumbering buildings so fast that the dust of demolition just misses the verdure which follows.

In 1936 nearly 10 million square yards of parks, plazas, and playgrounds were opened, an area nearly half as extensive as that of the city's paved streets.

In four years 88,000 trees were planted—enough to shade both sidewalks for 80 miles. Sometimes a change of parties wipes out trees. The monument to Bernardino Rivadavia, first President of the Republic, at the Plaza Once de Septiembre, rises from a bare gravel plot, once a rose arbor.

Across the Avenida Las Heras from the Zoo are the Botanic Gardens, which Lord Bryce found of the "highest interest."

More native in appeal are the show grounds of the Argentine Rural Society, which for more than threescore years and ten has encouraged and rewarded improvements in cattle, sheep, pigs, and poultry.

The Palermo Livestock Show in the August chill is as much a society event as

the Tigre Regatta, the San Isidro races, a José Iturbi concert, or a fashion show by mannequins from New York. The leading Argentine families are deeply rooted in the soil and a winning race horse carries no more social prestige than a prize Hereford, Aberdeen Angus, or Shorthorn bull.

In summer the showgrounds take on a side-show aspect, but in the big theater the outdoor revue surpasses its mid-city rivals.

Unless you are a cattle-breeder or one of his adoring satellites, it is easy to forego the fat stock parade for a streamlined ballet or a comedy in the Walt Disney manner.

Spanish songs are accented by clicking castanets; the resonant male voice of Hugo del Carril has a tonal background of guitars; criollo folk songs (*vidalitas, tristex, zambas*) are supported by the Kubik Chorus, a favorite with radio fans.

A prize bull would have to have bells on his ankles and a solid gold ring in his nose to compete with a show like that. Yet the Argentinos know that a side show is a side show, but a stock show, with animals selling at \$10,000 each, the real hope of the Republic.

SUMMER OPERA AND SYMPHONIES

Even better ballets are staged in Palermo Park by the staff of the Colón Theater. Nor is the summer visitor deprived of symphonies and opera—if he gets there in time. Twelve cents a seat. First come, first row.

Seven thousand attractive, attentive people listen to *Carmen* or the *Barber of Seville* or watch *Les Sylphides* or the *Prince Igor* dances.

The orchestra, singing, and dancing are excellent, the air delightful, and behind the bright scenery and softly lighted tree tops arch the starry heavens, with Orion's belt—the gaucho's *boleadoras*—on the left and the Southern Cross on the right.

It would be rather hard *not* to enjoy such a midsummer night's dream in the January June of Buenos Aires.

YOUR SOCIETY'S RECENT MAPS

Members of the National Geographic Society are reminded that three recent maps received with their copies of the NATIONAL GEOGRAPHIC MAGAZINE and the indices to these maps afford a comprehensive chart and gazetteer of all theaters of the war on land and sea. These maps are Europe and the Mediterranean, April, 1938; Atlantic Ocean (no index), July, 1939, and Central Europe and the Mediterranean, October, 1939. Members wishing additional copies of the maps and indices may obtain them by writing the National Geographic Society, Washington, D. C. Price of each map, in United States and Possessions, 50¢ on paper (unfolded); 75¢ mounted on linen; Index, to Europe and to Central Europe, 25¢ each. Outside the United States and Possessions, 75¢ on paper; \$1 on linen; Index, 50¢. Postage prepaid. A complete list of The Society's ten-color wall maps, including The World, Asia, Africa, Pacific Ocean, and South America, will be sent upon request.

BUENOS AIRES—METROPOLIS OF THE PAMPAS

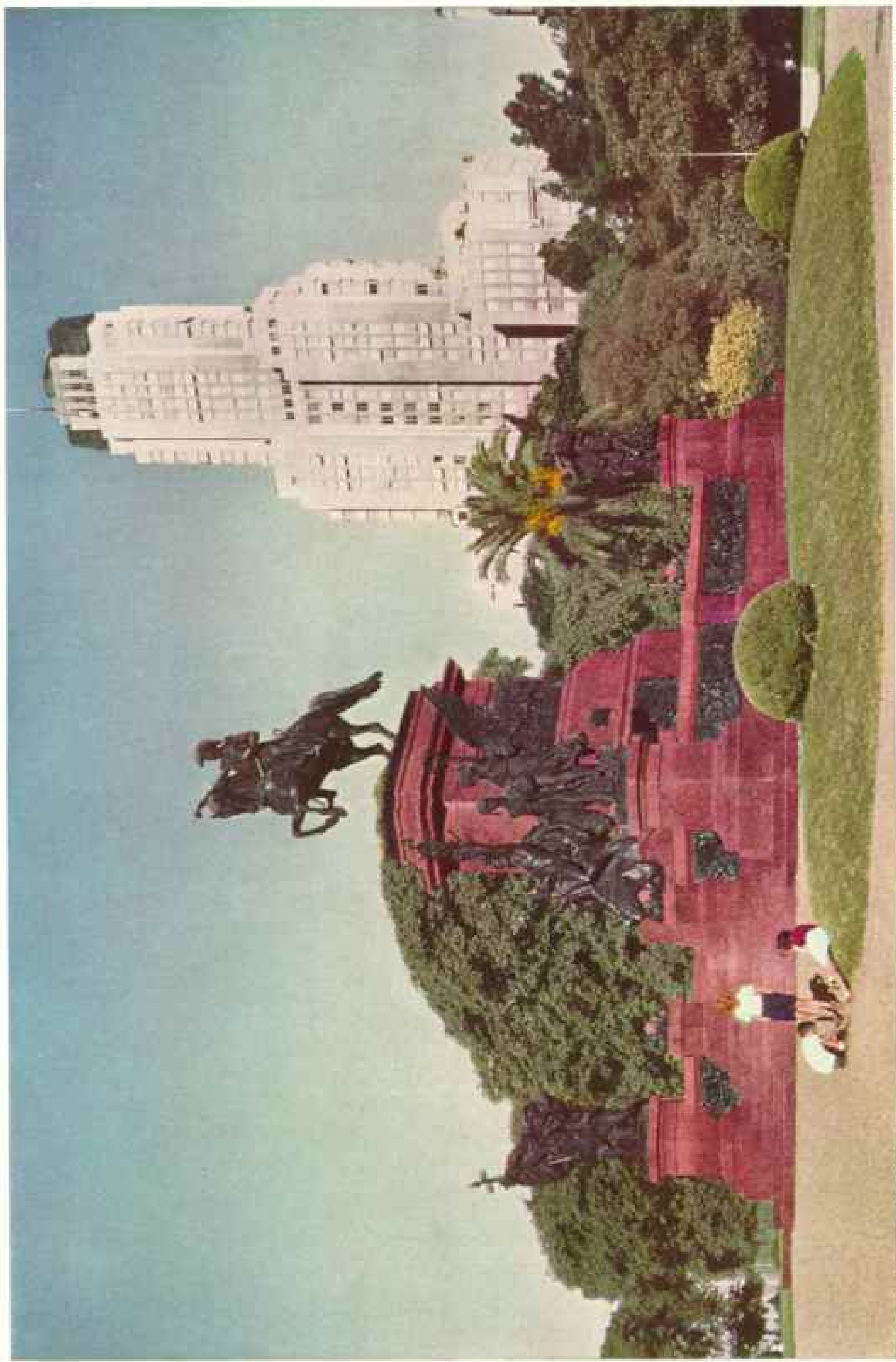


© National Geographic Society

Kodachrome by Maynard Owen Williams

DANCING GIRLS REST NEAR AN ARCADE OF LIVING PLANTS IN PALERMO PARK

They have slipped away from the floor of an Avenida de Mayo restaurant to relax in this huge preserve of more than 90,000 acres, only twenty minutes from the heart of Buenos Aires (Plate XIII). Palm groves, rose bowers, and miniature lakes dot the vast stretch, officially known as Third of February Park to mark the day of the defeat, in 1852, of the tyrant Rosas (Plate VIII).

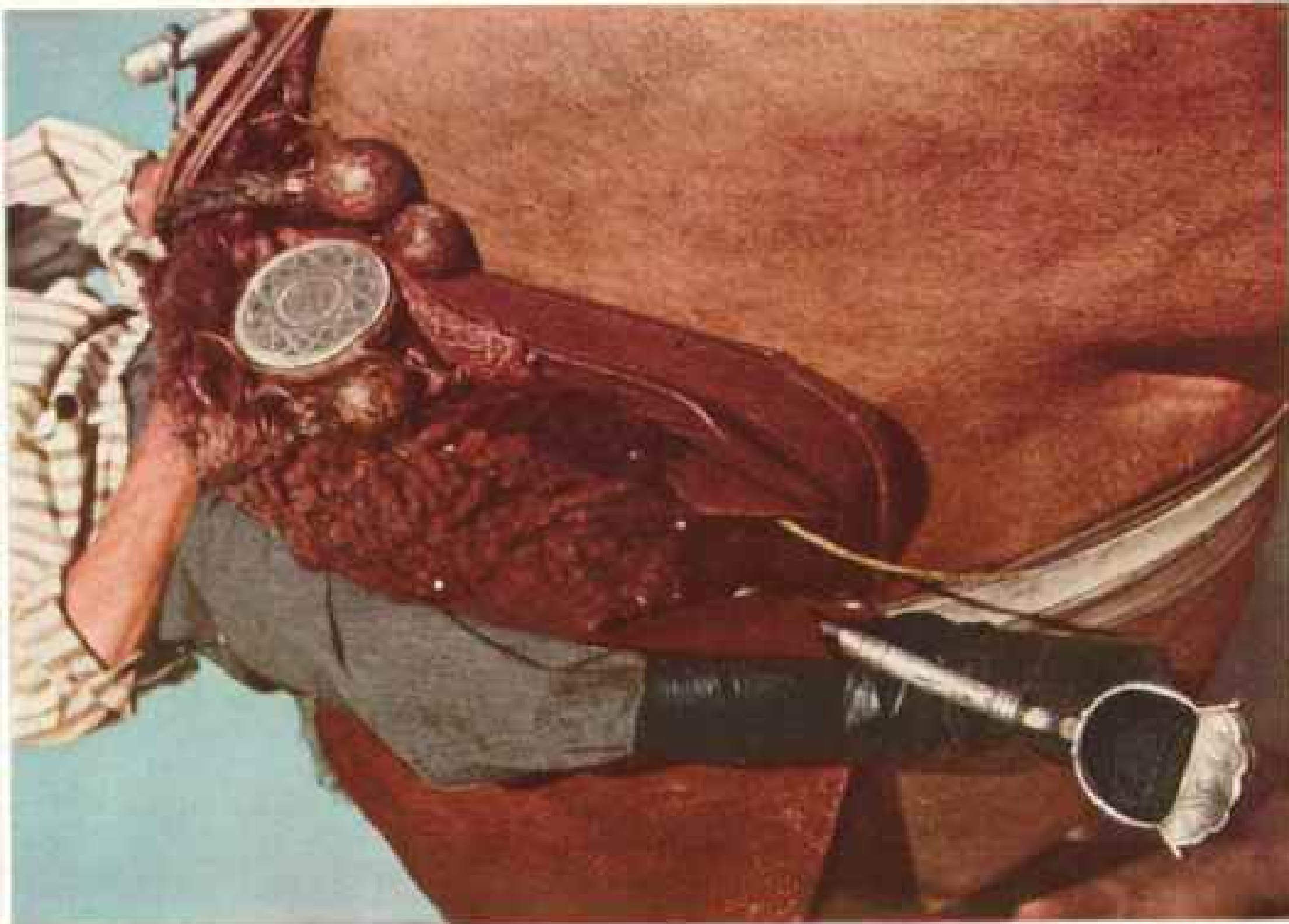


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TALLEST SKYSCRAPER ON THE SOUTH AMERICAN CONTINENT IS THE KAVANAGH BUILDING.

Until its 28 stories pierced the Buenos Aires skyline (Plate 11), the altitude record was held by the Palacio Salvo, across the river in Montevideo. In the Plaza San Martín (foreground) stands a monument to General José de San Martín (Plates VII and VIII).

Kodachrome by Louis Marden



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NARROW GAUCHO: STICKUPS ADMIT TOES ONLY

In place of a lasso, he carries the *boladoras*, a rope with three lead balls at the end. When it is hurled at a steer, the balls whirl out, wrap around the leg of the animal, and throw it.



—Kochchroma by Luis Maralen

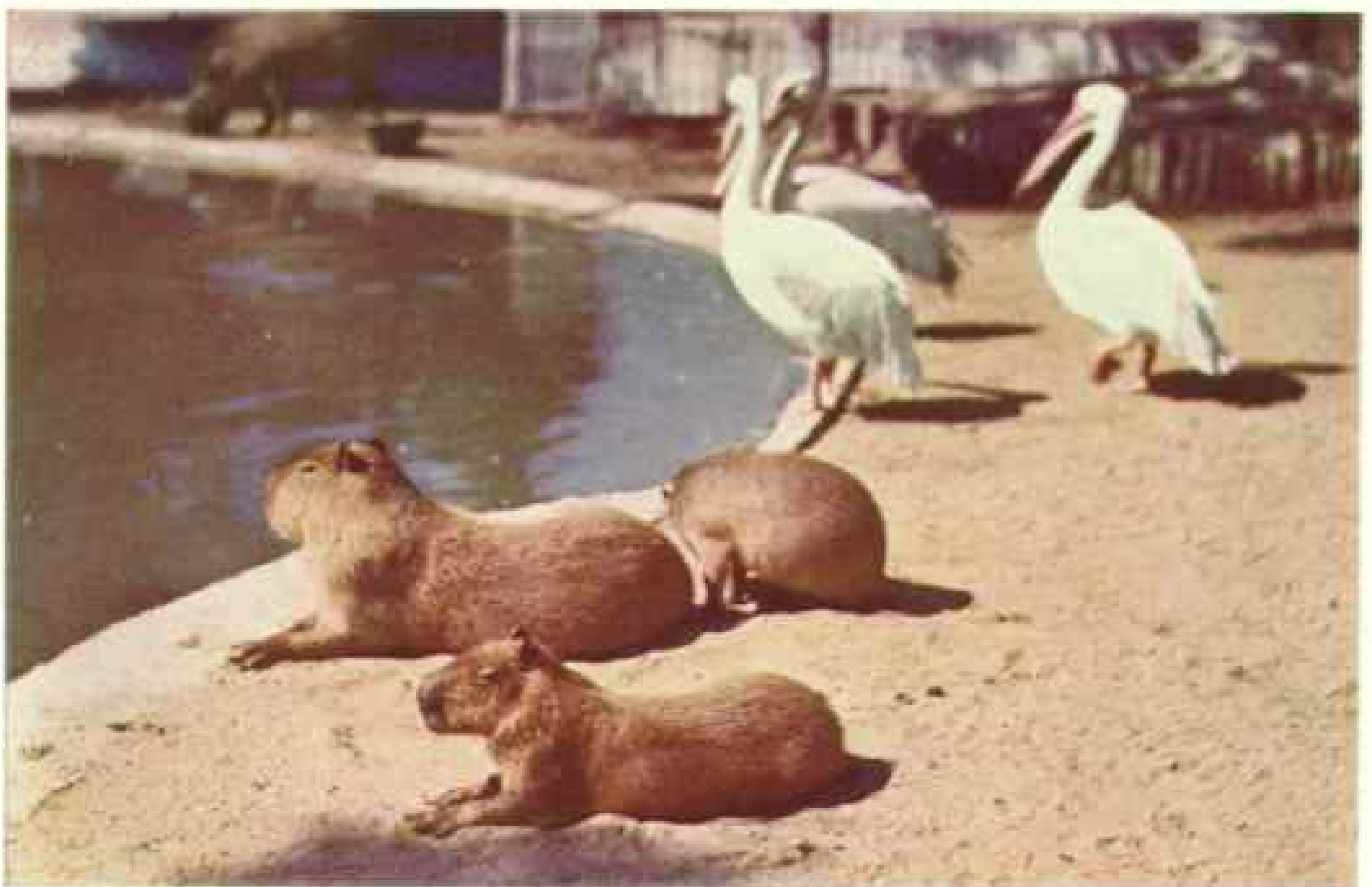
A SILVER COAT OF ARMS DECORATES HER TEA GOULD

The tube, also of silver, comes apart in the middle for convenience in packing. Visitors to Buenos Aires usually bring a mate container home with them as a typical South American souvenir.



BIRDS OF DIFFERENT FEATHER SWIM TOGETHER IN A BUENOS AIRES ZOO POND

Black-necked swan, at left; rosy-billed ducks between the humbler white varieties at right, and the coot in the foreground are residents of Argentina and adjacent lands. The mute swan, right rear, is a European bird, and the paradise duck, left foreground, comes from New Zealand.



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Kodachromes by Maynard Owen Williams

CAPYBARAS, EXPERT SWIMMERS AND DIVERS, IGNORE GOSSIPY PELICANS

These largest rodents, living in harmony with feathered friends at the Buenos Aires zoo, have partially webbed feet. Water plants and bark are their favorite foods.

BUENOS AIRES—METROPOLIS OF THE PAMPAS



IN THE ENTRANCE TO PALERMO PARK STANDS A MASSIVE SPANISH MEMORIAL.

The monument was presented to Argentina by Spanish residents of the Republic to commemorate the first centenary of the Revolution of May, 1810. Not far from here, beside a lake, a statue of George Washington has been erected by United States citizens living in Buenos Aires.



© National Geographic Society

Kodachrome by Lois Marden

AT A SHARP CORNER THE MIRROR SHOWS MOTORISTS A WAGON IS COMING

Similar aids to driving have been erected on some of the large boulevards. The beret-topped citizen posts a letter in a British-type mailbox, near which stands a French bakery wagon.



© National Geographic Society

ARGENTINA'S LAWMAKERS LOOK OUT UPON A TREE-PLANKED PLAZA FROM THEIR CHAMBERS IN CONGRESS HALL.

A copy of the statue of Rodin's "Thinker" stands in the foreground. Beneath the rows of spreading branches in Plaza del Congreso, shady park benches are favorite resting places for children and old-folks all day long (Plate 4).

Kodachrome by Latis Maerten



© National Geographic Society

PAMPAS ARTISTRY ADORN'S A BASQUE MILKMAN'S HORSE

Bridle decorations are from designs handed down by the plainness of an earlier generation. Beret-topped immigrants from the Pyrenees form a large segment of Buenos Aires' population. Many Argentines are of Spanish or Italian descent.

Kochharisms by Ludo Marden



Kochharisms by Maynard Owen Williams

GAUCHO TRADITION SURVIVES ON THE STAGE

The girl is a member of a singing and dancing troupe in Buenos Aires. These performers bring to mind old-time carter-cattle punchers, just as cowboy and Indian shows in New York revive memories of North America's Wild West.



Kodachrome by Luis Marden

SMALL FILLING STATIONS FIT INTO A GENERAL PARK AND BOULEVARD PLAN

YPF is the Government-owned-and-operated oil company. When the attendant is not busy, he sits beneath his sunshade and reads a book.



© National Geographic Society

Kodachrome by Maynard Owen Williams

FRUIT FROM THE WHOLE PARANÁ DELTA COMES TO TIGRE BY BOAT

This wholesale market, on the banks of the Tigre River, handles an annual crop worth more than \$1,000,000. Sportsmen also come here for boating, swimming, shooting, and fishing.

CHEMISTS MAKE A NEW WORLD

Creating Hitherto Unknown Raw Materials, Science Now Disrupts Old Trade Routes and Re- vamps the World Map of Industry

BY FREDERICK SIMPICH

AT A NEW YORK fashion show, we saw a girl clad from head to foot in artificial materials. Everything she wore was made from synthetic stuffs created by chemists.

Her hat was Cellophane; her frock was rayon. She wore "Nylon" stockings and carried a patent-leather handbag and stood in imitation alligator shoes and wore "jade" bracelets and "ivory" beads; her parasol handle was from beautifully colored plastic.

Even the faint hint of musk on her imitation silk handkerchief came from a synthetic perfume; on her nails there glistened a synthetic dye, and other coal-tar dyes imparted rich shades to her ensemble.

No wool or linen, no silk or cotton, no ivory or jade, not even any leather, figured in her costume. Only the girl herself was natural—natural flesh and bone wrapped in her own waterproof skin (Plate I).

There she stood, a startling symbol of this new artificial world risen so fast since the World War. In newspapers, every few days, you read of yet another "miracle" from this or that great chemical laboratory—"wool" from milk; alcohol, rubber, and false teeth from gas; licorice from old stumps—or a new way to poison grasshoppers.

NEW FIBERS, PLASTICS, DYES

That this burst of activity in the rise of new man-made fibers, plastics, dyes, etc., today brings startling, almost revolutionary changes into our industry is plain, even to laymen.

But what does it all mean? What needs, or forces, suddenly set all our laboratories at this miracle-making?

Clear answers lie in the recent words of Dr. C. M. A. Stine, vice president of E. I. du Pont de Nemours & Company.

At the end of the World War, Dr. Stine points out, "Sheep, plants, and worms supplied the fibers for our textiles. Bone, hides, tusks, horn, the saps and barks of trees, the excretions of insect and animal life, and countless other products as ancient

as commerce filled motor trucks and freight cars and the holds of ships, just as they made up the burdens of caravans in the days of Marco Polo.

"We were building and designing better homes, but of the same materials—stone, brick, and wood—of which homes had been built for thousands of years. We were wearing the same clothing that our great-grandfathers wore, merely cut to a new style and woven by machine instead of by hand. We were eating the same foods, using the same perfumes, sleeping in the same types of beds that the Caesars and Pharaohs knew."

Then a wave of inventive genius swept over the chemical world, and "we began to see wood, metal, fiber, rubber, and all other natural products not as raw materials in themselves, but as compounds of raw materials that are ever present in superabundance in the air, the water, and the soil."

COAL, AIR, AND WATER AS RAW MATERIALS

Coal, for instance, to a chemist, is far more than fuel; it is an almost limitless source of carbon. Air and water, too, are "inexhaustible reservoirs of oxygen, hydrogen, and nitrogen." Hence now, in these three sources—coal, water, and air—the chemist finds "the primary building blocks employed in the natural creation of silk, rubber, wood, camphor—in short, most organic things and their by-products."

Explore these chemical miracles further—see how they now affect our industry and daily lives—and you run into astonishing facts and unexpected thoughts. Also, you come to understand why the fashion show girl's outfit, though wholly synthetic, was yet beautiful, practical, and inexpensive.

Many of man's raw materials, even when he has carried them long distances, are not always perfect, or adequate. Wool, flax, hemp, hides, lumber, silk, even cotton, each in its own way has often given man a headache. Each, in its natural state, may have certain limitations. Metals he must make



Photograph by Willard R. Calver

"I CAN MAKE RUBBER, OR SMOKE, OR COLORS—AND SOMETIMES JUST AN AWFUL SMELL!"

All over America thousands of budding boy and girl chemists experiment with their toy sets. From such fascinating play come the laboratory wizards of tomorrow, as science marches on in its conquest of Nature.

harder and rust-proof; wood he must protect with paint or creosote; even water must be purified.

The list is long; but these are reasons why you see chemists busy not only with new alloys, paints, disinfectants, and fertilizers, but with synthetic leather, building materials, rubbers, fibers, dyes, etc.

On the brighter side, man needs the chemist to give him precious things. His women, like the girl at the fashion show, want to wear amber, jade, ivory, crystal, even pearls and other beautiful stones. These man can't always afford; many are rare and dear. So now, by synthesis, chemists make them at low cost.

Rare perfumes are also dear to some women's hearts. With them they attract the male. On the style show girl's handkerchief, we said, was artificial musk. Real musk few could afford—or even find. It comes from a fleet, graceful male deer that frolics among the high crags of the Hima-

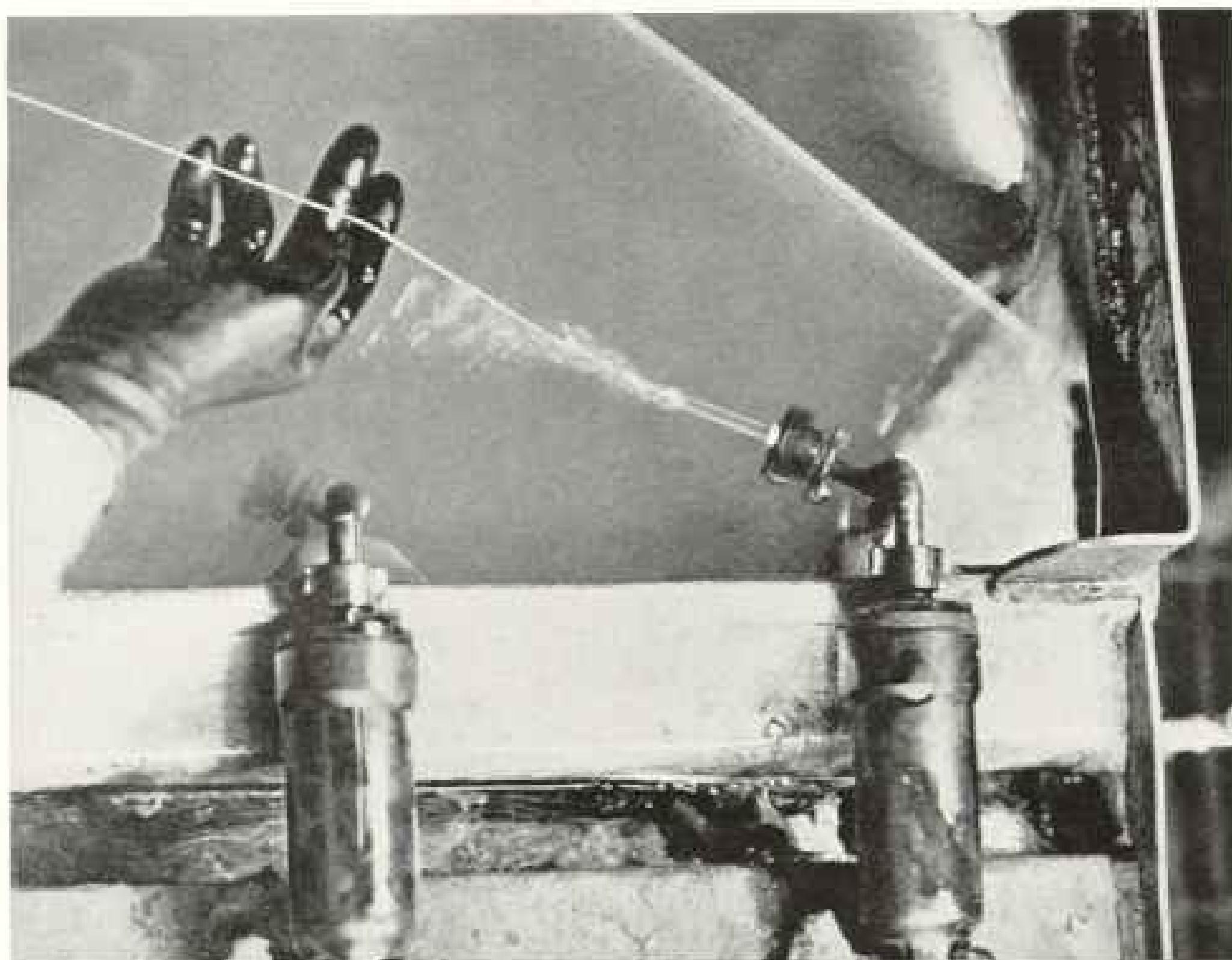
layas. One pound of natural musk—if you could find that much—would cost about \$40,000 and you might smell it from New York to Chicago.

Today's synthetic musk costs only a few hundred dollars a pound—and you might smell a pound of it no further than from New York to Brooklyn. But it serves the perfumers and saves wear and tear on the Asiatic deer, just as artificial ivory has made loafers out of many old tusk hunters.

Some things chemists do now would have been classed in Bible times with the miracles. As when water was turned into wine, chemists make things today which even differ chemically from the raw stuffs whence they spring.

PERFUME FROM COAL TAR

To make alcohol from molasses, or dyes from plants, is mere chemical change easily understood. But the magic of soft panties from lumps of coal, or sugar from pine



VISCOSE LIQUID SQUIRTS INTO A CHEMICAL BATH AND TURNS TO RAYON THREAD

Lay this picture flat. Then you look straight down into a tank over which a gloved hand reaches to fish up newly formed fiber. Through tiny gold-platinum spinnerets in the nozzle (right), copied after the business end of the silkworm, syrupy cellulose ejects, to coagulate in the chemical bath (page 623).

trees, or delicate heliotrope scent taken from stinking coal tar, seems akin to the wizardry of ancient alchemy and its myths of base metals turned to gold.

Today in du Pont's laboratory you actually see fine, silky thread for underwear and hose made from coal, air, and water. "Nylon," they call this new fiber which is a challenge to natural silk and even to rayon. When hardened and formed, it also makes bristles, going now into millions of toothbrushes. What Roman holidays this means for wild pigs in Siberia! Now, for all the chemist cares, pigs can keep their bristles (Plates XI, XIII).

Nitrates from the air; fruit flavors from tar; bromine from sea water; glossy fabrics from spun glass; all these hurdles our chemists take in their stride.

Volcanic in their furious heat and pressure are also man's present-day machines, needed to make such things as Nylon and artificial rubber. Before electricity led him

into the Power Age—and to new alloys that support terrific heat and pressures up to 25,000 pounds an inch—he could not have made all the things the girl wore at the fashion show. So engineers in other fields aid in the march of synthetic chemistry.

To study the groups of molecules, du Pont chemists use a supercentrifugal machine that whirls at 60,000 revolutions a minute. It takes 1½ hours of steady running to work this whizzing little bowl up to top speed—and then another 1½ hours to stop it! At full speed a speck on its rim travels at a rate which would mean speed of 1,200 miles an hour. If made of ordinary metals, the bowl would fly to pieces from centrifugal force and perhaps shoot bystanders to death.

THE GEOGRAPHY OF CHEMISTRY

Only new, incredibly tough alloys make possible this machine and other large ones now in factory use.



Photograph from *Wide World*.

DAUGHTERS OF ITALY VISIT THE NEW YORK WORLD'S FAIR GARBED IN GARMENTS OF TOMORROW

Skim milk, bamboo, and grass are among raw materials used in their costumes. "Lanital," a new textile half wool and half casein, is now enormously produced in Italy, going not only into women's garb but into army uniforms and overcoats (page 577).

"Yes," you repeat, "we know all that. But *why* do men make all these imitations? Take the case of your mannequin at that style show. Is her novel garb more than a chemist's trick, just to show what he can do?"

Indeed it is. Synthetic items in her costume are made now for sound reasons that range from economic to political, and even geographic.

Foreign trade routes, merchant ships, barriers, embargoes, tariffs; occasional scarcity or lack of uniformity in raw materials; jobs, wages, prices; even the germs of war itself, all figure in the reasons why man is creating this new world of artificial things.

Consider first chemical geography. In the United States chemists may find all they need of such common yet useful materials as salt, sulphur, limestone, coal, phosphates, potash, bauxite, oil, natural gas, rosin, etc. Nickel and arsenic, however, we must buy abroad; we also lack tin, antimony, manganese, and chromium.

Benevolent as Mother Nature is, if we still depended wholly on her, we should also have to import all our rubber, nitrates, camphor, many vegetable dyes, perfumes, certain flavors, drugs, and other things.

So today, synthetic chemistry aids us to



Photograph by Roy J. Jacoby

YOU SEE THROUGH IT WHEN ROLLED! WHEN FOLDED, YOU DON'T!

Billions of iodine and quinine crystals on the cellulose sheet form optical slots in which rays of light are flattened into parallel ribbons as they pass through. Twirl the slots out of line and you block the "light ribbons." One can look through several thicknesses of a Polaroid sheet, as they are in the roll at the left. Where the corner of the sheet is turned up, the slots are crossed, so no light may pass through. Polaroid light control is used now in antiglare glasses and lamps, and in three-dimensional movies. Some day, when Polaroid is adopted for automobile lamps and windshields, headlight glare will be eliminated and driving at night made safer (page 679).

be more independent; not completely self-contained, in the sense of one big, happy Swiss Family Robinson, but far more so than just a few short years ago.

As one easy, yet dramatic reason why we make synthetics, look at nitrate, which chemists now pull from the air as magicians pull rabbits from a hat.

When our fashion show girl's mother planted flowers—or was it cabbage?—the



Photograph by Drucker-Hilbert

BETTER THAN X-RAYS, THIS CAR'S TRANSPARENT BODY REVEALS ALL ITS INNER WORKINGS

With hood, fenders, and body panels of glasslike plastic, this Pontiac is shown at the New York World's Fair. Murals in the background are by Dean Cornwell and trace the steps in the making of a motorcar body.



Photograph by Willard R. Calver

WHAT A LONG STEP FROM PREHISTORIC POTTERY TO MOLDED PLASTIC PLATES!

He merely inserts the resinous molding material, works his hot, heavy press, and out comes a strong, light, graceful piece of tableware. Billions of plastic articles, from toys to battleship gadgets, are thus molded or pressed each year.

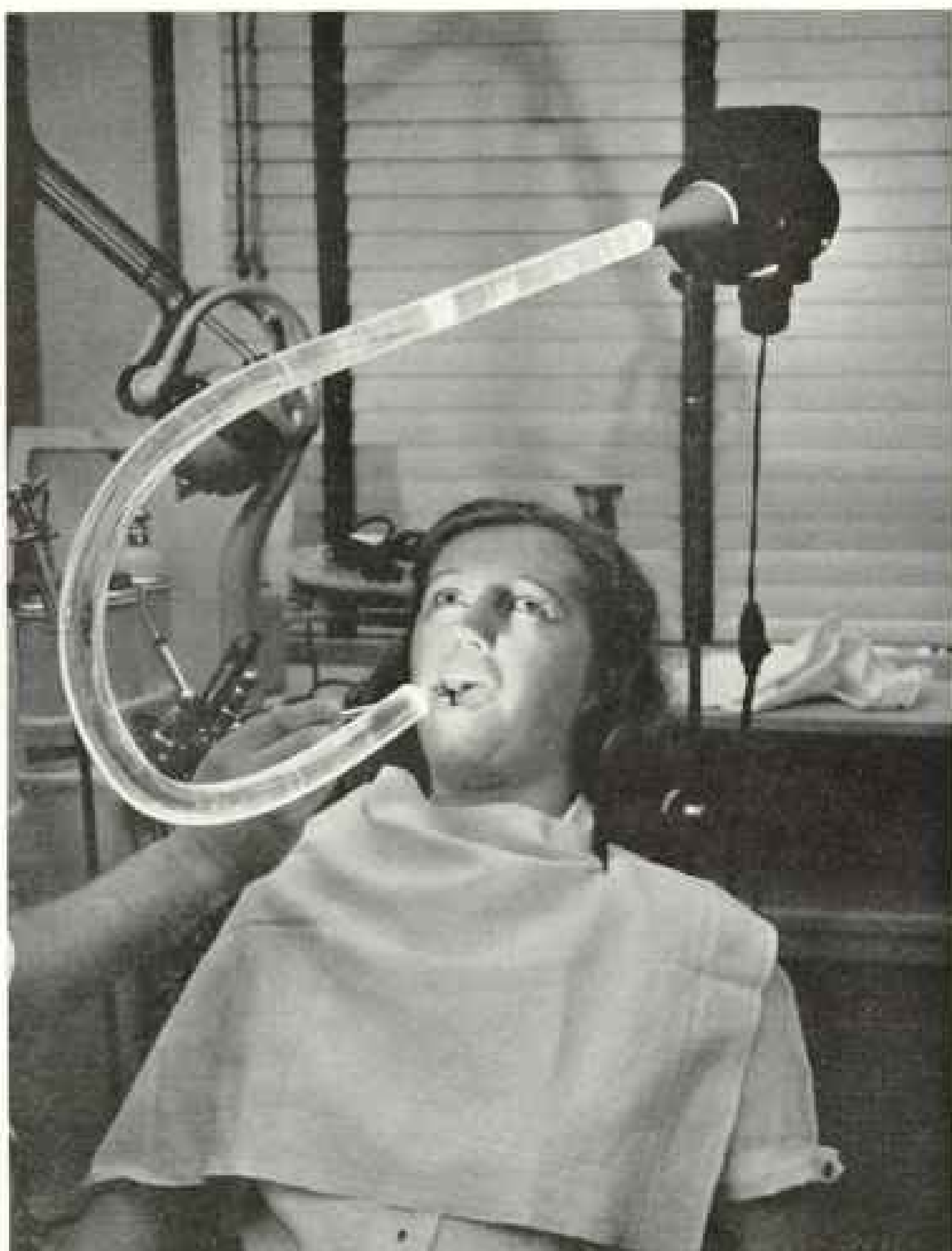
fertilizer she used was part nitrate, an essential plant food. You can't make gunpowder, either, without nitrates. For years we got this from Chile's nitrate fields, when Chile had a world monopoly.

MINING NITRATES FROM THE AIR

Then ships from all nations cut sea paths to Chilean ports, and great economists like Sir William Crookes dimly predicted that in time we might starve, should science find no substitute before Chile's niter beds went empty. Well, science found it. The how and where is a long story: it stretches from Scandinavia to Germany and down to Muscle Shoals and later out to Belle, West Virginia.

When the du Ponts went into West Virginia and put up tall chimneys and big shiny tanks and explained to the farmers that they were about to pull fertilizer out of the air, dubious agrarians nodded and "allowed somebody was crazy." But there the du Ponts are actually doing that now, just as a hundred air-nitrate plants are doing it now at a hundred other places.

So today the big fleet of nitrate ships no longer hurries to Chile. Exports from the desert nitrate fields have shrunk; fewer men find work there; but at the new air-nitrate plants thousands of new jobs have been created. That's what we mean when we say



"HOLD STILL A MINUTE—THIS WON'T HURT A BIT!"

Dentists and surgeons may now use cold beams flashed through "Lucite" plastic rods to explore oral and other cavities in patients' bodies. Remarkable, too, is this plastic's power to carry light around a bend, as in the curved rod shown here (page 619).

chemists are changing the setup of ocean shipping and international trade.

That West Virginia nitrate plant is also a perfect example of the chemists' proverb that "one thing leads to another." In working out ways to purify gases and make nitrates and ammonia, they hit on how to make methanol, other alcohols, and urea. This meant more new jobs in West Virginia, but it laid off hundreds of old workers elsewhere who used to make "wood alcohol" from wood.

Similar trade repercussions are due from the advent of Nylon. Silk is Japan's chief

export to us; but Nylon is more elastic than silk, and man can control its volume and hence its price. When it cuts into silk sales, the same trade upset follows as in the case of nitrates, pig bristles, camphor, etc.

Without camphor, the fashion show girl could not have had her plastic ornaments; without camphor, there could be no celluloid, nor many other chemical products. So here again when one nation, because of its strategic map spot, was able to limit our supply of camphor, or deny it altogether, our chemists began to make it by synthesis. This drama of camphor shows again how our chemists can disrupt old currents in trade geography.

STUMPS 50 YEARS OLD YIELD CHEMICAL TREASURES

Green trees on far Taiwan (Formosa) scent the island air with familiar drugstore fragrance. That's camphor, so named by Chinese.

From camphor wood sap, crudely treated, the Formosans formed cakes, traded through the East long ago as pagan amulets. In time, by caravan and junk, India, Egypt, and the Arabs came to know camphor; the latter, always experimenting, made medicine from it and passed it on to the Turks. So it came to Europe. Today industry consumes carloads of it. After Japan took Formosa from China, in 1895, she built up a world camphor monopoly. From this our chemists freed us by making camphor from turpentine.

Turpentine itself to the fashion show girl's old grandpa was just turpentine, made from the sticky exudate of pine trees. Today you see chemists taking 100 or more new things from rosin and turpentine, including oil for disinfectants, insecticides, perfumes, and flavors.

Licorice, made from stumps, is another synthetic that tends to upset old jobs and old trade connections and form new ones. Over in Iraq and Syria, Arabs dig wild licorice root. Baled and shipped, it lands here for use in our candy, baby medicine, chewing tobacco—even in certain fire extinguishers. Now all these Arab workers in the far Levant must compete with Georgia workers, who can make a synthetic that smells, tastes, and acts like real licorice.

To our symbolic girl's country kin, also, old stumps merely cluttered the corn or cotton fields; to get rid of them took hard,

costly work. Now the turpentine makers not only dig them up free, but pay for them.

MAN MAKES BRIGHTER, FASTER DYES THAN NATURE'S OWN

The only natural color on that girl at the fashion show may have been that in her blue eyes. For of pink cheeks, red, black, or blond hair, fingernails, and even summer "tan," Nature is no longer the sole boss.

Of course Nature still controls the colors of birds, flowers, green grass, blue skies. This would be indeed a monotonous world if all of one color—or no color at all! Even insects and beasts find food, flirt at mating time, and outwit enemies by use of color.

A mere pinch of history shows that Egypt made dyes from the indigo plant centuries ago. Later pelagic man, about the Mediterranean, used a shellfish to make the "royal purple" of Greek and Roman times, a costly color reserved for royalty.

Federico, a Florentine, found in the 15th century how to make dyes from lichens. From Mexico, in 1518, Spaniards brought the cochineal bug, used by Aztecs in making color. Dyewoods came into use and one of London's oldest guilds is that of the dyers.

Not till the 19th century did chemists ponder the use of coal tars. Finally William Henry Perkin, seeking to make synthetic quinine, found a coal-tar dye he named "mauve."

Till after the World War, we depended on Germany; everybody remembers how the submarine *Deutschland* sneaked into Baltimore with dyes that sold for dizzy prices. We had then so few dyes, and such poor ones, that our coat collars turned our necks blue and green, and Uncle Sam couldn't even properly color his postage stamps.

Now we can make all the dyes we need and export some. Du Ponts spent \$40,000,000 on experiments and factories before they earned a cent on their dyes. Their huge plant at Deepwater, New Jersey, is a city in itself (Plate XV).

Hot blasts rise from dryers. Giant cylinders rumble, vats bubble; acids—and ice, too—get in their work, and stinking rivers of every hue flow mysteriously about in fat pipes that twist and turn like sea serpents.

But don't try to understand it all. Not

FROM NATURE'S HIDDEN BUILDING BLOCKS



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Kodachrome by Willard R. Culver.

A LIVING SYMBOL OF THE CHEMICAL AGE

She wears no silk, wool, linen, cotton, or leather—no jade, ivory, or pearls. All is synthetic. From cellophane hat, rayon dress and gloves to plastic pearls and bracelet, patent-leather shoes with plastic heels, and a handbag with a "Lucite" plastic frame, her outfit is all of laboratory origin.



BIOLOGICAL SPECIMENS PRESERVED IN TRANSPARENT RESIN

This glossy-looking plastic is from the Philadelphia laboratory of Rohm and Haas. Objects are mounted in it for research and exhibition purposes by the U. S. Department of Agriculture.



© National Geographic Society

Kodichromes by Willard R. Culver

SCIENCE EVOLVED NEW MATERIALS TO MAKE ALL THESE USEFUL THINGS

Birds in the turban are of "Plastacel" — a cellulose acetate plastic. "Lucite" forms the walking stick; the perfume bottle is of synthetic amber. From other man-made materials came the vanity case, gloves, scarf, mannequin's head, model hand, etc.

FROM NATURE'S HIDDEN BUILDING BLOCKS



AMBER, IVORY, OR JADE—RARE AND COSTLY—ARE NOW REPRODUCED BY SYNTHESIS. Chemists abhor the words "imitation" or "substitute"; they say, "We've made a wholly new material, as beautiful as Nature's product, but cheaper and often better."



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Kadiachromes by Willard R. Culver

LUXURIANT BRILLIANCE EMANATES FROM GLITTERING PRODUCTS OF CHEMICAL ART.

Her robin's-egg blue negligee and her slip, as well as lamp shades and table "skirt," look like silk, but they're rayon. That toilet set of tea-rose tint is of "Pyralin" plastic, not onyx, and "Lucite" forms the brush and nail-file handles.



© National Geographic Society

HERE NATURE SUPPLIED ONLY THE GIRLS, THE PLANT LIFE, SEA, AND SAND

In this scene everything else is of artificial, man-made materials. Bathing suits, the beach dress, hat, umbrella, plates, napkins, tablecloth, sun glasses—even the book covers of "PTX" cloth—are made of synthetics.

Illustration by Willard R. Gibson



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"WRAPPED IN CELLOPHANE," FOOD KEEPS FRESH AND CLEAN

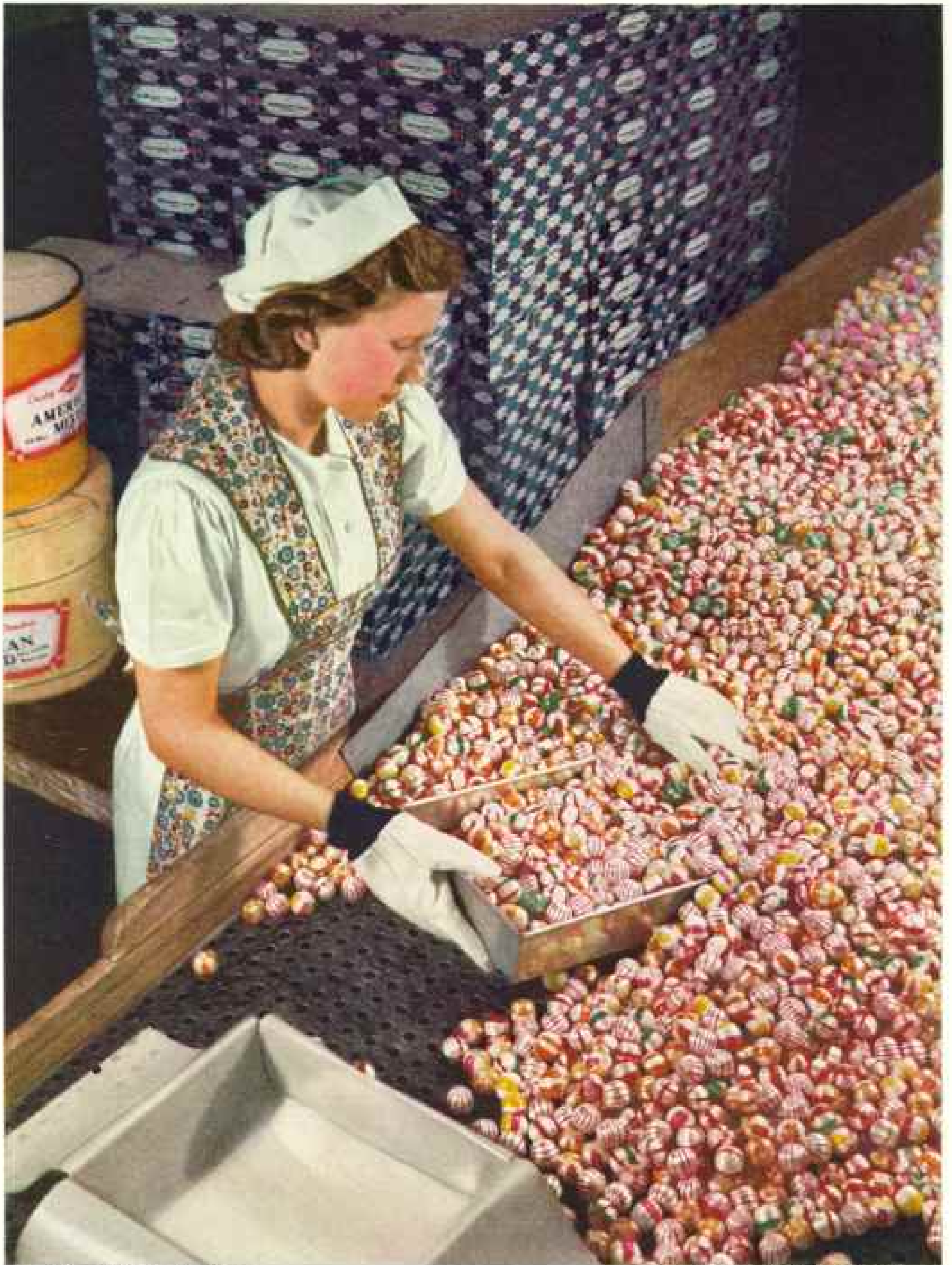
In this factory scene pieces of hard candy pour from an automatic wrapping machine at the rate of 160 a minute. The girl inspects each piece before boxing for shipment.



Koelchermans by Willard R. Carpenter

GLASS YOU CAN WEAVE LIKE SILK

Using standard textile machinery, strands of glass are combined to form yarns and threads which can be fabricated into cords, braided sleeveings, cloths, and decorative fabrics (Plate XIV).



© National Geographic Society

Kodachrome by Willard R. Culver

QUEEN OF LOLLIPOPS, IN GLOVES, BOXES PEPPERMINT BALLS

Choosing and blending colors, flavors, and aromas in candymaking is another chemist's job. In Henry Heile's New York factory hard candy is striped red with food colors certified as pure by the United States Government. Our grandparents boiled molasses on the kitchen stove at their candy-pulling parties; now scientific candymaking uses sugar by the carload, tons of imported almonds, coconuts, and other tasty ingredients.

FROM NATURE'S HIDDEN BUILDING BLOCKS



WHAT A BUSINESS DOOM PLASTICS BRING TO SANTA CLAUS!

Popeye, Susie Danny, Mickey Mouse—or just rattles and teething rings—they're all here. Besides their wide use in toys, celluloid and "Lumarith" have some 25,000 other applications in industry.



© National Geographic Society

Kodachromes by Willard R. Culver

A SYNTHETIC CHEMIST'S DREAM CAME TRUE!

The baby radio looks exactly like onyx, but actually it's "Catalin." To factories that transform it into dice, chessmen, toys, toilet sets, and jewelry, this raw plastic goes in the form of rods, bars, and tubes.



© National Geographic Society

Kodachrome by Willard R. Carter

TRULY NOW SCIENCE WITH LUSTROUS MAGIC GILDS THE LILY

Thanks to mass production of man-made textiles, women today can be better dressed than ever before, and at less cost. This garment in tango shade is of rayon, which now so largely displaces silk.

even the dictionary will help; only a chemist, who knows the symbols and equations, can follow this color cookery!

"How many dyes do you make?" I said.

"Oh, about 100 new ones every year, for as many new uses. In our color charts we show about 1,700 different shades."

"How many can you see, walking through fields of wild flowers in springtime?"

"Not so many as we make, by far. I can shut my eyes and imagine about 100,000; in fact, any trained dye chemist's eye can recognize fully 100,000 hues and colors. In a batch of yellows, for example, he can detect the presence of red, if it's only 1/20,000 of the batch. That's how in our standardizing laboratory we can pass confidently on every ounce of dye we make. Each lot is tested and compared with the particular standard set for it" (Plate IX).

FACTORIES USE COLOR CHARTS

Whether a customer wants to dye gloves, furs, silk, rayon, cotton, leather, or wall-paper, he can come here, choose just the shade he wants from a color chart, and they'll reproduce that exact shade for him.

Here they even have miniature tanneries and paper mills, in which they make their own samples for use in tests.

Here too they grind pigments for paints and printing inks.

"Not so long ago," they tell you, "printers had to hang magazine pages up to dry, like family wash. Now chemists can make ink that dries so quickly that you can handle a sheet, printed in colors, as soon as it's off the press."

Most printing inks are composed primarily of varnish in which color is suspended. Unlike dyes, the colors used in printing inks are powderlike pigments which do not actually dissolve. In the old days pigment colors came from natural sources, such as earths, and plant and animal extracts. Those colors were few in number, often dull, and quick to fade. Chemistry has given us the numerous brilliant colors of today, creating them from such surprising materials as pig lead, coal tar, and iron ore.

Here again dye chemists disrupted an old trade. Hordes of workers in India and elsewhere, who grew the indigo and madder plants, lost their jobs when man produced synthetic dyes, and millions of acres of land had to be idle while farmers planned other crops.

Other examples exist. Ivory hunters in Africa passed from romance with the rise of synthetics. We've seen what happened to Formosa camphor tree owners, to Chile's nitrate monopoly, and the slant-eyed boys who thought bristles could come only from Siberian swine (pages 603, 607, 608).

Now looms the giant of all examples, rubber. We still depend on Nature for it. But, should war shut us off from overseas rubber supplies, we could, in some months' time, be making enough synthetic product to meet our needs.

"Nature made rubber latex, then threw away the formula," said discouraged chemists after years of laboratory toil. But now they have it. Today's synthetic rubber, better in some ways than the natural product, comes not from plant life, but minerals.

That mannequin's shoe heels, you may have noticed, were not leather or wood. They were shiny, scuffless plastic, pressed from some glassy mystery, hard and durable, yet light as cork.

MAN-MADE PLASTICS ADD TO WOMAN'S CHARM

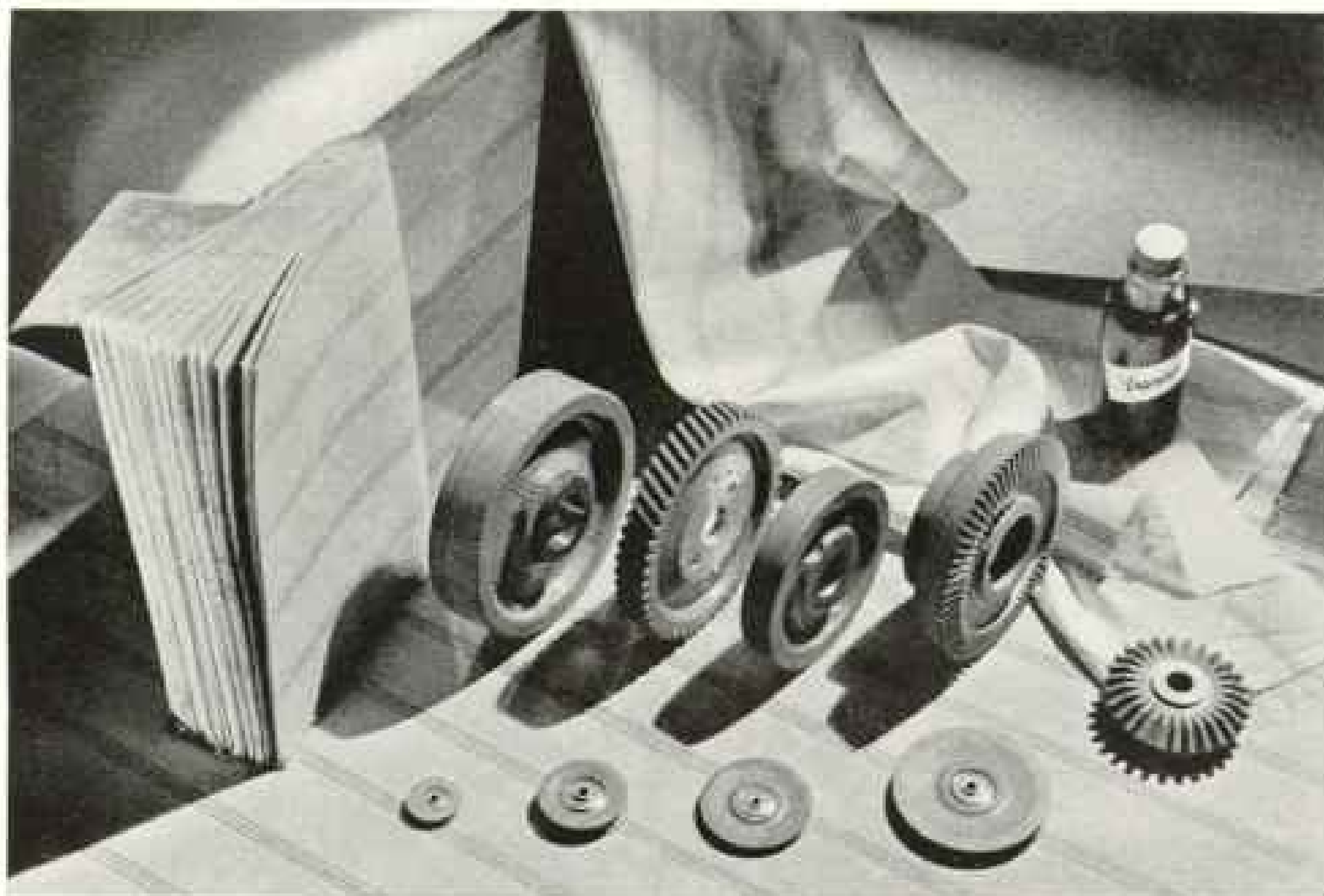
On her dressing table, had you seen it, as now on thousands of others, all the fancy combs, brushes, mirrors, trays, vanity cases, and cigarette holders were also of plastics (Plates III and VII).

All over America now such natural things as wood, bone, amber, ivory, tortoise shell, as well as porcelains and some metals, have been so supplanted by synthetics that you can hardly turn in your own home without touching one. Their trade names are as Greek; but all about us are "Bakelite" telephones, "Catalin" dice and bracelets, "celluloid" toys, "Lumarith" tool handles, "Beetleware" goblets, things of "Flaskon," "Glyptal," "Vinylite," "Tenite," and other "chemical compositions."

Pioneer was celluloid. Back in 1868, John W. Hyatt, an Albany printer, set out to make an imitation ivory billiard ball. He did it, by blending camphor and nitrated cellulose, and so produced the world's first thermoplastic.

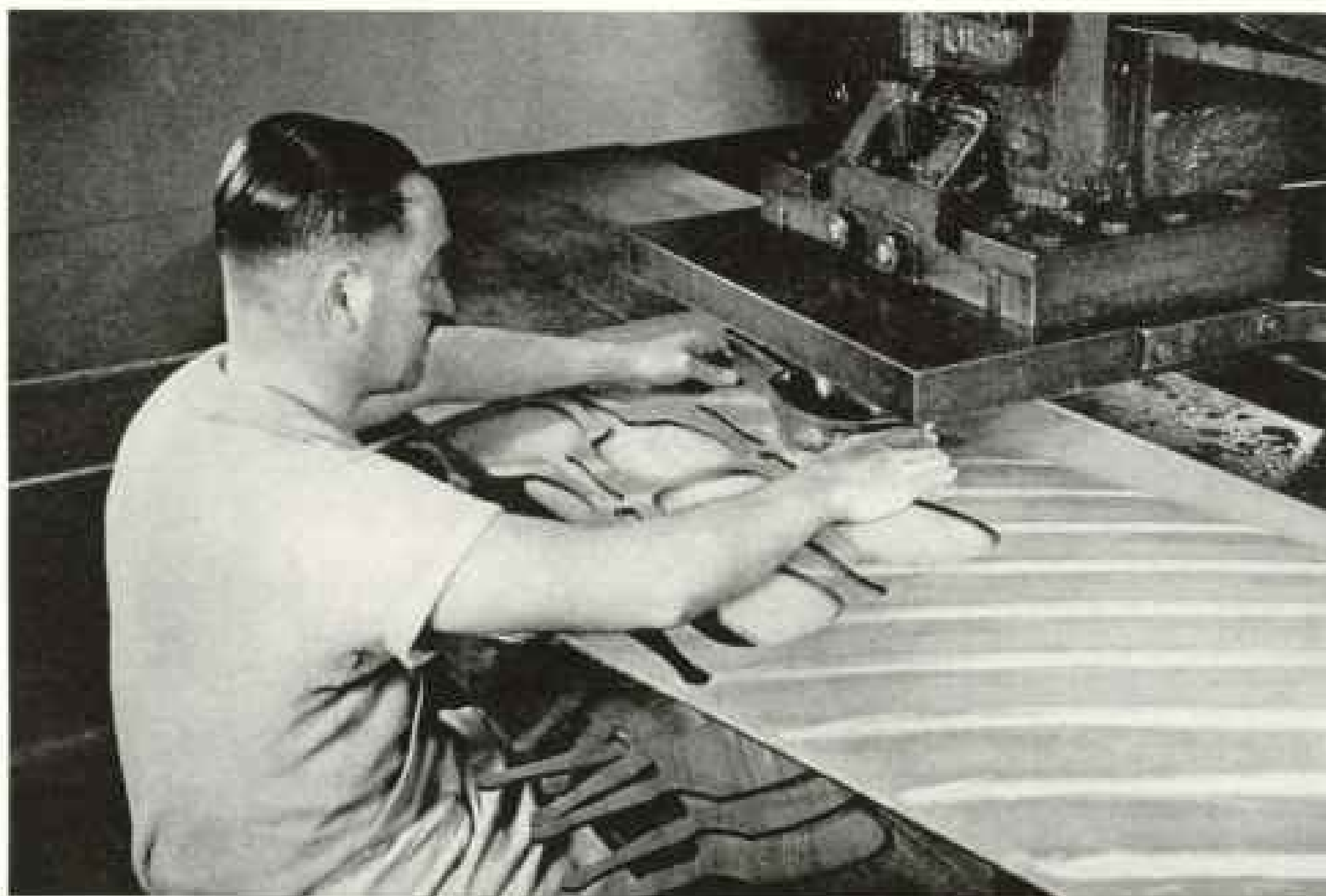
In 1890, when the Celluloid Corporation found a way to make transparent celluloid sheets in continuous lengths, it laid the base for the motion picture business. Today celluloid and its offspring find some 25,000 industrial applications.

Most plastics are resinous compounds. Natural resins come from plants and trees,



THINK OF GEAR WHEELS CUT FROM PRESSED CLOTH!

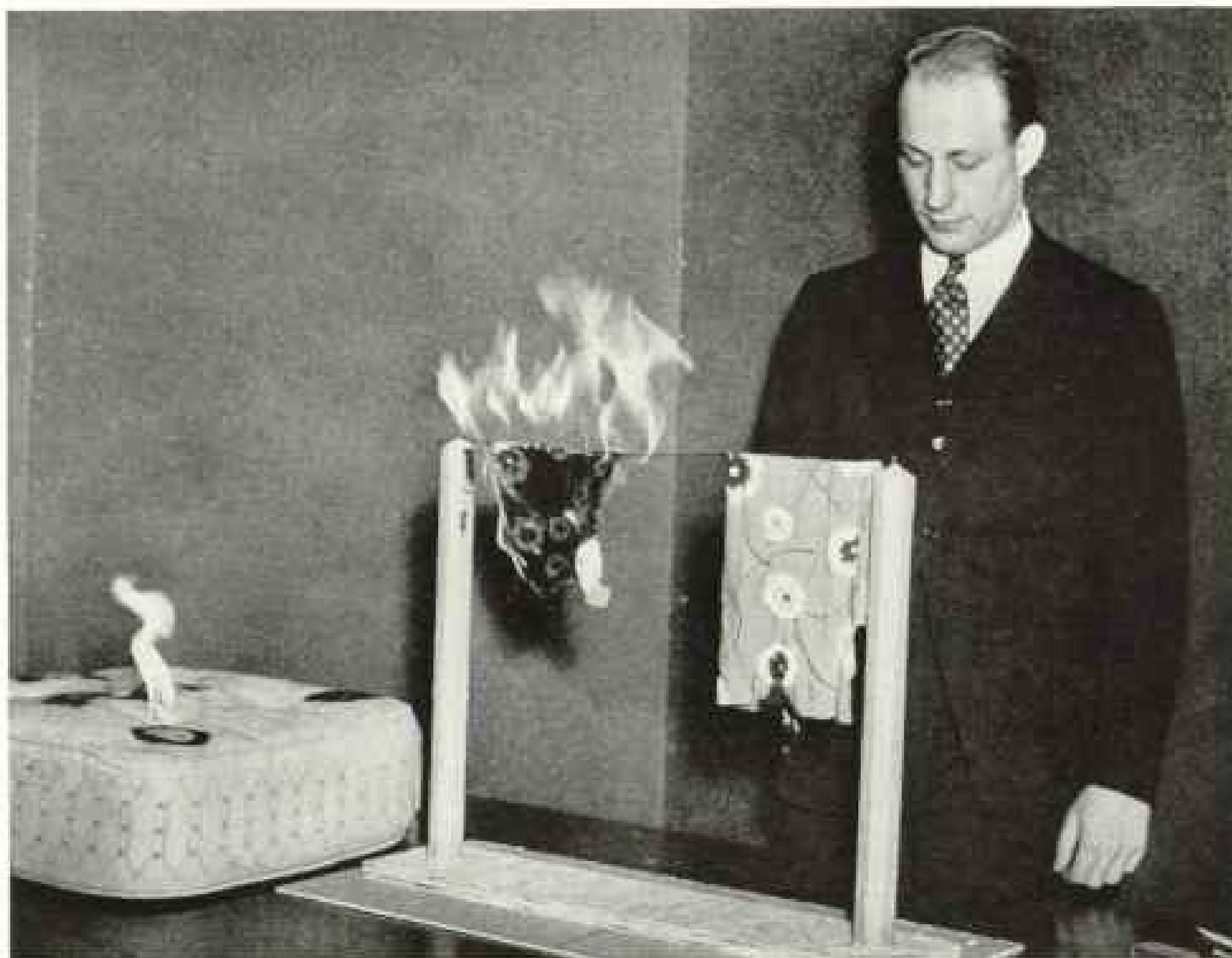
This type of "Formica" plastic is made by impregnating stacked-up sheets of cloth with a varnish mixture, then applying heat and pressure. Many gears made of plastics require no oil, being self-lubricating.



Photographs by Willard R. Culver

CUTTING MIRROR BACKS FROM A SOFTENED, ONYXLIKE PLASTIC SHEET

Woman's desire for beautiful materials at low price led science to evolve such new things as this synthetic onyx. Plastic raw materials come in various forms, from molding powders to rods, bars, tubes, and sheets, ready for cutting.



FABRICS, TREATED WITH FLAMEPROOF AGENTS, RESIST FIRE

Burning brightly is an untreated cloth; at right is a chemically protected sample that scorched but did not blaze when a lighted match was held to it. On a "treated" cushion, at left, gasoline was poured and fired, but only the gasoline burned.

and include shellac and pitch; Bakelite, used for years to make insulating parts, like later synthetic plastics, is a child of the laboratory.

Straight celluloid is highly inflammable; and hot sun will warp a talking-machine record made of shellac. But in 1907 a thermo-setting resin which would undergo a chemical change in hardening, and stay hard despite any heat, was found. Dr. L. H. Baekeland discovered it when he heated a mixture of formaldehyde and phenol, or "carbolic acid." He named his product "Bakelite" and as such some 50,000,000 pounds a year of it are now used.

Laminated plastics, made by many sheets of plastic-impregnated cloth, paper, or plywood pressed together hot, possess amazing strength. Bakelite is used in this way to make airplane fuselages. Such plastics also go into gear wheels, wallboard, instrument panels, and other things; they supplement and often wholly replace wood, steel, and slate. On the *Queen Mary* de

luxé staterooms are lined with fireproof plastic wallboard, and at Washington the Library of Congress used Bakelite in laminated plastics.

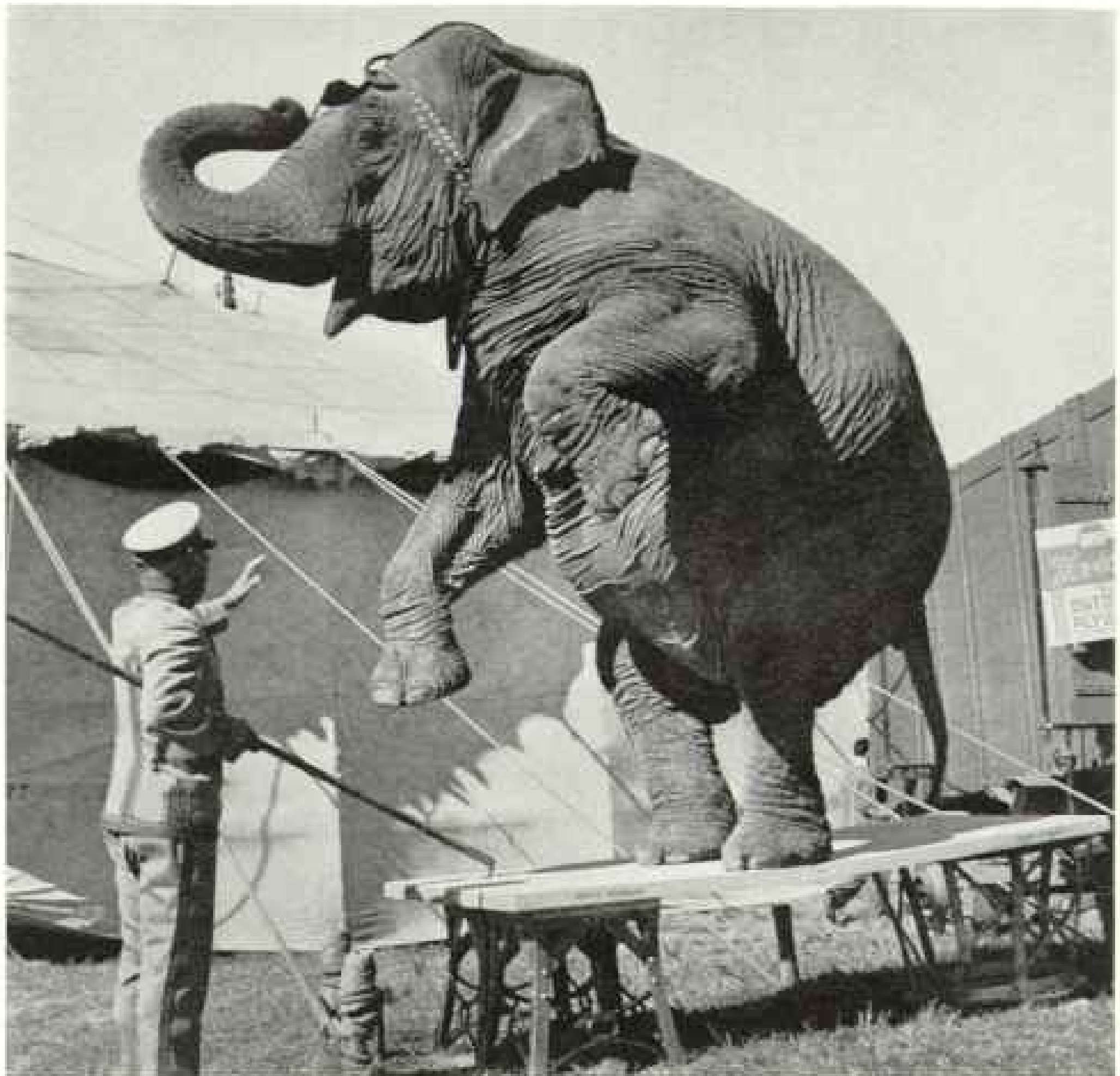
LIGHT FLOWS THROUGH A PIPE

"Lucite," a new addition to the plastic family, is transparent as glass. Through a rod of Lucite, light flows as water through a pipe. To show me its magic, a du Pont chemist held up a bent, twisted rod of this "glass." To one end he held a lighted match; I looked along the rod and saw no flicker of light. Then the chemist said, "Look at the other end!" And there was the light, coming out!

In surgery and dentistry, Lucite instruments are used to illuminate body and oral cavities without risk of burning the patient, because the light bounding through the rod is cold! (Page 607.)

Lucite reflectors, set along highways, prove many times as bright as glass.

Chemists again dislocated a lot of work-



Photograph by Furley Utes

"THIS STUNT BORES ME—MY DOUBLE CHIN AND WRINKLES ALL SHOW!"

Here a pouting pachyderm tests one of Pacific Forest Industries' plywood planks. But four elephantine tons can't break a 29-ply, chemically waterproofed board barely two inches thick.

ers and upset some long-established trades when they produced plastics. Today pounding presses and speedy molding machines disgorge by millions many objects that used to be made by hand or on slower machines.

THE MYSTERY OF PLASTICS.

You can't define a "plastic" by merely saying it's something that can be molded by heat and pressure.

At the National Bureau of Standards, in Washington, they show a whole room full of plastic products. They group them in four types. First is synthetic resins, which may go into any object from tableware and jewelry to steering wheels and radio cabinets. Then come door knobs,

telephone parts, and talking-machine records made of natural resins, which we commonly know as rosin, shellac, pitch, and asphalt.

Cellulose derivatives in the plastic trade show up in safety glass, photographic film, artificial leather, lacquers, airplane "dopes" and celluloid toys, hairbrushes, pens, pencils—thousands of things you see in drug and novelty stores.

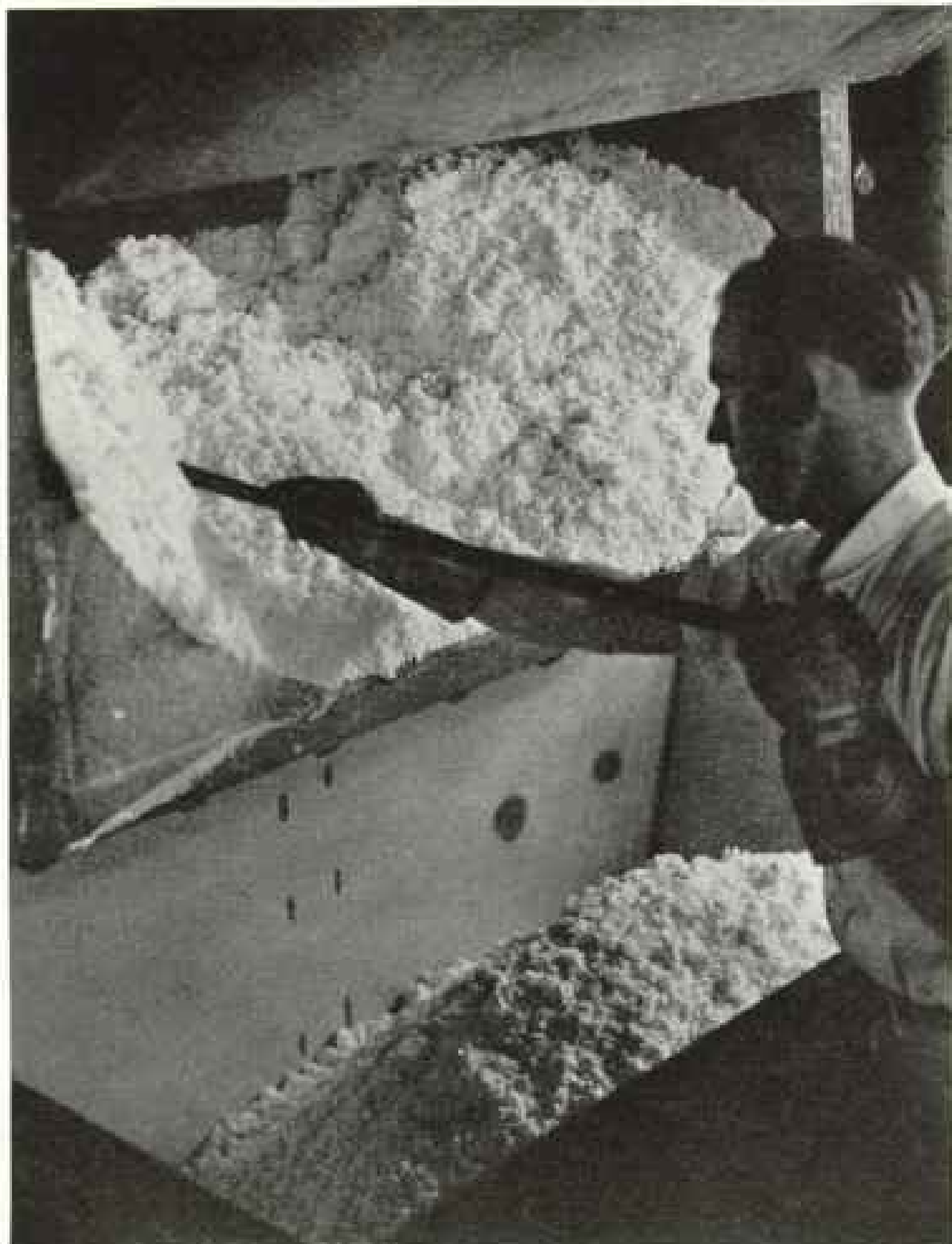
To see plastic objects being made, have a look at General Electric's factory at Pittsfield, Massachusetts. Here you see hundreds of workers cutting dies, while others, both men and girls, mold the various articles at the rate of nearly a million pieces a day on batteries of presses that run like stamp mills in a mining camp.



Photograph by Willard R. Cuiver

SCULPTORS FIND A NEW MATERIAL IN TRANSLUCENT PLASTIC OF PHENOLIC RESIN

Ralph Mancuso polishes his statue "Foreign Relations," displayed at the New York World's Fair with other figures by this sculptor, in the U. S. Government exhibit. Each plastic statue is 9½ feet high, and is lighted from within.



FROM WATCHING SILKWORMS DIGEST LEAVES, A FRENCH CHEMIST WAS INSPIRED TO MAKE CELLULOSE AND RAYON!

Here in a rayon works, a shredding machine has just ground up some cotton linters and spruce pulpwood to make alkali cellulose. This is one step in the manufacture of man-made textiles near Richmond, Virginia.

When a customer wants, say, 10,000 plastic heels for women's shoes, 50,000 steering wheels, or 10,000 cabinets for radios or teletype machines, he submits his model or pattern; then G. E. die cutters make the necessary steel mold. They can show you nearly 9,000 different molds, used in making as many different kinds of plastic articles.

BY SYNTHESIS, MAN NOW MAKES FABRIC

Change is swift and incessant; a \$10,000 press built only two years ago may already be scrapped and replaced by a later model.

Eve was naked; Nature left her so. The fig leaf was man's idea. All his age-long labor to clothe himself, since he first wore wolf, rabbit, or leopard skins, has been to gain more comfort. Furs, wool, linen, cotton, silk—all have served him.

Today, for the first time in centuries, man has new fabrics for his clothes. Rayon is most widely used of synthetic textiles. Nylon and another new one, "Vinyon," are coming on.

Italy uses "Lanital," half wool and half milk, or casein. Short of wool in her Ethiopian campaign, she turned to this casein fiber and now uses millions of yards of it in suits, dresses, socks, overcoats, and blankets. Germany has long used synthetic textiles, even a processed paper, for clothing.

Two American chemists, E. O. Whittier and Stephen P. Gould, have just patented a still newer way of making yarn from milk. Of it Dr. Whittier says: "It is unsafe to predict the future of casein fiber in this country; but there appears to be a real need for an inexpensive fiber to be used as a diluent or extender of wool so that our inadequate supply of wool may be made to satisfy our needs at a lower cost.

"We have a potential annual supply of skim milk of 40 billion pounds over and above that now converted into manufac-

tured products. This is equivalent to one billion pounds of casein fiber. It is equal to world production of rayon and is twice the consumption of wool in the United States. The economics of the textile situation will determine how far we go with casein fiber."

Here again, should America go for artificial wool as it has for imitation silk, you can see what further trade disruptions would occur, say between Boston and Buenos Aires, or Australia—to say nought of our own western sheep States.

FIVE TIMES AS MUCH RAYON USED AS SILK

Rayon was man's first long step in his quest for artificial textiles. Its dramatic history shows vividly how human patience and ingenuity again not only stole Nature's secret, the mechanics of the silkworm, but actually built a textile superior in many ways to the silk it imitates.

In voluminous writings on rayon, as synthetic silk is now named, the work of dozens of experimenters is traced. One great name, most commonly associated with rayon's development, is that of Count Hilaire de Chardonnet. He played with the syrupy solutions of cellulose and gained much by the discoveries of other European experimenters. As a student he had worked with Pasteur in Paris and knew of his efforts to cure a silkworm disease which at



Photograph courtesy Owens-Illinois Glass Co.

WHO WOULDN'T WHISTLE AT GLASS SPUN LIKE SILK!

Alice in Wonderland never saw any feat more astonishing. Fancy taking an old windowpane or a broken milk bottle, spinning such fragments into lustrous fiber, and then weaving yourself a pair of bathroom curtains! (Page 629.)

one time threatened to destroy the French silk industry.

Toiling in the twilight zone of atoms, he watched the silkworm exude its fluid through fine holes in its body.

From this came the idea for the "spinneret," that tiny platinum-gold disk full of fine holes used now in all the rayon mills. Through these spinnerets, man forces his chemically prepared cellulose; toughened in a chemical bath, picked up and wound on wheels, it forms into spider-webby filaments, 1,000 miles of which may weigh but a pound (page 603).

Now man can't control Nature's silk-



Photograph by J. Baylor Roberts

FROM ONCE USELESS PINE STUMPS MAN NOW EXTRACTS PRIZED CHEMICALS

Resin, turpentine, synthetic camphor, synthetic licorice, insecticides, and many other useful things are recovered from old pine stumps; here wagonloads of such splintered old snags are being delivered to Hercules Powder Company's mill at Hattiesburg, Mississippi.

worm. But he is master of his own machine. So he can make rayon fiber finer than silk, or coarser than horsehair. He can give it any luster, too, from gray, chalky dullness to the silvery brightness of shiny metal (Plate VIII).

Rayon, of course, dealt a staggering blow to the silk industry; Japan recouped by building rayon mills and becoming the world's largest producer of rayon.

In America we get cellulose from wood and cotton linters.

Treated with nitric and sulphuric acids, cellulose forms pyroxylin, which is the base of motion picture film, quick-drying lacquers, gunpowder, and various plastics. At the Eastman Kodak plant in Rochester, you see them dissolving truckloads of silver bars, making salts of silver with which to coat their cellulose (Plate XII).

If acetic acid is used, the yield is another compound of cellulose; it then goes into acetate rayon, and many things from fountain pens and airplane windows to lampshades and safety X-ray film.

THINGS BORN IN A LABORATORY

Look at the showcases in any drugstore, or check over items in your own home, and you'll be amazed at how many were born in a laboratory! Combs, brushes, buttons, buckles, bracelets, pens, pencils, fingernail tint, costume jewelry, fishing tackle, candy and hatboxes, cigar, cigarette, and food wrappings—even your wife's hat, hose, underwear and gowns, as well as your window shades and draperies.

Kin to rayon is cellophane, another white rabbit from the chemist's hat. It, too, is made through a spinneret, but comes out



AGAINST THE RAVAGES OF HUNGRY INSECTS MAN FIGHTS TO SAVE HIS FOOD

On this revolving table the chemist sets his food plants, on which captive pests have been released. Then, by trial and error, he finds the most effective poison (pages 626, 627, 628).

through a slit instead of fine holes, which makes it flat.

Hollywood used 50,000 yards of "cellophane to make moonbeams" when they shot "A Midsummer Night's Dream." The stage makes glittering transparent costumes from it. Besides its wide use as a wrapper, radio has used its "rustle" in sound effects:

MOVIE FILM TO PATENT LEATHER

Cellulose in yet another form went into the patent-leather shoes on that girl at the fashion show, and into the handbag she carried. You can't see it, but hidden in her bag or lost in her shoes is part of the 250,000 miles of film love, romance, and adventure pictured last year in Hollywood.

"That sounds crazy," you say. It does; but it's absolutely true. Much of our patent leather is made from discarded motion

picture films, and other film scrap, and so patent leather, like the "house that Jack built," may start with cotton fields and silver mines, turn into photographic film, run through studios, be released to theaters all over the land, end as junk, and be reclaimed to make coatings for artificial leathers. Of leather, and its imitations, we use so much that Nature can't supply it all. If all we used was made in the old way, from cowhides, we should have to graze practically the whole Mississippi Valley to raise cattle enough to meet our need for hides.

EVE NEVER SAW A BEAUTY PARLOR

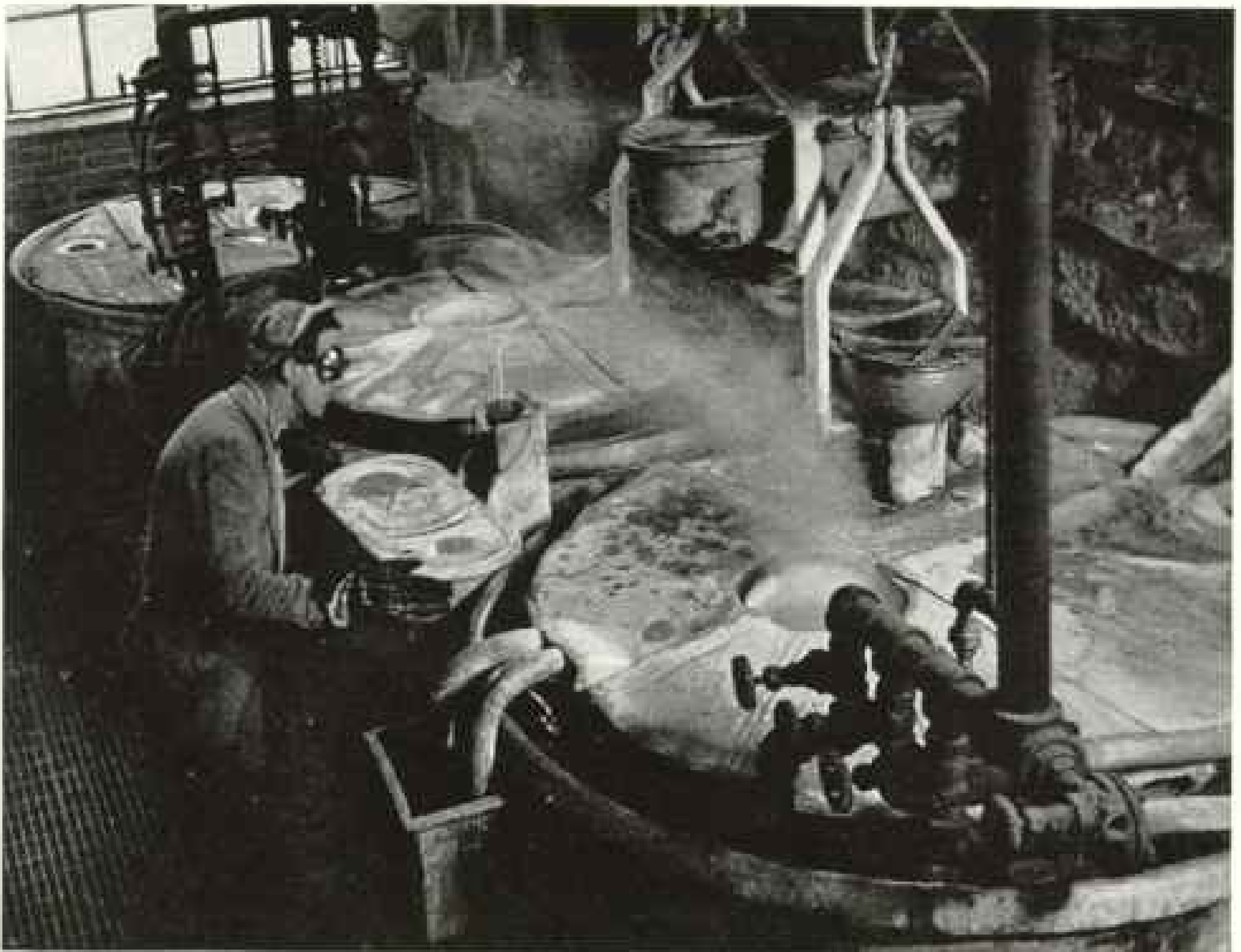
From fig leaves and leopard skins to rayon and patent leather made from canned romance! Truly a long step; yet only one more in man's creation of his artificial world.



Photograph by J. Bayler Roberts

BELCHING POISON AGAINST TOBACCO WORMS AT ONE ACRE A MINUTE

The plane flies low and operates only in early morning, when the air is still and the crops wet with dew. Poison itself is carried in dust made of lime, talc, or bentonite clay (page 628).



Photograph by Akron Studios

GLOVED AND GOGGLED, AMID HEAT AND STENCH HE TESTS HIS ACID

These jumbo vats are sulphuric-acid coolers in the chamber acid plant of the du Pont Company's Grasselli Chemicals Department, at Philadelphia. By odd coincidence, the first United States patent ever granted went to a Philadelphian for a sulphuric-acid process (page 632).

Washing her hair in one of the "Three Rivers of Eden," Eve dried it in the hot winds of what became Babylonia, and is now Iraq. Centuries later her pioneering daughters built crude ash hoppers, made lye, and boiled it with animal fats to make soap. In a few backwoods districts they still do it (page 631).

But great factories go far afield for raw materials; in fact, the geography of modern soap making spreads around the world. From far lands come now the cargoes of strange oils to be chemically analyzed at the factories and used instead of homemade lye and lard.

Filipino coconuts, Nigerian palms, Mediterranean olives, Chinese peanuts, sesame, tallow trees, and soybeans, even Russian sunflower seeds, ride the seas to make our soap.

Fable says man's first soap came by accident when he dropped some tallow from altar candles into a pile of wood ashes on Sapo Hill, outside ancient Rome; hence the name "soap." A crude soap was made in France in the second century, and Castile soap was named for early factories in Spain. In 1800 a French chemist found that soda could be made from common salt; this cut the cost of soap and it came into general use.



Photograph by Willard R. Culver

WE MIGHT STARVE BUT FOR CHEMISTS' RELENTLESS WAR ON INSECTS

Flies are a pest that science seeks to control. Beetles, moths, mosquitoes, roaches, army worms, potato bugs—all menace man's health or food supply. Incessantly chemists work to thwart the villainy of such hungry hordes (pages 623, 626, 628).

Chemists, however, remain the masters of ceremonies in every big factory. Outside Cincinnati, in Ivorydale, you see the colossal plant of Procter and Gamble. Long trains of their tank cars arrive every day with world-wide collections of oils and fats. Here rise 100 gigantic kettles, tall as 3-story houses; each holds 5 carloads of fats. Over each boiling kettle stands a master soapmaker. Now and then he drops down a small bottle on a chain and hauls up a sample for chemical analysis. Glycerin is a valuable by-

product. Printers, dyers, and textile makers, and many others depend on it.

SCOURING THE WORLD FOR SCENTS

Chemical geography figures, too, in gathering perfume for soap. Australian sandalwood, East Indian citronella and lemon grass, French lavender, Spanish rosemary, and other scents are imported. To choose a popular perfume for one toilet soap, 17,000 different women were consulted.

This is a long step from the ash hopper and the old black iron kettle that stood in grandfather's back yard. Still longer is the step to the new soapless household detergents which do not form curds and scum in hard water, thus eliminating the old "ring around the bathtub," the sticky stiff hair resulting from the ordinary shampoo, and the dull colors of fabrics washed in hard water.

The cost of these products will always be higher than the cost of soaps due to the complicated chemical process of manufacture. We cannot expect, therefore, the soaps we are all familiar with to be completely replaced.

Beside the ash hopper, on the show girl's old family farm, there stood an icehouse. Now it, too, is almost obsolete. With gas, electric iceboxes, and new freezing fluids, chemistry is slowly quieting the iceman's once familiar morning yell.

In strange places, too, chemical refrigerants now do many other astonishing jobs.

Some South African gold mines got so deep that workmen could no longer endure the terrible heat. Now, by chemical air-conditioning, miners are digging gold at a depth of 8,300 feet. Likewise, at the Magma Copper Mine in Superior, Arizona, cooling plants operate at a depth of nearly three-quarters of a mile.

Motorbus passengers through hot desert dust between Damascus and Baghdad ride in comfort, for the new "desert express" is air-conditioned. In Yankee submarines, chemists give comfort to the crews by actually making air for them to breathe while they work under water.

CHEMISTS WAGE WAR ON INSECTS

Man dare not falter in his grim fight on evil insects that eat his trees and food crops. About 624,300 kinds exist; 79,840 varieties swarm over the United States, of which about 6,000 are pests that form a veritable bugs' underworld of gangsters.

Dr. Lee Strong, Chief of the United States Bureau of Entomology, says that from one pair of aphids and their descendants, if all lived only one year, could come enough insects to fill the Atlantic Ocean. Cubic miles of bugs! A terrifying picture.

Derris roots and pyrethrum flowers we import to make insecticides. But such poisons are inadequate, and not useful in every fight. So chemists make more. One lethal laboratory, when we arrived, was testing a new fly spray. In a closed chamber 1,000 flies had just been locked up. Then through a hole a new fly-killer was sprayed in. After a moment a blast of fresh air was injected, so we could enter the door. Flies strewed the floor.

"Count 'em," ordered the chemist, and a stenographer did, dutifully, using two columns of her book.

"I count 920 dead and 80 paralytics."

"That's good," said the chemist. "We're getting somewhere" (pages 625, 626, 627).

MAN-MADE RAINBOWS AND IMITATION DAYLIGHT

Pitting his wit against the sun, man now makes true daylight, or any colored light he wants. Evolved by General Electric's house of magic, these new fluorescent lamps use peculiar chemicals known as "phosphors."

To get green, let's say, with the usual incandescent lamp, you simply coat your light globe with a green film, or make the globe of green glass. This gives off the green, but throws away all other colors, mostly as heat.

New fluorescent lamps are long tubes, not globes. Chemists coat the inside of these tubes with phosphors; these can change unseen ultraviolet light into visible, longer-wave lengths (Plate X).

These new lamps are unbelievably efficient. In making a green light, for example, they do not throw away all other colors; instead, they convert the ultraviolet almost all into green, or whatever color is desired. In case of some colors, this magic tube lamp gives off 200 times more light than the old-style globe!

Different phosphors can be made to yield different pastel shades. Astonishing effects of broad daylight also come from these tubes. Examine a daylight tube's inside coating with a powerful lens, and you see it as a patch of red, blue, and



Photograph by Harrison Howell Walker

HER EYES MAY BE BIGGER THAN HER STOMACH

Anne nibbles a jumbo stick of candy made from whey by Uncle Sam's Bureau of Dairy Industry. Science says this milk by-product may now go into confections as well as into casein fibers. In Italy and some other lands much cloth is now woven from such fibers, or from a mixture of it with wool.

green disks. These are the phosphors; working all together, they give the effect of pure daylight, for use in offices, homes, schools, libraries, anywhere.

Here also was developed the now famous sodium vapor light, so widely used to bathe congested highway spots, tunnels, and dangerous bridge approaches with bright, golden light.

Audacious man, intent on perfecting his artificial world, actually uses a compound of iodine and quinine now in coating a glass that takes glare from light—even from bright sunlight. "Polaroid," they named this new material. It has been called "the chemical answer to an age-old optical problem."

By use of this new Polaroid glass in headlights and visors, the automobile industry can take most of the glare out of night driving, give you complete road visibility, and reduce the other fellow's oncoming lamps to two soft violet disks, provided his headlights also have Polaroid

disks. In spectacles, camera filters, reading lamps, etc., Polaroid glass controls light for new uses.

What is it? In simple words, just a film of tiny needle-shaped crystals containing iodine and quinine, all lying parallel and fixed between two sheets of glass or transparent plastic (page 605).

By such feats man builds his new artificial world.

Daily man imitates Nature. In volcanoes she made obsidian, or glass; but it was in chunks. Now man spins it: from a common glass marble he can unwind a 90-mile filament, finer than spiderweb; or he can twist it and make it as strong as piano wire (Plates V, XII, XIV, and page 623).

Glass wool he can make, too, and now he controls Nature by using his own glass thread or wool in fireproof theater curtains, in insulation, filters, and sound-proofing.

Today you also see everyday lumber



Photograph by Willard R. Culver

"NOT CAKES OF SOAP," SHE SAYS, "BUT LACY LEAGUES OF SAPONACKOUS RIBBONS!"

From roller to dryer soap in endless tons runs through Procter and Gamble's Ivorydale works, near Cincinnati (page 627). Boilers here are tall as 3-story houses. Watch trainloads of fats rolling in and you imagine soap enough to turn the whole Great Lakes into foamy suds! Yet they say that the per capita use of soap has long been static!

yield to man-made boards, pressed into any shape desired. Insects may eat ordinary sawed boards, but man now stops this waste with chemistry. He even takes trees or old stumps, digests them, recovers the fiber, and rearranges it to make his own boards that cannot split or stain or rot.

EXPLOSIVE GASES PUT TO WORK

Nature shows her explosive powers in earthquakes, volcanoes, or lightning strokes. Man captures her gases to make powder and dynamite to do his work on dams, canals, roads, and in mines. Before chemists learned this, it took 100,000 men 30 years to build the Great Pyramid of Giza. Now Grand Coulee Dam, three times as big a job as Giza, is soon finished, with fewer men.

Pharaoh's workers rolled and carried materials; at Coulee Dam a giant man-made belt hauls mud, rocks, and even rattle-

snakes, on a continuous conveyer system; and when a great landslide started, man used chemicals to freeze the mud and stones to stop the slide!

In General Electric's laboratory you see men play with a little metal man, who performs on a whirling round table. They do this stunt to show the power of a new permanent magnet alloy "Alnico." With a piece no bigger than a pea one can lift a heavy flatiron; actually, it can be made to lift 1,500 times its own weight.

Beneath the whirling steel table I saw them place a tiny bit of Alnico; on top of the table they dropped the little metal man. He scrambled furiously, tumbled, sprawled, rolled over and over, but always kept his place just above the magnet, no matter how fast they turned the circular table top.

Du Ponts have made a sponge that never saw the sea bottom; yet it would fool even a fish, it looks so natural. It is from spruce. It can be cleaned and sterilized by boiling



Photograph by Paul Pryor

BOILING HOMEMADE SOAP ON A CHESAPEAKE BAY FARM

First by straining rain water through wood ashes in a hopper, she makes her lye. In this she boils her fat, saved from hog-killing time and other domestic sources (page 627).

and won't crumble. Yet it will absorb twenty times its own weight of water. Here are nice soft mattresses, too, and seat cushions made of imitation rubber and blown up like a soufflé pudding!

At Procter and Gamble's you may even see chemists "fingerprint" a slice of cake to study its texture after baking with certain cooking fats.

Like soap (page 627), legend says that glass was also found by accident, when Syrian campers lit a fire of seaweed on the beach.

Perkin, as we've told, was hunting synthetic quinine when he found the first coal-tar dye (page 608).

Now comes the U. S. Patent No. 2,115,886, for a novel color-photography process. Instead of ruled screens or starch grains, this color filter is made from the differently dyed blood corpuscles of sheep.

Even the children are at it. Toy chemical sets, played with by fascinated boys and girls, make smoke, smells, and bubbling

magic in a million homes. In countless classrooms other groups stain their clothes and fingers monkeying with test tubes and tiny bottles. No branch of science holds more devotees, or more portent for tomorrow.

NEARLY ONE-FOURTH OF INDUSTRY IS CHEMICAL

Across our country more than 2,000 research laboratories are busy; membership in the distinguished American Chemical Society, as I write, is about 22,245.

Chemical engineering makes one great factory of the whole United States. We produce half of the world's supply of chemical products.

No other country makes more new things by synthetic chemistry. Dr. Stine, of the du Pont firm (page 601), estimates that since the World War there have come from our laboratories more than 200,000 products entirely new to man. Work with only a few of these has revolutionized the methods and

products of more than a score of vast industries, and brought changes to perhaps 40,000,000 jobs.

"At least one-third of all things our factories now make were unknown in 1880," says Dr. E. R. Weidlein, Director of the Mellon Institute, at Pittsburgh. "New industries, such as the automobile, aircraft, radio, refrigeration, air-conditioning, and synthetic fiber, are children of science that are being continuously strengthened by research."

CHEMISTRY AT YOUR STEERING WHEEL

From your plastic steering wheel on your car to your small girl's doll head, you see the works of synthetic chemistry. Less obvious is synthetic chemistry's magic in the fields of oil refining and the making of new gases, acids, and alcohols. Consider your own automobile. It works, almost perfectly, but only because of years of chemical research on antiknock fuels, special lubricants, brake fluids, durable tires, antifreezes, lacquer, safety glass, etc.

Today we live knee-deep in that scientific romance fictionized by Jules Verne in *Twenty Thousand Leagues Under the Sea* and other yarns. Yet even the fertile-minded Verne could hardly have imagined that New York fashion show girl, in all her chemical costume, stepping into a roadster equipped with radio, hydraulic brakes, and Polaroid headlights.

Yet, to us today, such miracles are commonplace.

How far we've come in chemistry since colonial Jamestown's first chemical industry made pitch, tar, and soap ashes, and glass beads for the Indian trade; or since that first of all United States patents was issued in July, 1790, to a Philadelphia chemist for a new way to make sulphuric acid! (Page 626.)

Colonies belong to empire. Egypt had them; so did Rome; then Portugal, Holland, Spain, England, France, Germany, Japan. By this form of government economy kings gained colonies with which they might trade their finished goods for food

and raw materials found where Nature produced them. After the Industrial Revolution and the rise of the Machine Age, this process gained more momentum.

In such oversea competition for raw material sources often lay the germs of war. Indubitably, ancestors of the fashion show girl sometime helped some king, somewhere, fight for oil, ores, hides, slaves, spices, fibers, food—or gold.

Today in the Power Age, synthetic chemistry tends to diminish the dependence of nations on colonial raw materials. Man's complete conquest of matter is, of course, an ideal only of fancy. Some nations will always have to import food, and certain raw materials, just as we forever may trade finished goods for certain things we need and which our chemists may never make.

Yet each year sees some new synthetic, some dislocation of older sources, older jobs, and older trade routes. Germany makes "Buna" rubber, motor fuel from lignite, sugar from pine trees. England's great Imperial Chemical Industries, Limited, works to free her from shortage of many natural things. Japan, we hear, makes airplane motor grease from fish and a new dress goods from seaweed.

VEGETABLES IN "WATER GARDENS"

Even farming, we know, is a chemical business which mixes air, water, sunshine, and salts to make starch, sugar, gums, and oils. So now nutritious vegetables grow in trays of water and chemicals—without soil; chemists mix farm-crop alcohols with gasoline to make new motor fuels. Trainloads of corn go into chemicals; soy beans, into oil and plastics.

Profoundly, with infinite pains, science seeks still more new uses for farm surplus. Change is incessant, inevitable. "The only perpetual motion is the growth of truth."

No limits appear, for imaginative man, in his drive on the unknown. Prodigal he is in waste of Nature's gifts; compensating, too, in his genius for finding new uses for them—and creating new things that Nature forgot.



FROM NATURE'S HIDDEN BUILDING BLOCKS



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Kodachrome by Willard R. Culver

HE JUDGES DYED YARNS FOR STRENGTH AND SHADE

At a glance he can identify some 1,700 different variations of color! Such men, when thoroughly trained, become so expert that their eyes are recognized, in the dye world, as more accurate in color testing than any machine now known.



TESTING WHISTLES IN SINGING KETTLES IS THIS GIRL'S SOFT JOB.

Through a tube, she feeds air pressure into the aluminum kettle, with a whistle over its spout. If no pleasant sound issues, or if the result is cacophonous, a new whistle is put on.



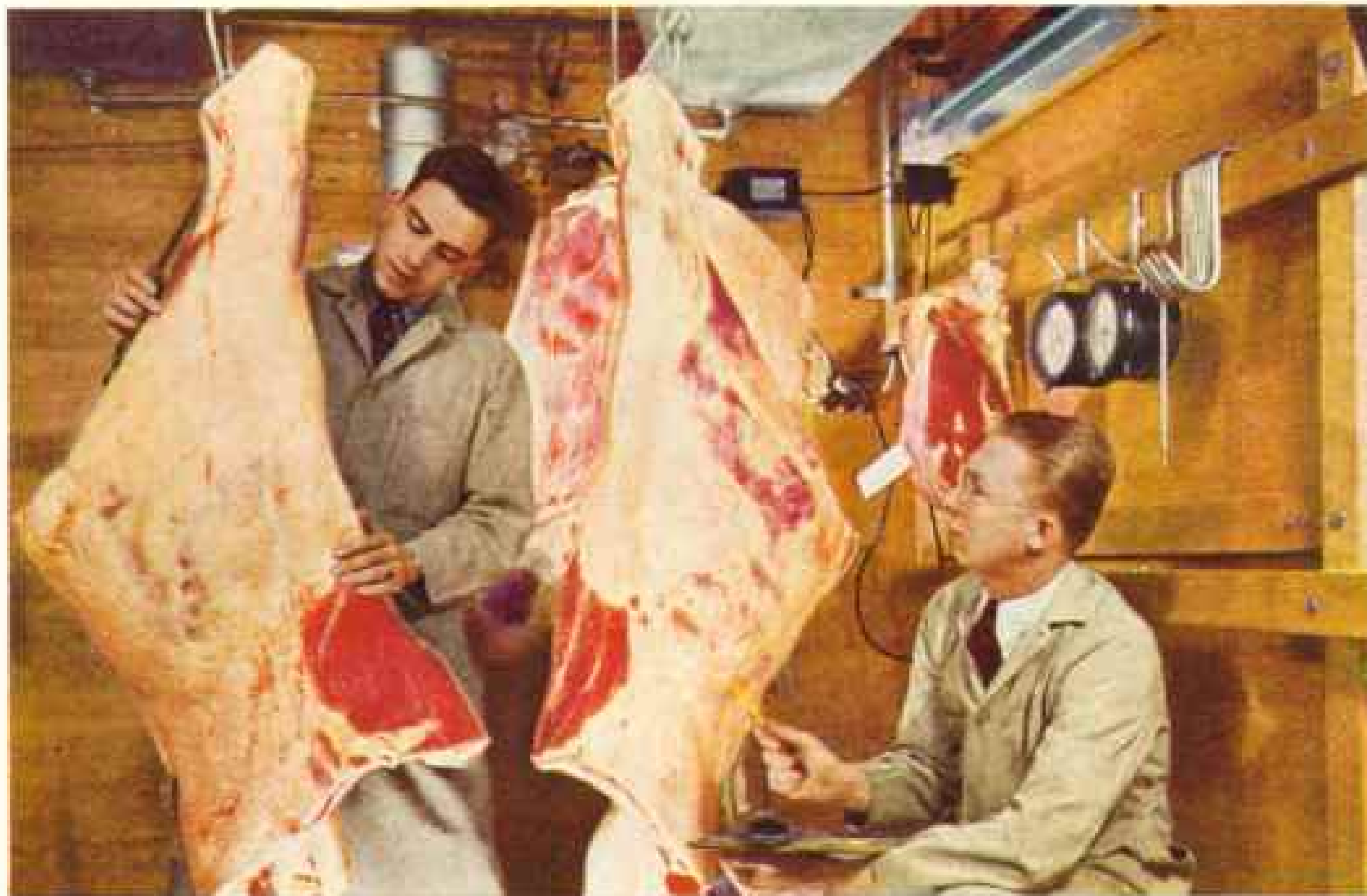
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NOW INVISIBLE ULTRAVIOLET RAYS ARE CHANGED INTO COLORED LIGHTS

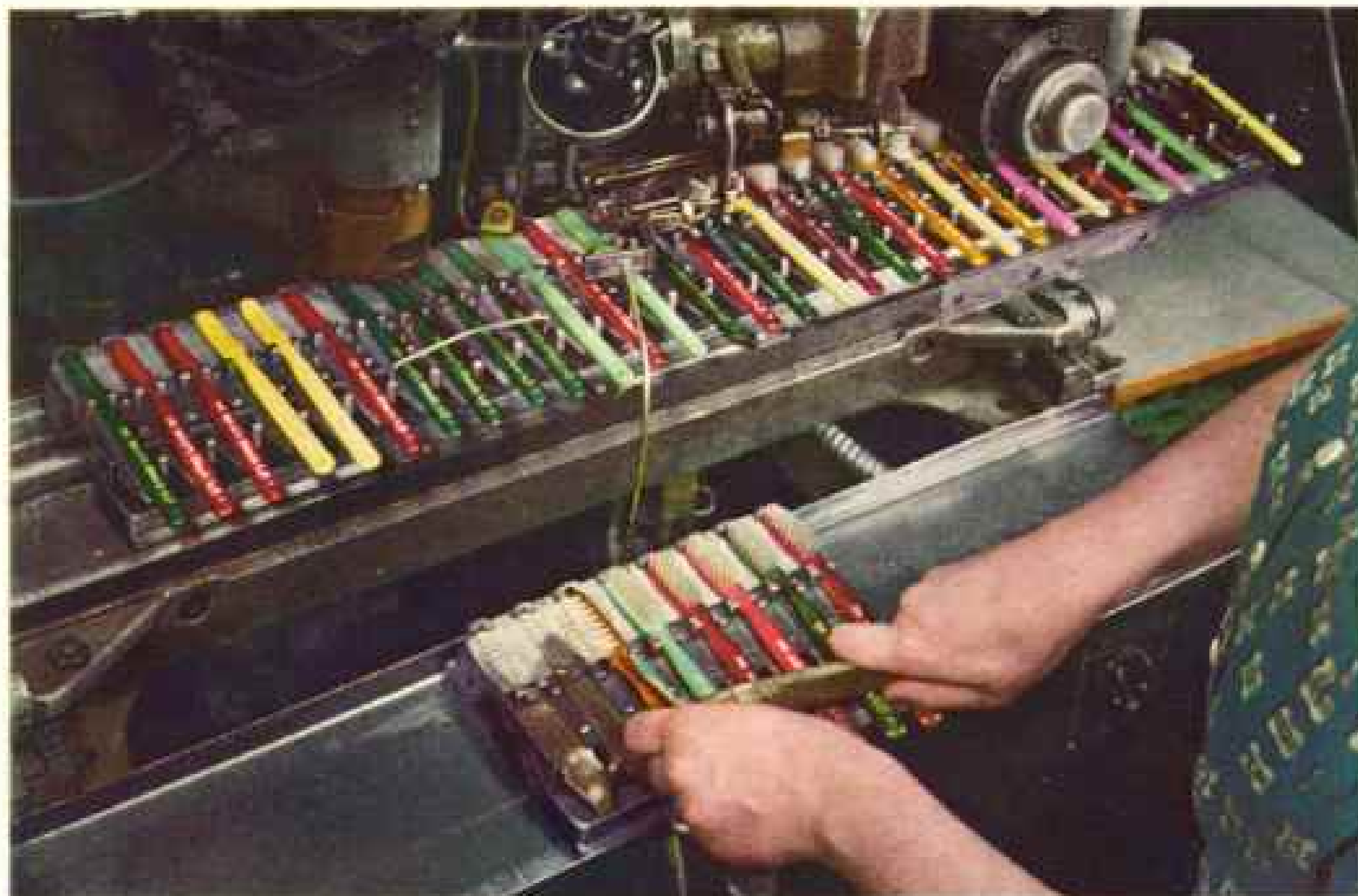
These new fluorescent lamps give 50 to 200 times as much colored light, per unit of energy used, as do ordinary incandescent lamps. A "white fluorescent" permits the closest approach to natural daylight ever invented.

FROM NATURE'S HIDDEN BUILDING BLOCKS



TOUGH BEEF BECOMES TENDER BY EXPOSURE TO ULTRAVIOLET RAYS

Each year the United States eats nearly 4,000,000 tons of beef, much of it tough. Now Dr. M. D. Coulter, of Mellon Institute, has found this new way to tenderize it quickly.



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Kodachromes by Willard R. Culver

WITH BRISTLES NOW MADE OF COAL, SIBERIAN WILD HOGS GRUNT IN GLEE

"Nylon," du Pont's mysterious new textile, is formed and hardened into durable toothbrush bristles. Here in a shop at Leominster, Massachusetts, a machine punches holes in the brush handle, sets the bristles, and fastens them (Plate XIII).



© National Geographic Society

AS TEA MELTS SUGAR, NITRIC ACID DISSOLVES SILVER

Five tons of silver are used each week at Eastman Kodak's factory in Rochester, New York. Left in the tank, when the bars are fully dissolved, is silver nitrate in solution; it goes into making film and paper emulsions.



Kodachromes by Willard R. Cובר

TESTING SPUN GLASS FOR USE IN SHOE SOLES

Today "Fiberglas" forms an outstanding material in almost every industry. Here this new product is being utilized as a sole fiber to provide shoes with inviolated, cushioned treads and to make soles more flexible.



Kodachrome by Willard R. Culver

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FROM COAL, AIR, AND WATER, SCIENCE PRODUCES THESE SOFT, DIAPHANOUS STOCKINGS

Known as "Nylon," this amazing fabric is not imitation silk, but an entirely new material, developed by du Pont after years of research. Strong, durable, and elastic, it seems destined to have a profound effect on the world's long-established silk industry (Plate XI).



"CAREFULLY WOULD YOU SAY THAT PERFUME IS NATURAL—OR ARTIFICIAL?"

If she says "natural," she's wrong, for the flowers shown are lilacs, and no lilac perfume was ever obtained till chemists made one synthetically, as shown in this du Pont laboratory, at New Brunswick, New Jersey.

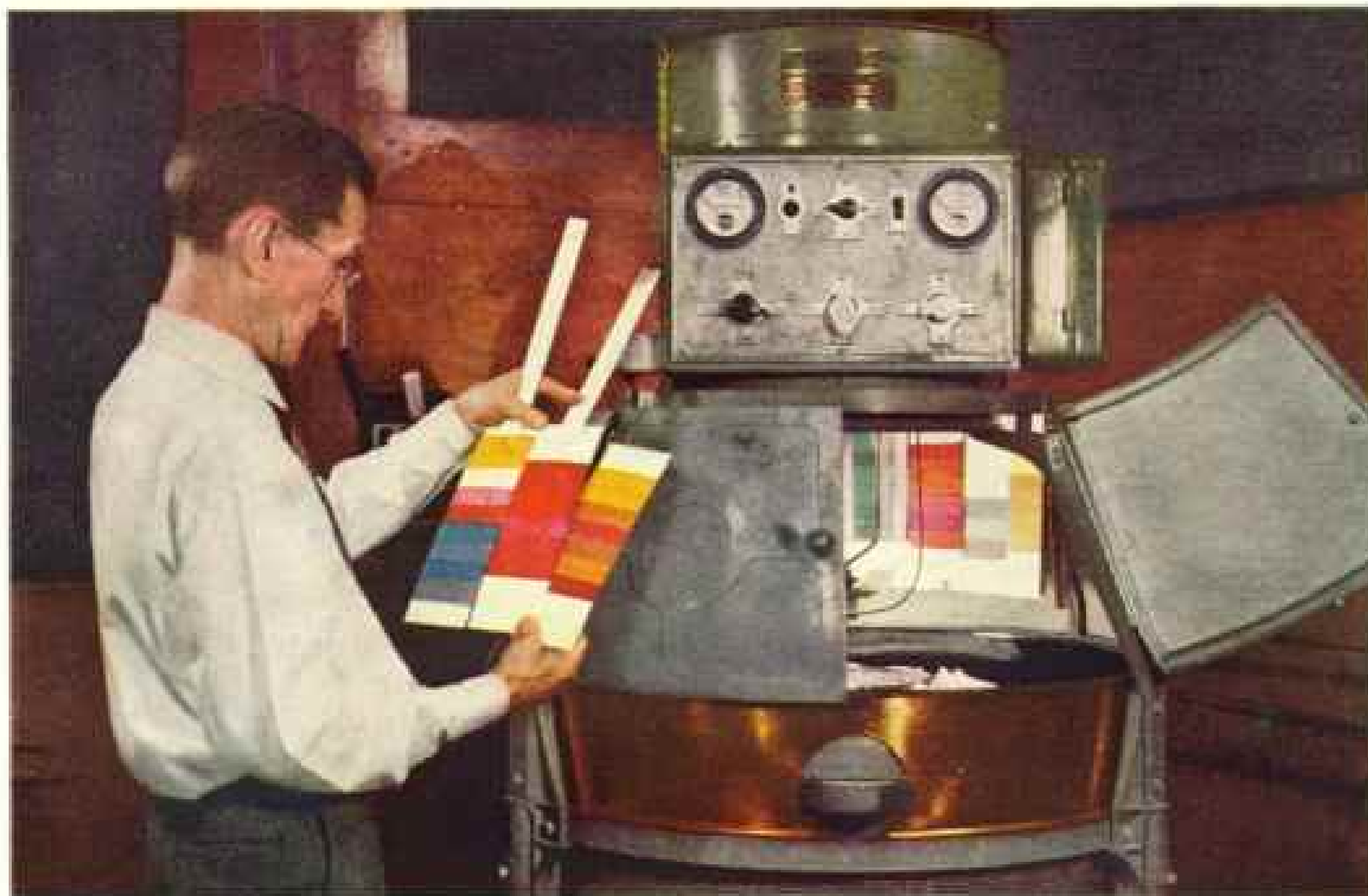


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Kodachromes by Willard R. Calver

PRODUCTS OF A MAN-MADE SPIDER

Filaments of glass, less than 1/15 the diameter of a hair, are drawn from 102 tiny holes in an electric furnace. These wisplike threads are then wound on spools revolving at mile-a-minute speed.



HERE A CHEMIST TESTS THE EFFECTS OF LIGHT ON DYES

The instrument in a Deepwater, New Jersey, laboratory simulates sunshine. It accurately brings out the fading or nonfading characteristics of a dye, but is constant and shows results faster than would sunshine.



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Kodachromes by Willard R. Culver

IN LABORATORY EXPERIMENTS MEN ARE "FOREVER BLOWING BUBBLES"

Equipment shown here is for testing and precipitation of dyes soluble in water. Such dyes, known as "lakes," are used to color paint, varnish, printing ink, lacquer, and wallpaper.



NOT A ROPE TRICK, BUT A NEW INSULATION MATERIAL

"Flamamol" is much used for wrapping wires and cables. Made by General Electric chemists, it is strong, durable, flame-resistant, and unaffected by oils or mild acids. Use of different colors makes it easy to trace circuits.



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Kodachromes by Willard R. Calver

GRACEFUL, GLISTERING NEW STRIRING WHEELS MADE OF "CELULARITH"

(On the bench beside the wheels, in Celluloid Corporation's factory, are shown the molding materials—cellulose acetate, cotton linters, acetic acid, and water—from which these light but stout wheels are made.)

THE NOMADS OF ARCTIC LAPLAND

Mysterious Little People of a Land of the Midnight Sun Live Off the Country Above the Arctic Circle

BY CLYDE FISHER

AMONG the far mountains and rivers of northern Scandinavia, above the Arctic Circle, wanders a mysterious race of people known as the Lapps. Where they came from or who their ancestors were, are matters of debate.

Small in stature but of surprising courage and endurance, most of these sturdy little people are ever on the move. Through whirling snows of the Arctic, up steep mountain passes, through icy rivers, year after year they follow the migrations of their reindeer, upon which they depend for their livelihood.

REINDEER RULE IN LAPLAND

Here we find the usual order of things reversed, man's life being ruled by an animal's needs. The reindeer is the basis of Lappish life. Since verdure in even the best pasturage fields is scanty, the reindeer do not stay long in one place; therefore, few Lapps have a fixed abode and they build no towns. To see how these people, living as their ancestors have lived from time immemorial, meet the problems of life in the inhospitable Arctic is a fascinating adventure.

All the Lapps may be divided into three groups: the poorer sedentary Lapps, who make a living chiefly by fishing; the mountain Lapps, who carry on reindeer culture; and the forest Lapps, who live in the forest district and have settled down to a large extent with their reindeer herds (page 656). There are numerous tribes, which can be distinguished by the shape and color of their caps. Within the same tribe the men's caps are usually different from the women's.

On a late spring day Carveth Wells and I found ourselves on a long, narrow lake well above the Arctic Circle. A pile of miscellaneous baggage lay in the bottom of the little old Finnish boat—cameras and films, food, and gifts for the Lapps.

We had come to Arctic Lapland on a photographic expedition for the American Museum of Natural History, to make still and motion pictures of the everyday life of the Lapps, so different from our own; to carry back to our civilization a glimpse of the

courage and grit of a people carrying on in the face of tremendous odds (Plates I-VIII).

With us as guide and interpreter we were fortunate in having Dr. Erik Bergström,* inspector of the nomad schools of Swedish Lapland, who passed eight months of every year in this Arctic country. His integrity of character and sympathetic interest in the Lapps had won for him the confidence of these mysterious people.

Across the spring heath, bright with the shining yellow of butterballs and the waxy white of dwarf dogwood, rose low, snow-covered mountains, pink in the morning sun. It was a brilliant and unforgettable scene.

Close at hand was a sight that interested me even more. On the shore of Lake Kårtjejaure squatted a small, conical, blackish Lapp tent, or *kåta* (pronounced "kawta"; cf. *cottage*, *cote*)—the first Lapp dwelling we had seen, and the only habitation for miles (map, page 645). Blue smoke curled invitingly from the wide smoke hole.

DON'T KNOCK, THE DOGS WILL ANNOUNCE YOU!

"I should like to call on this family and make some pictures," I told Dr. Bergström.

"Certainly, if you wish," he replied. "You won't even need to knock, for the dogs will announce you. In fact, it is not customary in Lapland to knock at the door."

Suddenly I felt diffident at the thought of intruding upon these strange people, uninvited and unannounced. To be sure, I had come more than 5,000 miles over land and sea to become acquainted with them and to study their customs, but how did I know that I would be welcome? How ought I to behave when once inside the *kåta*?

As if he guessed my thoughts, Dr. Bergström went on: "You will find the Lapps

* Doctor Bergström gave his life in the service of the Lapps. Some time after this account was written he was caught overnight in a blizzard while on a journey to the schools. He died of an illness caused by the exposure.



Photograph by Clyde Fisher

HER TRUSTY LAPP DOG GUARDS LITTLE JOKKMOKK WELL

When the author tried to shake hands with the child, as he had done with older members of her family, the dog seized his wrist and growled, warning the visitor that such liberties were forbidden. "The dog did not mean to bite you, but only to protect the baby," explained the father (page 653).

seated on the floor around a central fire, for theirs is for the most part a floor culture. Usually they have no tables, chairs, or elevated beds. When you enter, shake hands with each Lapp in the tent, and say to him, "Pourist! Pourist!" That is Lapp for "I greet you! I greet you!"

A CALL ON A LAPP FAMILY

"Be careful not to walk behind the fire; that is, on the side of the fire opposite the door, because they keep their food in that place, and from time immemorial that part of the kâta has been a sacred place."

We landed our boat within a few rods of the tent and observed on close view that the kâta resembled the tepee of some of our American Indians. The smoke hole was much larger, being about five feet in diameter, large enough to let in a great deal of rain if occupants did not cover it more or less completely at such times.

The dogs soon discovered us, and four black fellows came out from under the sides of the tent, barking loudly. However, we felt that they were not really dangerous, and, although no human being appeared, we marched boldly to the kâta, lifted the door flap and walked in.

The people in the tent showed no surprise at our entering their home in so unceremonious a manner. Four Lapps were

seated around a fire in the center of the tent: one very old woman with gray hair and wrinkled, weather-beaten face, two young men and a young woman—her three children. They looked at us with some slight show of interest, and soon we were exchanging "Pourists."

After we had shaken hands all around, I looked about curiously. The tent cloth was a lightweight woolen material. The floor was covered with 8 or 10 inches of fresh twigs, which made a soft, springy carpet, slippery and hard to walk upon. There were several reindeer-skin bags on



Photograph by Borg Merell

BY REINDEER ON AND SLEIGH, WOOD COMES TO JUKKASJÄRVI.

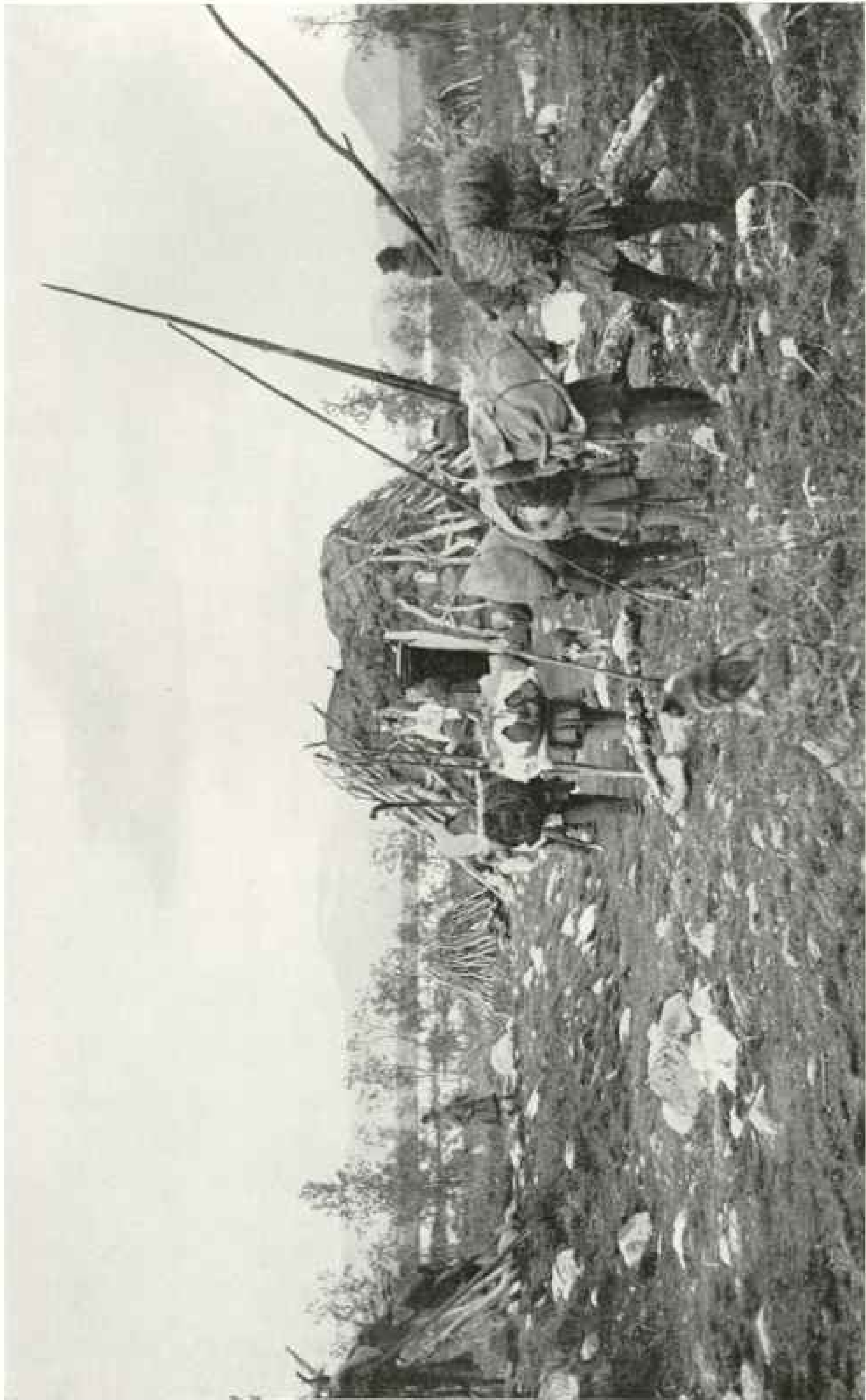
Lapps train the animals for draft and pack work, but only small children ride on their backs. Reindeer are not strong enough to support grownups. This sled is more conventional than the migratory Lapp's *pulka*, which has only one runner (page 656). The driver controls the reindeer with a single rein, attached near the base of the antlers.



Photograph by Clyde Fisher

A LAPP MAIDEN'S ALPINE STAFF MARKS HER GRAVE IN ARCTIC WASTES.

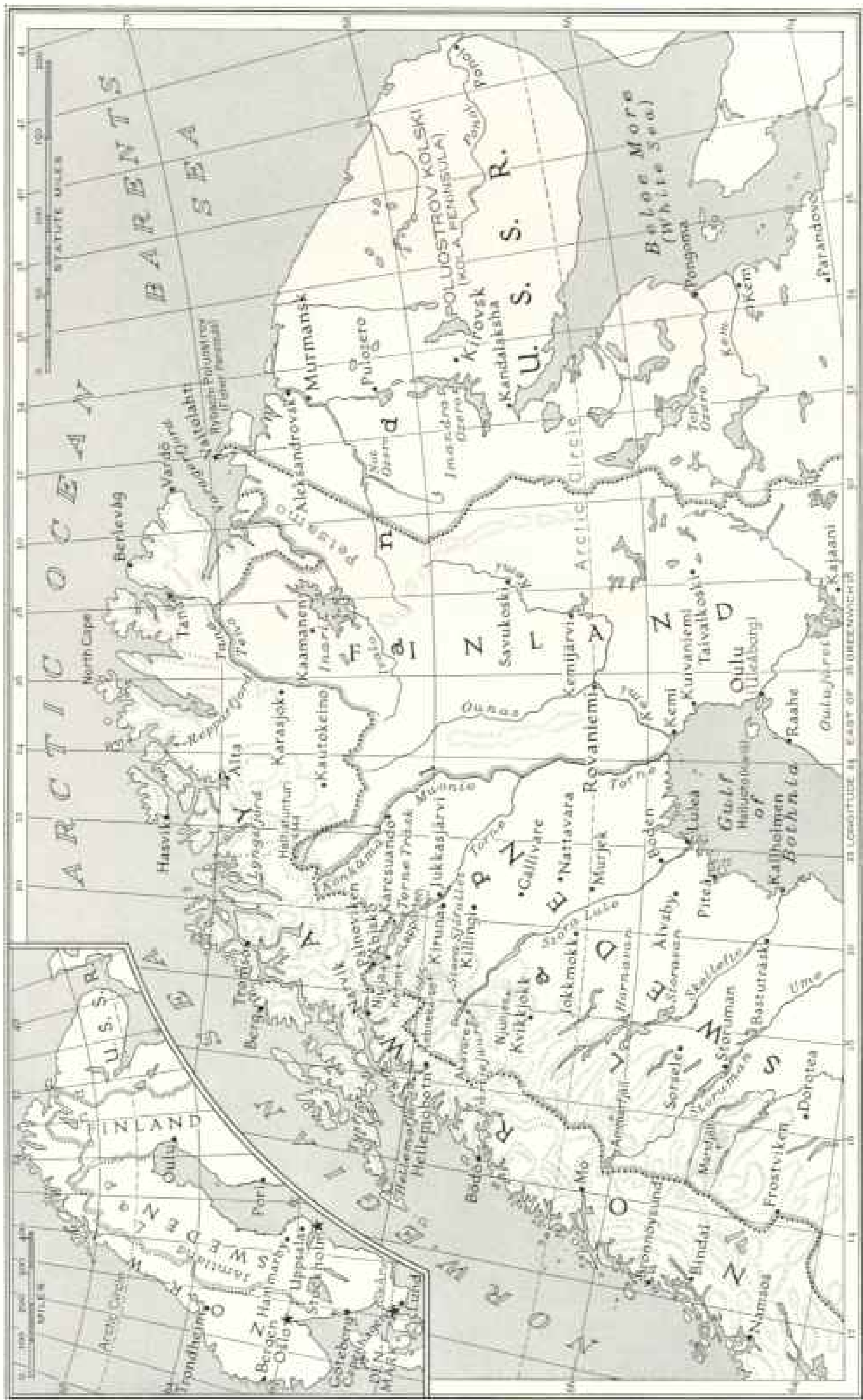
The author's porters, crossing the rugged terrain, pause at the boulder-covered resting place of the girl, who was drowned while crossing a swollen river during spring floods.



Photograph by Borg Mesch.

EVERY ADULT MEMBER OF A LAPP FAMILY CARRIES PART OF THE TENT ON MIGRATION

These nomads are moving camp, ready to follow their reindeer to new feeding grounds. Even in the best fields above the Arctic Circle pasturage is scanty, so the reindeer must constantly move on, and the Lapps follow the animals (page 644).



Drawn by Ralph E. McAleer

LAPPS AND THEIR REMINDER RANGE EUROPE'S FROZEN NORTH, FROM THE NORWEGIAN COAST TO THE WHITE SEA

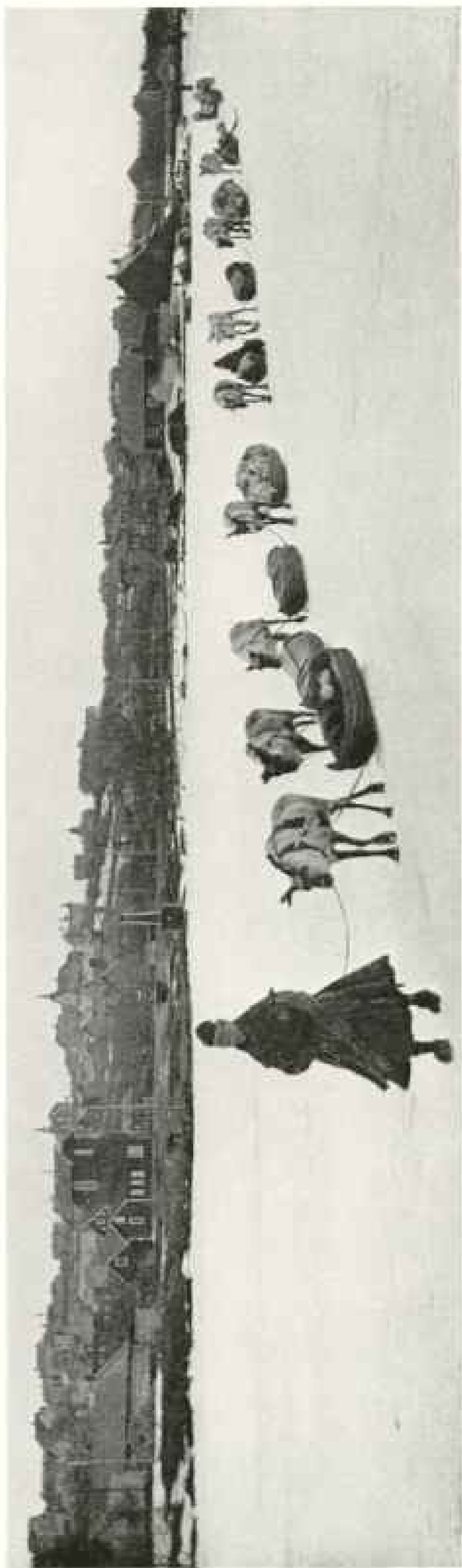
More than half of Lapland lies above the Arctic Circle. The vast region of ice, snow, and sparse vegetation extends over the northern tips of Norway, Sweden, Finland, and the western part of the U. S. S. R., and has no political boundaries of its own. Here unbroken sunlight lasts for several months in the summer, with corresponding periods of darkness in winter. Life centers about the large herds of reindeer, which the nomadic Lapps follow from one feeding ground to another.



Photograph by Doug Mesch

AT THE FOOT OF MOUNT KERON, NEAR TORNE TRÅSK, REINDEER FIND WILL-COME. SUMMER PASTURES

The feeding grounds are eight miles from the Abisko Hotel, nearer for summer visitors to the Arctic (page 665). In winter, the reindeer nose through the snow to find their forage. When an early autumn thaw, followed by a freeze, coats the ground with ice in advance of the heavy winter snows, then starvation threatens the animals, for they cannot penetrate the snow-covered blanket of ice to reach their forage.



LADEN WITH FOODSTUFFS, A REINDEER TRAIN PLUDS OFF TO THE MOUNTAINS FROM KIRUNA



Photographs by Borg Meuch

ACROSS FROZEN LUOSSAJÄRVI, AT KIRUNA, LÄPP AND FAITHFUL DOG FOLLOW A MIGRATING HERD OF REINDEER

The animals may belong to half a dozen families. Ownership is established by the identifying notches cut into the ears of each reindeer when it is a calf.



Photograph by Marcus Beeckinridge

PUP LOOKS ON AS HIS MISTRESS CLEANSSES A REINDEER HIDE

After washing the skin, the Lapp girl stretches it on a rough board and applies the scraper. When a reindeer is killed, every part of the carcass is utilized. Meat is smoked and dried, or sold frozen for shipment to Norway and Finland. Brains and liver are boiled and eaten fresh. Lungs and blood are food for the dogs.

the floor to serve as chairs, and birch-bark cases somewhat like our suitcases, used for storing and carrying various articles. A few pots and pans completed the equipment.

Both the men and the women wore long coatlike garments trimmed with bands of bright cloth.

The daughter, Inka, was busy roasting coffee in an iron kettle swung over the fire, stirring the coffee beans with a stick. With true hospitality she laid aside her work soon after we entered and hung a

kettle of water over the fire to make coffee. The Lapps are coffee drinkers and always serve the beverage to their guests.

I sat down cross-legged, as I often do in camp, and listened to Dr. Bergström speaking to our hosts in Lapp. Suddenly he turned to me with an amused smile and said, "Dr. Fisher, these Lapps think you understand what they say!"

I was astonished, for I knew only two words of Lapp—*Pou-rist* and *Hyvästi* (Goodby). I had already practiced my "How do you do?" when we entered, and was now trying not to forget my other word before we should take our leave.

Laughingly I asked, "Why do they think I understand their language?"

"They say you sit like a Lapp and you look like a Lapp."

I now noticed that the girl was washing apparently clean cups in hot water before serving us.

"Why is she doing that?" I asked.

Doctor Bergström explained that cups are always washed by the Lapps both before and after use. This was one more process than I was used to at home, and the explanation removed any doubts I might have had about sanitary conditions.

Inka raised the lid of one of the birch-bark cases in the back of the tent and



Photograph from Mrs. Alexander Graham Bell

FATHER LASSES THE REINDEER, MOTHER DOES THE MILKING

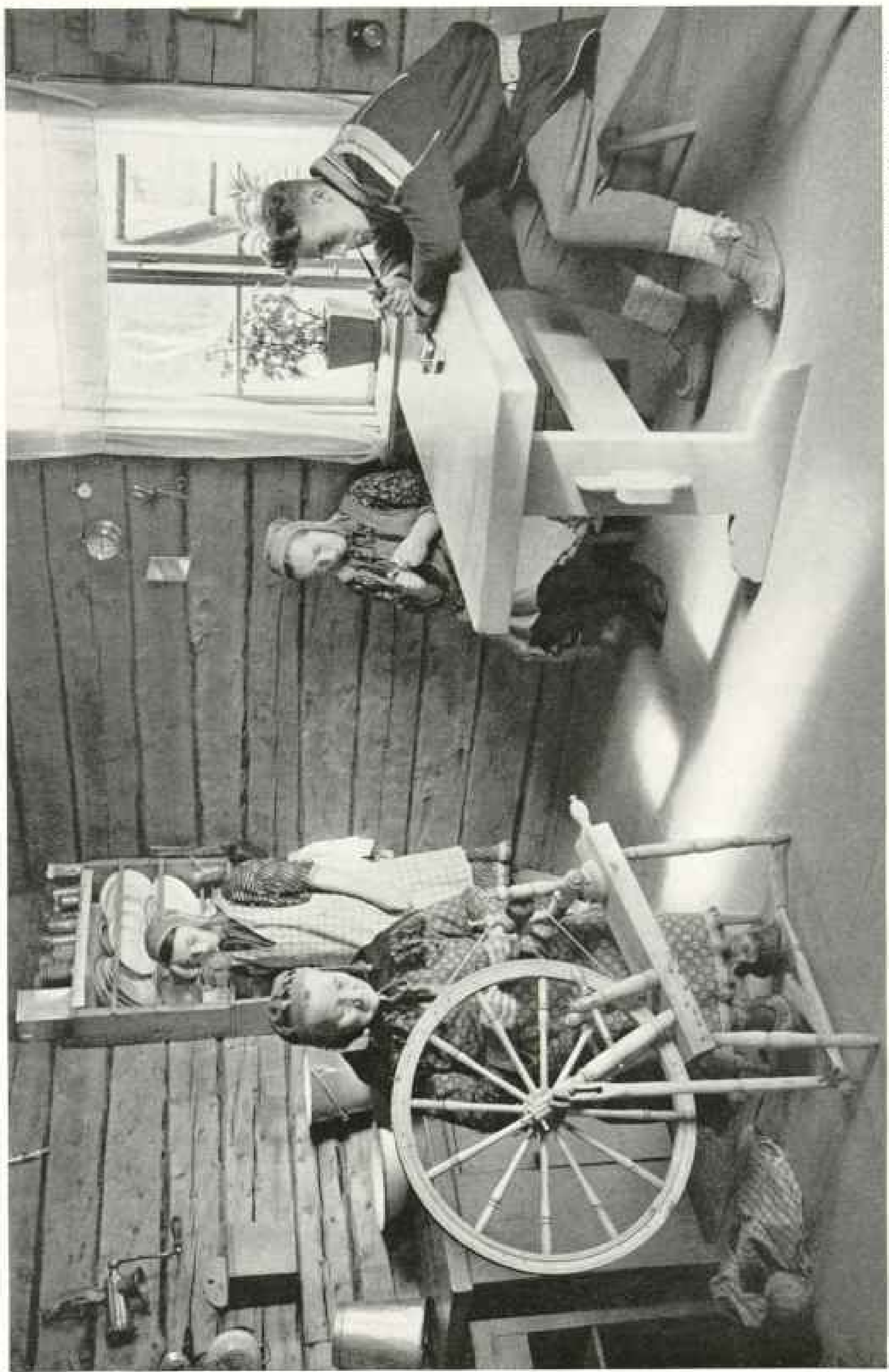
The reindeer cow is not so tame as domestic cattle and must be roped. As accurate with the lasso as a western cowboy, the Lapp always huris it while afoot. Then the protesting cow is pulled in, hand over hand, and held with the improved halter. The rim of the dipperlike wooden bucket curves inward to keep the milk from splashing should the cow kick (page 653).



Photograph by Clyde Fisher

MOUNTAIN BUTTERCUPS BLOOM IN THE MIDNIGHT SUN OF ARCTIC LAPLAND

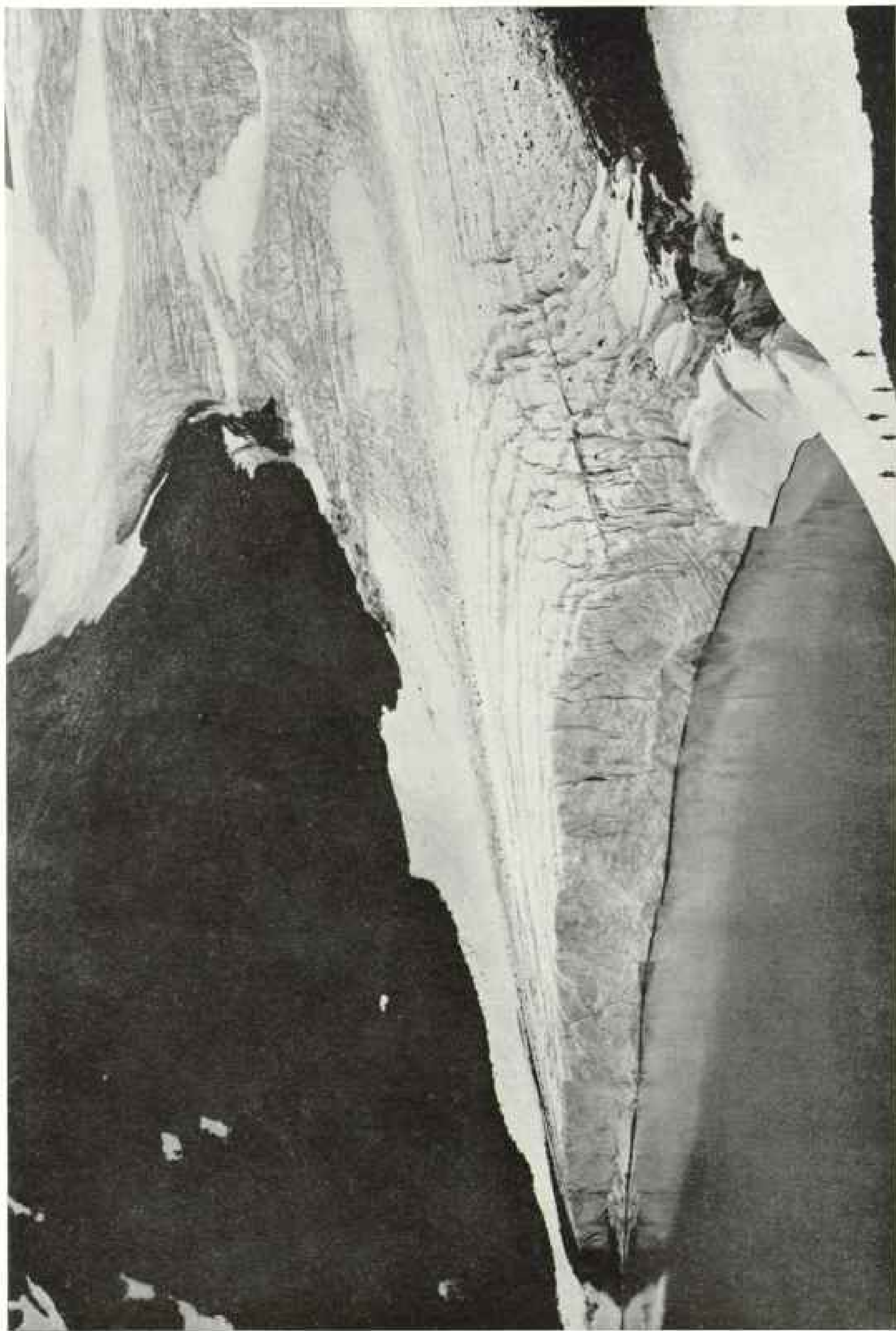
The author made the photograph in mid-July at 1:30 a.m., on the slopes of Mount Njulja, near Abisko. The Lapps call the succulent plant the "reindeer flower" (*Ranunculus glacialis*), because in summer the reindeer feast upon it high on the mountainsides (page 669).



Photograph by Mervin Brockbridge

A LAPP FAMILY OF FINLAND SUBSTITUTES FARMING AND SPINNING FOR REINDEER MIGRATIONS

Differing from the nomadic mountain stock, the forest Lapps have permanent homes and engage in fishing and agriculture (page 641). This home, near Kaamanen, is similar to that of other Finnish farmers of the region.



Photograph by Borg Mørch

STOHGLACTÄREN, VAST SWEDISH GLACIER ON MOUNT. KRONSKAISE, IS 130 FEET HIGH AT THE WATER'S EDGE.



Photograph by Beng Meck

TOO HIGH FOR CHILDREN OR DOGS TO REACH—AN AL FRESCO LAPP PANTRY

The storehouse for the family's supply of dried reindeer meat and other provisions is an elevated platform of sticks, built close to the tent (page 655).

drew out a little old-fashioned coffee mill. Seating herself beside me on one of the rolled-up reindeer skins, she held the mill on her lap and ground the coffee, just as I had seen my grandmother do when I was a boy.

After the coffee had been sufficiently boiled, Inka opened a reindeer-skin bag, drew out a dried fish, and pulled off a piece of fish skin which she put into the pot, scales and all, to settle the coffee. After this, a few coarse crystals of salt were added, I suppose to improve the taste, and at last the coffee was ready to serve.

PINCERS FOR A SUGAR LOAF

Inka poured it into cups fashioned of northern white birch in the shape of small dippers and beautifully hand-decorated with primitive designs. These were passed around on a long, narrow, rectangular

wooden tray, similarly decorated. I later found that these trays were characteristic utensils of all the *kätas* I visited.

To my surprise there was sugar for the coffee, not granulated and not in little blocks, but in a large conical loaf as large as a small loaf of bread. From this the Lapps broke off a piece for each cup with a specially devised pair of pincers.

I put my piece of sugar in my cup of coffee and stirred it as I would at home, but each Lapp placed the lump of sugar in his mouth and drank his coffee through it with a loud sucking noise. Cream there was, too, in the form of goat's milk, heated to remove objectionable aroma.

Knowing that the reindeer was highly prized by the Lapps both for its flesh and for its milk, I asked Dr. Bergström why they used goat's milk.

He replied, "The Lapps are using goat's

milk more and more and reindeer's milk less and less because it is more convenient to keep two or three goats that are willing to stay near the *káta*, living if need be on the very sparse pasturage, than it is to go off a mile or so up the mountains to milk the roving reindeer (page 671).

"Another consideration is that the female goats are more docile than the reindeer cows, which have to be lassoed before they can be milked. Then, too, a female goat gives much more milk than a reindeer cow, although the goat's milk is not so rich."

The hospitality of these Gällivare Lapps was delightful, but the coffee left much to be desired, in spite of Inka's elaborate preparations. The Lapps buy the cheaper grades of green coffee and roast it themselves. However, one is not fastidious about coffee or anything else in the Arctic.

"Well," said Dr. Bergström finally, "we must be on our way."

We shook hands with each member of the family as we had when we came in, but this time we said "Hyvästi! Hyvästi!"—the word I had been trying so hard to remember.

Inka and her two brothers came out of the *káta* to see us off and permitted us to photograph them. This was a concession, since the Lapps are averse to being photographed because of religious scruples and superstitions. It was only by Dr. Bergström's influence throughout Lapland that we were able to obtain the pictures we sought.

LAPP GIRLS LIKE BRIGHT COLORS

As a mark of appreciation we presented Inka with a strip of red military cloth. This is highly prized by the Lapps for trimming their coats, dresses, and caps. It is difficult to obtain in Lapland and quite expensive. Knowing this, we had laid in a supply in Copenhagen, tearing it (not cutting it) into strips as wide as we could span between thumb and little finger.

The strips were torn crosswise of the bolt, so that each strip was about eight inches wide and slightly more than a yard long. Although the Lapps are an undemonstrative race, Inka thanked us with a smile and was evidently pleased.

We went down to our boat and pushed off. When we were a few yards from the shore, the three Lapps waved their arms and called to us quite distinctly, "Goodby! Goodby!"

Doctor Bergström laughed at my astonished question.

"These Lapps came to me privately," he said, "and stated that you had said 'How do you do?' and 'Goodby' to them in their language. They asked me how they might say goodby to you in your language. They are merely showing their characteristic fine courtesy and kindness."

I was eager to visit members of another tribe to compare them with the Gällivares who had just entertained us. For this reason, when about three o'clock we spied another telltale column of smoke at the head of Kártjejaure, I could hardly wait to get to shore.

"This is the home of a Lapp family belonging to the Jokkmokk tribe," Dr. Bergström told me. "Perhaps they will put us up for the night."

The ever-present dogs again announced our approach. Feeling more confident, we boldly entered, to find a family of father, mother, and five children seated on the floor around the fire.

THE DOG GUARDS THE BABY

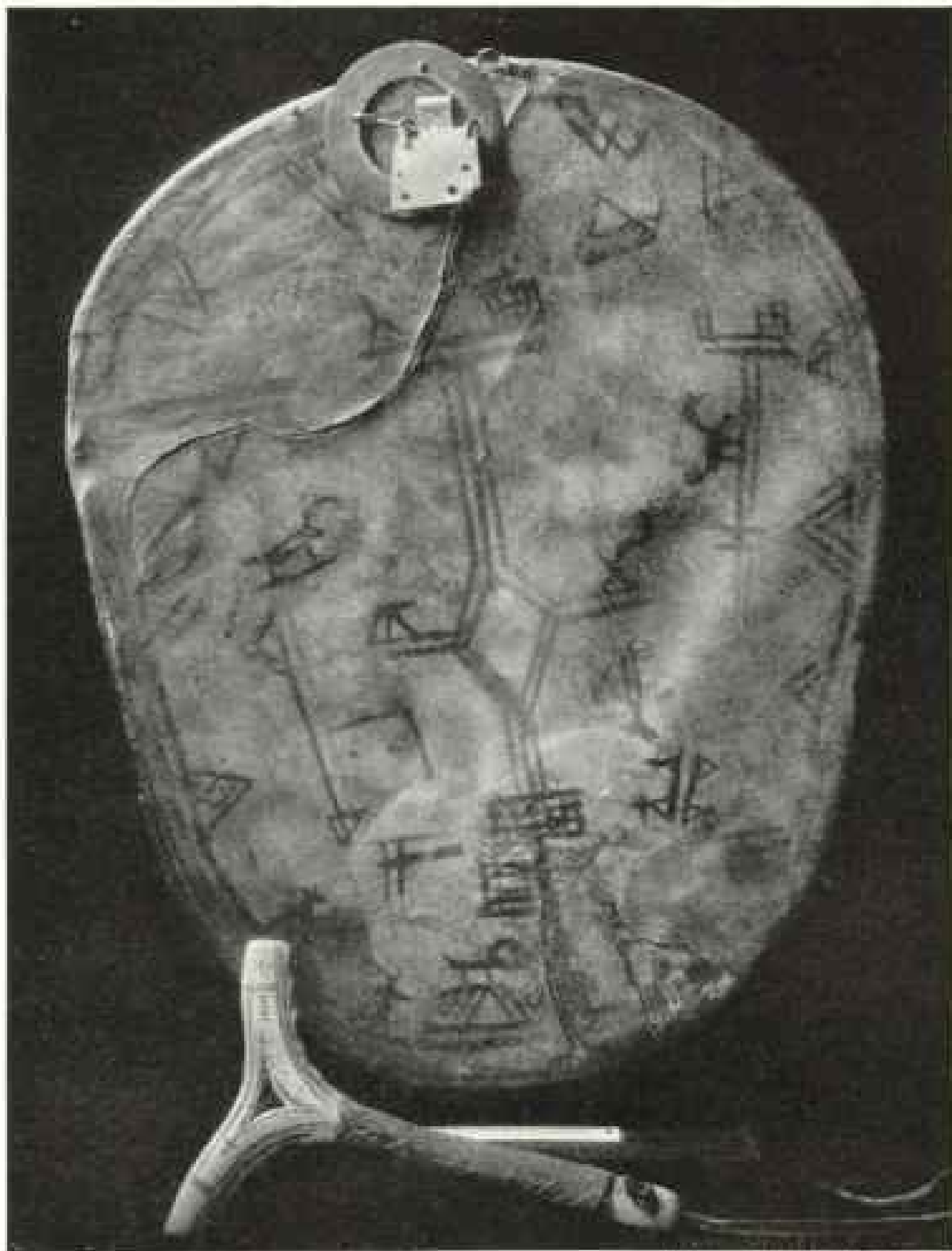
They, like the Gällivares, showed no surprise at their unexpected callers. No one rose as we entered, but they greeted us in Lapp and held out their hands in friendly manner. The mother explained to Dr. Bergström that her eldest son was away in the neighboring mountains, caring for the reindeer.

I shook hands with the adults and elder children, but when I came to the youngest, a baby girl most cunning in her Lapp dress and boots with turned-up toes, and attempted to take her hand, an old black Lapp dog that had been lying beside her snapped my wrist between his jaws and held it with a growl which plainly told me that I should not touch the baby.

Although surprised, I was not hurt, for the dog's teeth had not broken the skin. Noting its action, the adult Lapps quickly slapped the dog away, with words which sounded like scolding (page 642).

The father spoke to Dr. Bergström, who explained to me, "The dog did not mean to bite you, but only to protect the baby. This is his prescribed duty. You can see he did not draw blood."

I asked Dr. Bergström to assure the mother and father that I was neither injured nor offended. Later I learned that it is a common custom in Lapland to have an



Photograph by Clyde Fisher

STILLED IS THE MAGIC DRUM OF THE LAPPS.

Linnaeus, famous Swedish botanist, found the relic, with reindeer hide drumhead, when he visited Lapland in 1732. Now it is on display in the National Historical Museum in Stockholm. When the Lapps embraced Christianity in the 18th century, they destroyed their drums (page 676).

old, dependable dog trained to take care of the baby, since the mother has so much work both inside and outside the tent.

We joined the circle around the fire, seating ourselves upon reindeer skins supplied by the Lapp mother. Here we visited for awhile, watching with much interest everything that was done. No doubt we were as interesting to these people as they were to us.

I wished to reload my camera, and I am sure I must have cut a strange figure with both arms up to the elbows in a black bag. The Lapps, while evidently interested, were

too innately polite to stare at me or to notice openly what I was doing. In this respect they are much like the American Indian, who is too polite to stare or appear curious, no matter how strange a figure you may present.

THREAD OF REIN-
DEER SINEWS

The mother was making thread of reindeer sinews. The tendons were separated into slender strands, which she rolled against her cheek and drew between her teeth. The sinew thread is very strong. It is used chiefly in Lappboots, which are waterproof when sewed with reindeer sinews. The eldest daughter and a Lapp woman caller were plaiting shoebands of bright red and yellow woolen yarn.

We had not been in the tent

long before the mother made tea for us, and excellent tea it was. Perhaps this was in deference to my English companion, Mr. Wells. I do not know. We drank the tea with goat's milk.

Night was approaching, although the sun was still shining brightly. In fact, the sun was never out of sight day or night during our journey in this land. Even at midnight, when the sun was low on the northern horizon, there was enough light for me to take pictures.

Doctor Bergström asked the mother if she could keep us for the night. There was ap-

parently no hesitation whatever in extending hospitality in this humble home. It was delightful—no hurried trips for extra provisions, no hustle and bustle about the house. The family was ready to share its simple comforts with strangers at a moment's notice.

Our hostess merely went outdoors to her pantry, an elevated platform of sticks where she kept her dried reindeer meat out of reach of the dogs, and brought in an extra piece of venison (page 652).

We had a delicious dinner of reindeer meat, smoked with the fragrant dwarf juniper, wild golden mountain raspberries, and ember cakes made of barley meal and water and baked in a shallow, open frying pan set up on edge in front of the hot coals.

These ember cakes, though much tougher, reminded me of the hoeecake of our Southern States.

THE AUTHOR LEARNS TO EAT WITH HIS KNIFE

At this meal coffee was served with a little cube of reindeer cheese instead of milk or cream. The Lapps sliced off slivers of the reindeer meat with their knives, and then skillfully conveyed the morsels to their mouths between knife and thumb, meanwhile turning the knife so that the back of



Photograph by Clyde Fisher.

ONTO THE MAGIC DRUM WENT RINGS AND TWIGS

Hand-carved is the hollow block frame for the drumhead (opposite page). *Noaides*, or sorcerers, gathered about the instrument to mutter incantations, grind their teeth, and tap the drum. During the tapping, the small objects placed on the head shifted from their original positions. The new locations of the rings and twigs on the drumhead held mystical meanings.

it touched their lips. It seemed as easy for them to do this as it is for us to use a fork or spoon, and I was soon imitating them and eating with my knife.

Dried reindeer meat, prepared in Lapland and smoked with dwarf juniper, now is seen in Swedish delicatessen stores in New York and in other American cities. Also imported are golden mountain raspberries (*hjortron*) and mountain cranberries (*lingon*).

The Lapps who migrate with their reindeer have no time to engage in gardening

or in agriculture. Their vegetable food is limited to a few wild berries and to a few plants, of which they eat the stems or leaves or both. The food of the migratory Lapps is largely animal. The article of food ranking next below reindeer meat in amount consumed is fresh fish, about a half dozen kinds being caught and eaten. We were especially fond of the black-spotted trout.

Soon after this excellent meal our hosts prepared to retire for the night. The central fire was banked; and the reindeer skins, which had been rolled up to serve as seats during the day, were unrolled for beds. The family's beds were spread on the floor on one side of the fire, and ours were on the opposite side. There are no partitions or divisions in the tent, but one half of it was always assigned to Mr. Wells and me for sleeping, regardless of the number of persons in the Lapp family.

Our hostess indicated our pile of skins, and we wasted no time in turning in, pausing only to remove our coats and boots. The reindeer-skin bed was surprisingly comfortable. The skins, covered with thick hair two or three inches long, were soft and warm, and the fresh carpet of twigs underneath acted as excellent springs.

Soon asleep, I knew nothing more until I was awakened in the morning by the Lapp mother moving about the tent, and by the welcome aroma of coffee. Like all good Lapp wives, she was the first of the family to rise so that she could uncover the embers and kindle the fire afresh, make coffee, and serve it to her husband in bed.

This morning, maintaining her courteous hospitality, she served coffee to us before she did to her lord and master. Unaccustomed to such luxury, Mr. Wells and I awkwardly sat up amid our reindeer skins and drank with enjoyment, for the early spring is frosty in the Arctic.

After breakfast we prepared to leave. To our kind hostess we gave two lengths of the precious red cloth, then shook hands all round, and said, "Hyvästi!"

Assuming that the dog had been made to understand that we were accredited guests in the household, I again attempted to approach the baby; but before I reached her hand the dog snapped me again by the wrist, growling as before.

The mountain Lapps, the nomads proper (page 641), are entirely engrossed in reindeer culture, and are all migratory. On our journey we saw little of the forest Lapps,

who stay in the forests the whole year round. Their reindeer are different from those of the mountain Lapps, being larger than the mountain reindeer. While forest Lapps engage in reindeer culture to a considerable extent, many find time for agriculture as well as fishing (page 650). We gave our attention to the nomadic mountain Lapps, who live almost wholly upon their reindeer.

Besides the flesh, the milk of the reindeer is an important article of food. It may be drunk when fresh and sweet, eaten with wild berries, or dried, or made into cheese. The milk contains much fat, but butter is not made by the Lapps.

REINDEER LASSOED FOR MILKING

Although the reindeer belong to the Lapps, they are not so tame as the domestic cows of our barnyard, and each reindeer cow must be lassoed before milking. The Lapp handles the lasso as expertly as does our western cowboy. He can throw the rope as far and as accurately, but he always does it while on foot.

After lassoing a cow, the Lapp draws her up to him hand over hand, then makes an improvised halter of the rope, which he holds while his wife does the milking (page 649). The milk bucket is a large dipper with a handle, all in one piece, carved from a burl of northern white birch. The rim is curved inward to keep the milk from splashing out should the reindeer cow kick during the milking.

The reindeer skins are used for boots and trousers, and for coats and dresses, as we might call them. In winter the tuniclike coats or outer garments of the men and women are worn with the hair inside; in summer they are worn with the hair outside. However, in the parts of Lapland we visited, nearly all of the Lapps wore outer garments made of heavy woolen cloth, and all of the caps were made of cloth.

When used for trousers and for many other purposes, the reindeer skins are de-haired as well as tanned. The skins are floated on the water of a lake until the hair begins to slip, when it is easy to remove it. Then the skin is rolled up with the inner bark of the white birch, the tannin of which changes the raw skin to leather.

In winter the reindeer are used as draft animals, a peculiar sled called a *pulka* being drawn over the snow by a single reindeer ox (page 643). The sled, which has a single runner, is shaped like the bow of a

EUROPE'S NORTHERN NOMADS



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Kodochrome by Kahne, Martinowicz

BURLY DEER HERDSMEN WEAR PINK HATS AND TUNICS TRIMMED WITH RIBBONS

Heavy clothes for a warm July day are the thick wool shirts and reindeer-skin trousers and boots worn by these nomads camped for the summer at Kantokkeino, in Norway. Throughout a broad region known as Lapland, extending across the top of Norway, Sweden, Finland, and Russia's Kola Peninsula, hardy Lapps of many tribes follow their vast herds of grazing reindeer.



© National Geographic Society

Kodachrome by Kuhn, Moultonrows

GARBED LIKE COURT JESTERS, LAPP MEN SEEM TWINS OF THEIR WIVES AND DAUGHTERS

Cloth flaps dangle from men's hats in the Rupparrford district of Norway. Lapps once inhabited regions farther south in Scandinavia, Finland, and Russia; other peoples pushed them into the far north. They are not directly related to any present-day European race, and their place of origin is uncertain.



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"HURRY, MOTHER, I WANT A LOOK, TOO!"

A Lapp wife inspects her country through the eye of the photographer's motion-picture camera. Women often don several tasseled silk shawls at once. The boy wears a skinskin jerkin.



Kodachromes by Kuban, Mottelmann

LIFE BELTS ARE STUFFED WITH BUOYANT REINDEER HAIR

Each strand is a hollow, uninkable tube. The fur is also used to fill pillows, pads, and mattresses. Here a Lapp woman picks soft, white throat hair for a *jukka*, or reindeer-sled, resembling a shalloy canoe.



CAMPGROUND TURF IS THE RING FOR A FRIENDLY TUSSLE.

During sunlit nights of Arctic summer the hollow pile of brush affords a cool place to sleep. A cloth tent stands behind. The dozing dog helps herd the reindeer.



© National Geographic Society

Kodiak houses by Kuluu, Moeletshew

IT'S EASIER TO GOSSIP WITH THE HAT FLAPS UP.

In chilly weather they can be tied snugly under the chin. Numerous gay scarfs help protect a mother, son, and daughter from the summer plague of mosquitoes and gnats.

EUROPE'S NORTHERN NOMADS



THE LAPLANDER'S "SUMMER PALACE" IS A SNUG SOD HUT

Heavy stones prevent winds from raising the roof. The boys doing chores belong to the Kautokeino tribe, which follows the reindeer herds north and west in summer.



© National Geographic Society

Kodachromes by Kuhn, Moynihan

NOT A TAFFY PULL!—MOTHER AND DAUGHTER WRING OUT A REINDEER SKIN

The hide has just been dipped in a tanning solution. Besides pulling sleds, domesticated reindeer provide meat, skins for garments and boots, antlers and bones for tools, and sinews for thread.



© National Geographic Society.

CRADLES, LIKE ALL LAPP HOUSEHOLD GEAR, ARE DESIGNED FOR LIFE ON THE MOVE

Kodachrome by Kuhn, Mayslesourwa

The baby's rumble mat is fashioned from a hollowed birch log and covered with soft skins. A cloth curtain may be pulled down to protect the child from sun glare and insects. Red pompons on the boys' hats indicate that these Lapps are Swedish. They are encamped for the summer at Lyngsfjord in Norway. A tin roof modernizes the mud hut, behind.



Kostbudsromer by Kobbve, Mosjøen

BY HIS POM-PON YOU KNOW HE'S A SWEDISH LAPPING



© National Geographic Society

A "SINKAKER" -SHOD HEIR GETS A LIFT AT LYNGSFJORD



© National Geographic Society

Kodichrome by Kihne, Mooretowers

EVEN THE CAMP'S GILT-EDGED BEAU BRUMMELL STUFFS HIS BOOTS WITH GRASS

Lapps wear no stockings, but fill their oversize shoes with dry hay, which is easily replaced. Long leather trousers of this Kautokeino dandy are tied with ribbons over the boot uppers.

bout at the front end and is abruptly truncated at the back end. The single tug of the harness is attached to a collar about the reindeer's neck, from which it passes back between the front legs and between the hind legs to the sled. The reindeer is driven with a single line attached to the base of the antlers.

ONLY CHILDREN RIDE REINDEER

On the migration, reindeer oxen (or castrated males) are used as pack animals, each animal carrying a light load fastened on the back by means of a peculiar saddle, the two parts of which link together over the back. The adult Lapps never ride the reindeer, for it is not strong enough to support them. However, the Lapp children are sometimes carried in this way.

Like the caribou, both the male and female reindeer bear antlers. The antlers of the male reindeer, however, are larger than those of the female.*

Not only does castration make the males more docile—an important consideration in pack and draft animals—but it also changes the time of shedding the antlers.

In normal adult males the antlers are shed after the rutting season in the fall; that is, several months before those of the adult females, which shed their antlers after the birth of the calves or fawns in May or June. The oxen sometimes carry their antlers a few months longer, and shed them usually shortly after the first of the year or in early spring. Also the skin is never shed from the antlers, which are always in the velvet.

The greatest enemy of the reindeer is the Lapland wolf, which closely resembles the gray wolf of America. Some of the Lapps have become expert wolf hunters, pursuing the predatory animals on skis.

As a pack and draft animal, the reindeer has at least one advantage over the Eskimo dog, and that is in the matter of food. The reindeer finds its food where it rests (except when near settlements), but the driver of a dog team must take food for his dogs along with him. For the sake of the migratory Lapps, who move from Sweden over into Norway during the short summer, a special treaty is in force between these two countries to insure the pasturage rights of these nomads of the north.

The Lapp dog is a most important animal in the reindeer culture. He is always used as a herder. It is astonishing to see

how quickly one of these dogs can bring a stray reindeer back to the herd.

The Lapp dogs are never used as draft animals; in fact, they are as different from the Eskimo dogs as Lapps are from Eskimos. By some scientists the Lapp dog is considered a distinct variety or subspecies.

The great majority we saw were uniformly black, though some were spotted. The handsomest ones were cream-colored and would have attracted attention in any dog show in America. I believe the Lapp dog resembles the Samoyed breed more closely than any other I know.†

LAPP DOGS TAKE TURNS AT EATING

Unlike the Eskimo dogs, Lapp dogs are trained from puppyhood to take turns in feeding, and always in the same order. This is done under strict supervision, and the method insures that every dog gets its share. The main food is a hot soup consisting largely of reindeer blood, all of which is preserved at slaughtering time.

On July 4 we climbed Akavare (Akka), one of the most beautiful mountains of Lapland, about as high as our Mount Washington in the White Mountains. Akavare, however, has several peaks instead of one, and several glaciers, three of which are large.

We began our ascent of the mountain along the milky-colored stream which flows out from Hambergs Glacier, and were interested to note the concentric crevasses in this glacier, which are correlated with the fact that a glacier, just like a river, flows faster in the middle than at the sides.

During our tramping over the glaciers of Akavare, our Lapp guide watched us most carefully lest we fall into a crevasse. Whenever either of us got into a dangerous position, we always noted the Lapp with his alpine staff set to prevent an accident. He seemed to be everywhere at once when the trail was treacherous.

On this trip I came across my first "red snow," the phenomenon frequently mentioned by Arctic explorers. It is caused by a microscopic plant, a reddish alga (*Chlamydomonas* (or *Sphaerella*) *nivalis*), which grows and multiplies on the snow. The snow is hardly red, but it is a decided pink. The tiny plant which gives the red-

* See "Deer of the World," by Victor Cahalane, NATIONAL GEOGRAPHIC MAGAZINE, October, 1939.

† See "The Book of Dogs," published by the National Geographic Society.



Photograph by Borg Mesch

THEY SHALL HAVE MUSIC WHEREVER THEY GO!

Father has suspended bells from the necks of the little Lapplings. Even if they elude the watchful dog and stray away while playing, the tinkle of the bells will make the children easy to find.

dish color to the snow is closely related to the one that grows abundantly on the bark of trees in temperate latitudes, often forming a continuous green coating, especially upon the lower and more shaded parts of the tree trunks.

After crossing the boundary between Swedish and Norwegian Lapland, we soon came to the head of Hellemofjord, an arm of Tysfjord, which opens out on the Norwegian coast. On Hellemofjord most of the population is composed of Lapps, and these are of the nonmigratory fishing tribes.

I shall not soon forget our descent into this steep-sided fjord, for the heelless

Lapp boots which we wore in the mountains were not adapted for climbing down steep slopes kept slippery by a steady rain.

Probably the trouble was with the inexperienced wearer, for the Lapps seemed not to be troubled. One doesn't mind sitting down unexpectedly once, but before reaching the bottom of the fjord the experience had become to me decidedly monotonous.

We passed the night with one of these fishing Lapps at the head of Hellemofjord in a little settlement known as Hellemobotn. Because of the long walk in the rain, as well as frequent wading, my feet were as wet as they could be. I was reminded of the remark of an American naturalist who said, "The higher the boots, the more water they hold."

The Lapps wear no hose whatever; instead, they line the boot, just before pulling it on, with dry grass or hay. To the botanist it is not a grass, but a fine, flexible sedge (*Carex* sp.). We also used this shoe grass in our Lapp boots.

GOATS LIKE LAPP "SOCKS"

Before going to bed, I hung up my shoe grass near the door to drain, perhaps to dry a little. When I rose next morning, it was not where I had left it. All evidence indicated that during the night the goats had eaten my "socks."



Photograph by Borg Mesick

IN MOUNTAIN SOLITUDES OF TORNE TRÄSK A LAPP FAMILY PITCHES CAMP

The hamlet of Páinoviiken lies beyond the arm of the lake at right. About ten miles away is the village of Abisko, where many travelers journey to see the glories of the midnight sun. Lappporten, or Lapp Gate, opens a way through the peaks far in the distance.



Photograph by Clyde Fisher

LINNAEUS, "FATHER OF BOTANY," ONCE WANDERED IN THESE GARDENS

The author visited the cottage at Linnés Hammarby, near Uppsala, Sweden, where the great scientist passed his last summer (pages 668 and 675). Now the humble dwelling is a shrine for naturalists. In the year George Washington was born, Linnaeus explored Lapland, and classified its flora.



Photograph from Clyde Fisher

THE AUTHOR SITS IN THE SEAT OF LINNAEUS

Dr. Fisher poses in the saddlelike stool used by the Swedish botanist when he lectured at the University of Uppsala. The photograph was made outside the little stucco-covered museum devoted to Linnæana at Hammarby (page 676).

This was the more serious because we had no more of the sedge, and could not conveniently replenish our supply then and there. However, I dug out from our camera supplies some excelsior and used this for socks during the next few days. Knowing the goat's omnivorous appetite, I was henceforth careful of even the excelsior.

We traveled on to Abisko on Torne Träsk where we visited the Swedish Scientific Station. Here meteorologists, geologists, botanists, entomologists, and other scientists carry on research work in the Arctic. I examined a modern seismograph invented by a Russian at this station and

was amazed to find how delicately responsive it was. It was especially noteworthy as one of the most northern seismographs in the world. By means of kites, equipped with lightweight recording instruments, there had also been carried on here important research work on conditions in the upper air.

With the Tourist Station at Abisko as a base, I climbed Njulja (Mount Nuolja) three times, once with Dr. G. Einar Du Rietz of the Department of Botany in the University of Uppsala, whose studies in ecology and plant geography are well known and much appreciated in America.

The trip with Professor Du Rietz, who says that Njulja is one of the richest mountains botani-

cally in all Lapland, was made especially for photographing Arctic alpine flowers.

LAPLAND HAS 99 KINDS OF DANDELIONS

One of the most surprising things about the Arctic is the abundance of wild flowers which bloom during the short summer. Another less pleasant surprise was the abundance of mosquitoes over the snow fields. I would brush them from my coffee, but before I could lift the cup to my mouth there would be several more on the surface of the beverage.

Because of the present distribution of Arctic plants, it is believed that some time

in the past there must have been an easier means of dissemination around the Pole than now. Not a single family and scarcely a genus of Arctic plants is known that is not circumpolar in distribution.

In comparing the evolution of certain genera of plants in Sweden and Swedish Lapland with that of eastern United States, I observed some striking contrasts. For example, in Lapland, in fact in all Sweden, there is but one species of goldenrod, whereas in eastern United States there are more than sixty! On the other hand, in eastern United States there are only two species of dandelion; in Sweden there are 99!

While tramping with Professor Du Rietz, I made photographic studies of butterballs, or *smörboll* (*Trollius europæus*), which grow in meadows about the upper limit of trees on Njulja. The plant, which grows knee-high, belongs to the buttercup family. The flowers never open out like buttercups, but always keep a globular shape similar to that of the flowers of our yellow pond lily. In English they are sometimes called "globeflowers." The flowers, which are more than two inches in diameter, are bright yellow. A meadow of these is an unforgettable sight.

A true buttercup (*Ranunculus glacialis*) growing on top of Njulja interested me be-



Photograph by Boris Mesch

"NO GOOD UNLESS THE WIND'S BLOWING IN HIS NOSE!"

So Johan Turi (Thuri), Lapp author, describes his fellow tribesmen from the Jukkasjärvi District. In his *Book of Lapland* he extols the merits of these nomad reindeer herdsman as they doggedly follow their animals over the high fells of the Arctic, through the fierce winds and driving snows of winter blizzards.

cause this succulent plant constitutes the principal food of the reindeer when they reach the highest parts of Lapland. It is called "reindeer flower" (page 649).

From Abisko I crossed Torne Träsk to visit Johan Olafsson Turi, the Lapp author, who has since died. His fascinating book, entitled in English translation *Turi's Book of Lapland*, was the first to be written by a Lapp about his own people, and in recognition of this work he was pensioned by the Swedish Government.

Now too old to migrate with his people and their reindeer, he was living the year



Photograph by Borg Mesch

JOHAN TURI'S "BOOK OF LAPPLAND" WON A GOLD MEDAL FROM SWEDEN'S KING

The venerable Lapp author, first of his race to tell the story of his own people, is shown receiving the decoration in the Jukkasjärvi schoolhouse. Turi, who did not know how old he was, had been a nomad from birth, until advancing years forced him to give up the annual migrations with his tribe. He retired to a cabin in a forest near Torne Träsk and there, with the assistance of a Danish writer, Emilie Demant Hatt, he prepared the volume of Lapp folklore which made him famous. He died November 30, 1936 (page 669 and below).

round on the shores of Torne Träsk, where he devoted much of his time to fishing. We ate a meal with him at his simple home, and found him a fine, likable person and a genial host. He was naïve, and had a strength of character resulting from more than threescore and ten years amid Lapland's mountains.

FOLLOWING A LEMMING MIGRATION

Having heard much of the migration of the lemming in Scandinavia, we were most eager to see this little rodent (page 671).

Its migration occurs every few years, at irregular intervals. The chapter on the lemming in *Mårbacka*, the autobiography of Selma Lagerlöf, gives a vivid picture of its mysterious coming and going.

We were lucky enough to run into the tail end of a lemming migration in the vicinity of Great Lake Fall (Stora Sjöfallet) on the Stora Lule River. First we observed droppings of the lemmings in ever increasing numbers, until they became so numerous that it was almost impossible to

obtain clean water even from melted snow.

The lemmings on their migration do not stop for snow or water, or anything else. They even swim out to sea and drown. Soon we came across more or less mummified carcasses, and presently saw the lemmings running across the heath.

They are not much afraid of human beings or dogs, and are extremely pugnacious when cornered. In attempting to frighten a man away, they will jump at him repeatedly, giving a little barking sound at every jump. I could not help admiring their courage, for I never saw one show the white feather.

They are a little bigger than our chipmunk, which they also resemble in color, but the tail of the lemming is so short that one cannot see it as the animal runs about. They reminded me of diminutive guinea pigs, brick red or yellowish red with some black above and light below.

Why does the lemming migrate? There are two theories: the first that, having exhausted its food supply in a certain



SHE PREFERS HER GOAT—IT'S EASY TO GET!

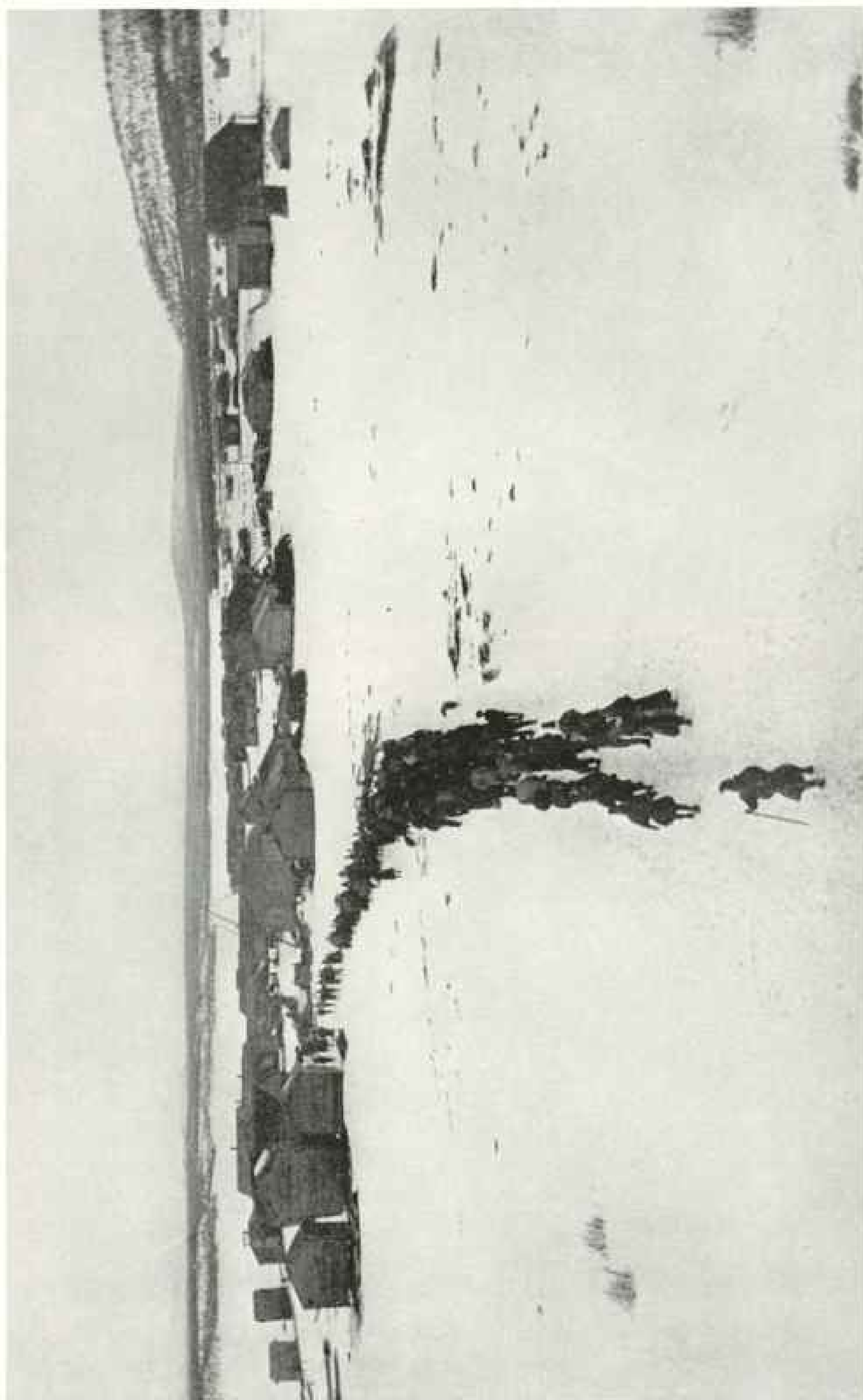
Nanny stays near the tent always, but the Karesuando woman would have to hike up the mountain to reach a reindeer cow, and then wait until her husband lassoed it before milking. In addition to being more docile, goats also give more milk, even though it is not so rich. More and more, the Lapps are turning from reindeer to goats for their milk (page 655).



Photographs by Clyde Fisher

WHEN BABY LEMMING GROWS UP, HE MAY MARCH INTO THE SEA TO HIS DEATH

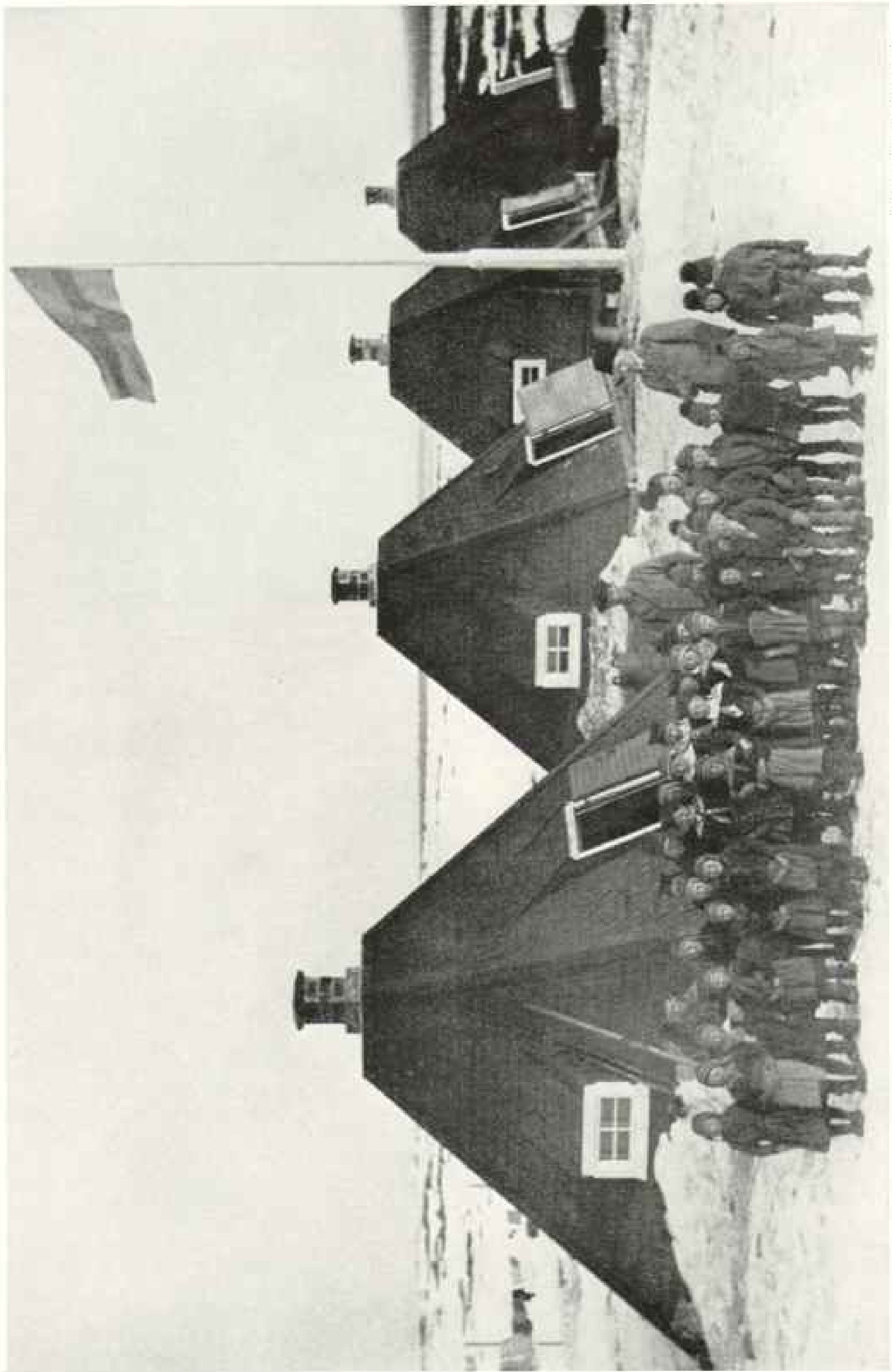
At irregular intervals through the years, these Scandinavian rodents, about the size of chipmunks, descend in multitudes from the mountains and journey to the ocean, where they drown themselves. They move mostly by night, feeding and sleeping by day. So prolific are these small animals that they actually increase in numbers during their frenzied journey (page 670).



Photograph by Dora Mosch

DIVINE SERVICE OVER, DEVOUT LAPPS TRUDGE BACK TO THEIR HOMES THROUGH THE SNOW

The photograph was made on an Easter Sunday from the belfry of the church in Jukkasjärvi, centuries-old Lapp village near Kiruna (page 674). On March 25, the day of the Annunciation, the church always is crowded for christenings, marriages, and funerals. The Lapps come in sledges from all the countryside for the various services. The bodies of many who died during the winter in the mountains are brought down for burial.



Photograph by Borg Mesch

YOUTHFUL SOMADS ATTEND PERMANENT SCHOOLS IN WINTER, BETWEEN MIGRATIONS

Three upper classes are taught here at Källingå, and also at Juhkajärväl. Lower classes are conducted in the portable Lapp mountain schools (page 175).



Photograph by Clyde Fisher

"SOON YOU WILL BE BIG ENOUGH TO RIDE A REINDEER, TOO, LITTLE BROTHER"

In the meantime, Mother will carry him, cradle and all, slung upon her back (Plate VI). The chubby Lapping's bed is lined with moss and linen, and under his head is a feather pillow. If he gets tired, he probably will find solace in sucking a piece of cooked reindeer fat.

region, it moves out to get food; the other, that it runs blindly because of a disease, perhaps an infectious or contagious bacterial disease. Fitting better with the second theory is the fact that the migrating creature goes until it dies.

I had been commissioned to examine the educational system of Sweden, from the elementary schools to the two complete universities of Lund and Uppsala, the latter founded before Columbus discovered America.

SCHOOLS WANDER WITH THE LAPPS

In carrying out this project, I traveled for several weeks over the country from Skåne in the south to Jämtland in the north. The whole undertaking proved worth while, but none of the schools interested me more than the nomad schools established by the Swedish Government in Swedish Lapland (676).

These nomad schools move along with the Lapps on their migration. School is conducted in a *kåta* set aside for this purpose just as long as the Lapps remain in one place—a week or ten days or two weeks; then it is moved to the next stopping place on the migration. Teachers are usu-

ally Lapp men or women trained in a special seminary at Murjek. Occasionally the teachers are Swedish girls.

The children are given a practical course of study which includes the Swedish language, numbers, local geography, and elementary natural history based upon plants and animals with which they actually come into contact. When reciting, the pupils did not rise to their feet, but to their knees—probably because of the sloping sides of the low tent and the cramped quarters.

After visiting two or three of the real nomad schools, I desired to visit one of the permanent schools which the children attend during the winter when the Lapps are not on migration. This we had opportunity to do at Jukkasjärvi, a Lapp village in Sweden several hundred years old about ten miles east of Kiruna (pages 672, 673).

Before entering the village, we had to cross the Torne River, the outlet of Torne Träsk, a broad peaceful stream here. We hired two Finnish women to row us across in a Finnish boat such as we had frequently seen and used in Lapland.

In the Lapp school at Jukkasjärvi only the three upper classes are held, the three



Photograph by Clyde Fisher

MIGRATORY LAPP PUPILS CAN'T ESCAPE TEACHER—SHE'S A NOMAD, TOO

Schools move from one location to another every week or ten days because children accompany their parents on the annual trek with the reindeer herds. Miss Elisabet Sjulsson, the instructor, traveling with her class, was encountered here at a temporary stopping place near Kvikkjokk.

lower classes being conducted in the nomad schools in the *kátas* in the mountains. The permanent schools have excellent buildings and fine equipment provided by the State.

These well-built schoolhouses were painted red and trimmed in white, a color scheme common in Swedish cottages (*stugor*). There were modern desks and seats, good blackboards, charts, maps, pictures, etc. On the walls were hygiene, anatomy, and natural-history charts, and many maps.

We were told that the Lapp children especially enjoy geography, which might be expected because of their migratory habits. There were maps showing the migrations of the Lapps and the districts where they have the right to pasture their reindeer, this material being used for instruction in the course of "nomad knowledge," important to the Lapps and most characteristic study of the nomad schools.

At the time of our visit, in late July, the Lapps were all away on their migration, but we were shown about the school by one of the teachers, a Swede. On one of the blackboards we observed an amusing drawing, very un-Lappish, captioned *Leve de Lappen* (Long live the Lapps!).

We were told that it had been made by Princess Juliana of the Netherlands a few weeks before, on a visit of the Queen and her party to this school.

I inferred that this was perhaps the first drawing made by a royal visitor on the blackboard in a Lapp schoolhouse, so I photographed it and later sent the teacher prints for his pupils.

NO ATTEMPT TO CHANGE LAPP HABITS

The thing which impressed me most about this school was the sensible boarding department. The Lapp children live, eat, and sleep in permanent *kátas*, where they are taught cleanly habits of floor life, to fit them for life in their home *kátas*. When they return home, they will not have had their floor culture interfered with; they will not have to readjust themselves.

It was my privilege to visit Linnés Hammarby, located near Uppsala. This was the last summer home of the most widely known botanist who ever lived, a shrine for all naturalists (pages 607, 608).

In 1732, the year in which George Washington was born, Linnaeus made a journey through Lapland which he described in his



Photograph by Hartmann from Black Star.

A LAPP BOY LEARNS HIS METERS AND DECIMETERS

Pupils and blackboard are on the floor, for nomad Lapps do not use tables and chairs. Reckoning distance is important to these wanderers. Geography is a favorite subject (page 674).

fascinating diary, *The Lachesis Lapponica*, copiously illustrated with his own pen drawings. Here the "Father of Botany" collected Arctic plants, including his favorite, *Linnaea borealis*, or twinflower.

He also brought back a Lapp magic drum, now in the National Historical Museum in Stockholm (pages 654-5). The Lapp used this drum to foretell the future and to answer such questions as where lost reindeer were to be found, and whether sick friends or relatives would recover.

When the Lapps were Christianized, they were taught that the use of the magic drum was sinful, and they were persuaded—even compelled—to destroy their drums. This they did so thoroughly that the drums are now extremely scarce even in museums.

At Mount Njunjes we visited a self-educated Lapp family, three of whom were naturalists. They had received their training in natural history from a German scientist, who for a long time had collected in this vicinity. They knew the Latin scientific names of the wild flowers, the birds,

and the butterflies. (I tested them on the first two.) From two of these brothers I obtained for the American Museum of Natural History a few butterflies which they had collected and carefully labeled.

We wonder why the Lapps stay so far north where living conditions are necessarily difficult; but they seem contented and seldom leave their native heath.

After I had seen a small Lapp man carry my heavy motion-picture camera for fifteen hours one day in the rain, and after I had tramped twenty-five or thirty miles with Magnus Holmbom, the Lapp ski runner, I was ready to take off my hat to their grit and endurance.

I have observed no more temperate and peaceable people than the Lapps. It is certainly true that they have been unprogressive in many ways. They live in tents, as their ancestors have lived for hundreds, if not thousands of years. Who will say that the tenacity with which they have held to the culture of their forebears has been a disadvantage?

HISTORIC DANZIG: LAST OF THE CITY-STATES

BY WILLIAM AND ALICELIA FRANKLIN

"CRISIS or no crisis, we must see Danzig!" With this firm resolve calming our political jitters we boarded the Corridor Express in the eventful summer of 1939 for a plunge into the troubled area of the Free City of Danzig, last survivor of a long line of city-states.

From Athens and Venice to Bremen and Riga, every independent secular city of the past had long since struck its colors before the rising tide of modern states. Except Vatican City, Danzig alone, until September 1, 1939, when it was made a part of the German Reich, still flew its own flag, issued its own money, and made its own laws. Danzig was a living relic of bygone days, and we were determined not to let this historical oddity slip through our fingers.

Across our path lay the Polish Corridor (Pomorze), that 130-mile-long wedge of territory from Thorn (Toruń) to the Baltic which severed East Prussia from the rest of Germany and thereby furnished Poland with a direct approach to her narrow bay window on the Baltic Sea.

For some years after the World War a trip across the Polish Corridor had to be made in locked coaches with the shades drawn, but we found the process surprisingly painless. Behind the barbed-wire frontier at Konitz (Chojnice) our German train ground to a halt, and after substituting a Polish locomotive we again sped on our way, through deep pine forests and rolling hills of rye to the flood plains of the Vistula River and the towering battlements of the Marienburg (page 684).

CRUSADERS' CASTLE—WITH CENTRAL HEATING

The mighty Marienburg (Castle of Mary) is the key to Danzig, past and present. Standing on the very frontier of East Prussia, the fortress dominates the area where according to the Treaty of Versailles the boundaries of Poland, Germany, and Danzig met.* In earlier centuries the significance of the Marienburg for Danzig was even greater, for from this stronghold Danzig received its first military protection as well as its earliest and most char-

acteristic architecture, a form of early Gothic in rough, red brick.

One is surprised to learn that the builders of the Marienburg were none of the usual feudal barons who adorned the medieval landscape, but rather the religious Order of the Teutonic Knights. These were Crusaders, who, after returning from the Near East, turned their energies to colonizing and Christianizing the pagan lands of the southern Baltic regions.

Touring the castle, we were amused to find that the warrior-monks had imported many a Byzantine touch, and, practical-minded, had constructed central heating shafts leading from the basement to all major quarters. Although our guide didn't mention it, we were convinced that here was to be found the real reason for the long waiting list of candidates which the Teutonic Brotherhood boasted of in the otherwise chilly 13th century!

At Marienburg we boarded an antiquated "local" for an hour's ride through one of the world's smallest states. Although the territory of Danzig was only three-fifths the size of Rhode Island, yet the Free City had all the paraphernalia of the giant nations of the 20th century, including its own customs inspectors, looking most imposing with their brass buttons flashing the official seal of their tiny state.

Our particular official bowed stiffly and asked for our baggage. When I indicated all six weighty suitcases, he stared in amazement, glanced furtively in the direction of Mrs. Franklin, and with a sigh of understanding stamped our luggage, sight unseen.

As we rattled along over the lowlands of the Vistula Delta, we thought of the checkered history which had produced this pygmy state—area, 754 square miles; population, 407,000.

A FREE CITY FOR FIVE CENTURIES

Although the boundaries of Danzig were designed in 1919 primarily to give Poland a Baltic harbor, still the idea of a Free City of Danzig was more a resurrection of the medieval past than a pure invention of the postwar years. For approximately five centuries in its early history Danzig had actually been a free and independent city. In spite of its various connections with the Teutonic Order, the Hanseatic League, and the Polish kings, Danzig had always been

* See "Flying Around the Baltic," the NATIONAL GEOGRAPHIC MAGAZINE, June, 1938; and the new map of Central Europe and the Mediterranean, sent to members as a special supplement to The Magazine for October, 1939.



Photograph courtesy Danzig Archives

A CITIZEN TAKES THE OATH

This 18th-century print shows a good solid burgher taking the Oath of Citizenship in full regalia. As in other medieval city-states, citizenship was limited to a select few who could pass strict qualifications as to health, wealth, character, and parentage.

able to maintain the authority of its city council of merchant princes.

But long-continued conflicts between Poland and Sweden so weakened the position of Danzig that in 1793 it was annexed to Prussia. From that time Danzig became an integral part of Germany, although Napoleon gave the city an enforced "freedom" of seven years from his Prussian enemy.

At this point our historical ponderings were interrupted by a squeal from our little locomotive, which wished thereby to indi-

cate that we had reached the railway terminal of that freak of history, the Third Free City of Danzig.

ZONING FOR THE PAST

Danzig has a surprising way of impressing the visitor's first glance. Although the city is about as large as Memphis, Tennessee, we found that even the busy railroad station had been built to harmonize with the prevailing architecture of old Danzig. Only the taxis marred the medieval effect of clock tower and rose window. By careful zoning and traditional good taste, Danzig merges imperceptibly into its past. Everywhere we went, even in the major business quarters, we found long rows of magnificent baroque facades with "A. D. 1938" matching

the delicate scrolls of her 1638 neighbor.

Quaint old street names also had been religiously preserved. For example, one of our pleasant rambles through the heart of the city took us from "Holy Ghost Street" through "Cow Lane" and "Parson Lane" to "Bread Counter Street." From there we turned into "Old Horse Lane" and walked down "Thread Lane" and "Street of Nine Eyes" as far as the avenue called "Pepper City."

Strolling through the city, one begins to wonder whether the old Danzigers were



Photograph by Wain © C. Anders & Co.

GERMANY HAS ANNEXED DANZIG, WHOSE TROOPS NOW MARCH FOR THE REICH

Soldiers of one of the city's Nazi military groups parade past the railroad station. Of the 407,000 population of the former Danzig state, about 93 per cent are German. The latest shift of sovereignty is the tenth in 800 years. From 1920 until September 1, 1939, the city and its environs constituted a free state, governed by its own constitution under the League of Nations, but in customs union with Poland.



Photograph by Kere Ziller © C. Anders & Co.

TRAFFIC BETWEEN DANZIG AND POLAND STOPPED AT THE BORDER FOR CUSTOMS INSPECTION

The sign, photographed before the invasion by German forces in September, reads: "Republic of Poland, Border Crossing, Orłowo-Kolibki." No visa was required for passage across this boundary. The truck was carrying freight between Gdynia, Poland's port, and Warsaw, its capital.

extraordinarily religious, or simply reluctant about walking. At any rate, every tiny section of the old city was supplied with at least one ample church, even in pre-Reformation days. Today the array of religious buildings, ranging from Romanesque to Renaissance, and from Catholic to Mennonite, is truly astonishing.

Mightiest of all is the Church of St. Mary (Marienkirche), begun by the Teutonic Knights in the 14th century. Subsequent burgomasters, with an eye for comfort if not beauty, have since dotted the imposing nave with their own special pews, cosily heated with enormous Dutch ovens. But the original windows still leap toward

heaven, to lose themselves in groined arches so ingeniously constructed of handmade brick that modern bricklayers can scarcely be found to attempt a job of reconstruction (page 682).

"At least," as a local architect told us, "no contractors of today would give a five-century guarantee!" Artistically considered, the old glass is a disappointment, but one might reserve a quiet smile for the old windows donated by the medieval guilds who saw nothing inappropriate in gently advertising their homely products alongside the Holy Apostles.

Together with a Danzig friend of ours, we panted up the massive, winding steps to



© Hilde Brinckmann/Schöler

DANZIG DAMSELS ON EXCURSION TAKE A THOUGHTFUL VIEW OF THINGS

Jumpers and blouses are of traditional style. Dresses seen on the streets are either quite modern or simple adaptations of the older designs. Genuine native dress is rarely seen.

the dizzy heights of St. Mary's tower. On the way, we stopped to catch our breath and inspect the vertical wooden treadmill where one strong man, like a squirrel in a cage, could toll the heavy bells. At last we reached the summit, atop 248 feet of ancient brick rising sheer from the cobblestone street far below.

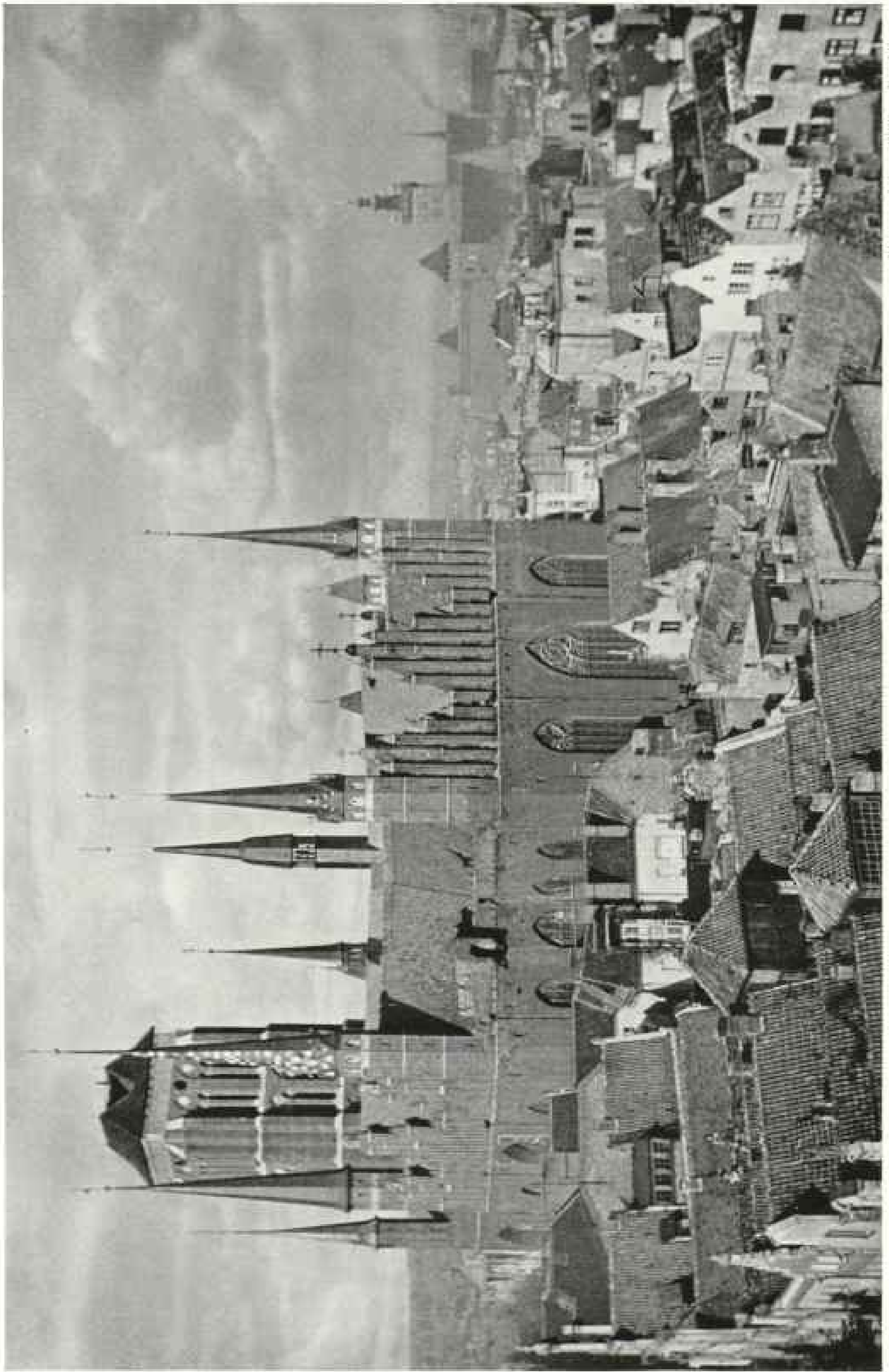
THREE-WINDOW MILLIONAIRES

A breath-taking view was the reward of our breath-taking climb; for our horizon lay beyond the Baltic Sea, and at our feet clustered the last of the city-states, with its pointed fortifications and circular streets looking for all the world like a 15th-century engraving. Taking advantage of the panorama, our Danzig friend pointed out some

of the striking characteristics of the old town.

"As you can readily see," began our oracle-friend, "all the old Danzig houses are very narrow in front, but run a long way back from the street. Most of them have only two windows in front, but a few of the most elaborate ones have three. Those houses belonged to the millionaires—the 'three-window men'—who could afford the higher taxation which they had to pay for the luxury of an extra window. Those were the so-called patrician houses of the Uphagens and Steffens (pages 685, 692).

"Space was always at a premium within the old city gates," continued our friend, "but the good burghers were not to be denied their flower gardens; so special



Photograph from William Franklin

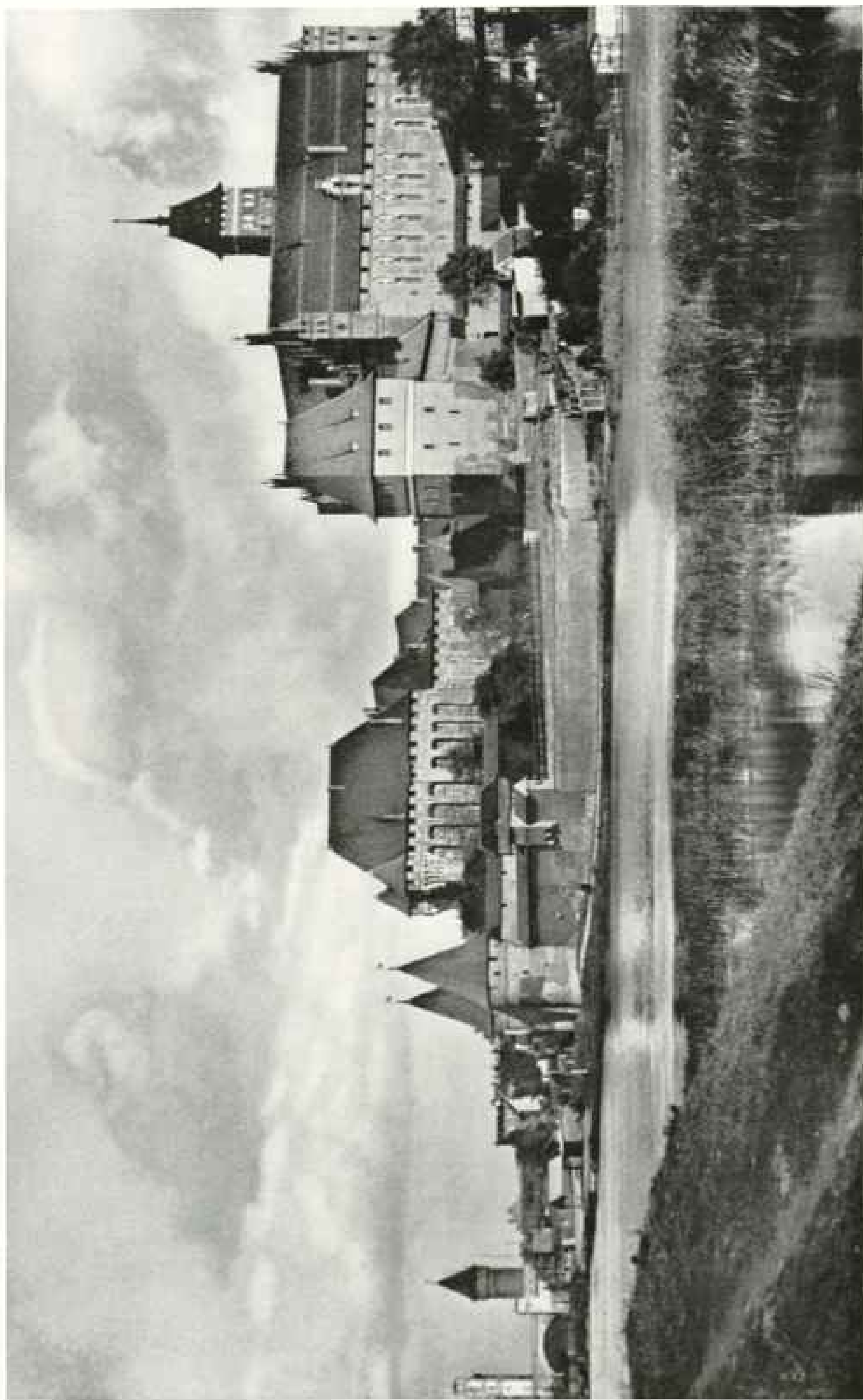
HIGH ABOVE NARROW, TIGHT-PACKED DANZIG HOUSES LOOMS THE MAGNIFICENT BRICK PILE OF THE CHURCH OF ST. MARY



Photograph by Paul Wolff from Hairyeye
NO CHARGE FOR LOOKING



Photograph by Ferno Zuber © C. Anders & Co.
DANZIG BOYS FACE THE FUTURE WITH A GRIN



Photograph courtesy Ford Freres

MIGHTY MARIENBURG WAS A STRONGHOLD OF THE TEUTONIC KNIGHTS, MEDIEVAL CONQUERORS OF PRUSSIA

This picture of the famous church and castle was made from the Danzig bank of the Nogat River, which separated the Free City from East Prussia. From 1309 to 1457 the fortress was the seat of the Grand Master of the Teutonic Order. At the battle of Tannenberg (1410), the Poles crushed this military brotherhood (page 677).



Photograph from William Franklin

A TASTE OF FLANDERS IN DANZIG—THE STEFFENS HOUSE

Heavy taxes were imposed on houses with three windows across the front (p. 681).



Photograph by Wern O. C. Anders & Co.

NAZI STORM TROOPERS CHAT WITH A POLICEMAN

A high-crowned cap with large metal insignia distinguished the Danzig "cop."



Photograph by Paul from Three Lions

GOLD BRAIDS AND WHITE BLOUSES GLEAM AGAINST AN AGE-OLD PORTAL OF DANZIG'S
SPLENDID CITY HALL.

A class of school girls has come out on the balcony to view the venerable coat of arms with its lions.



Photograph by William Franklin

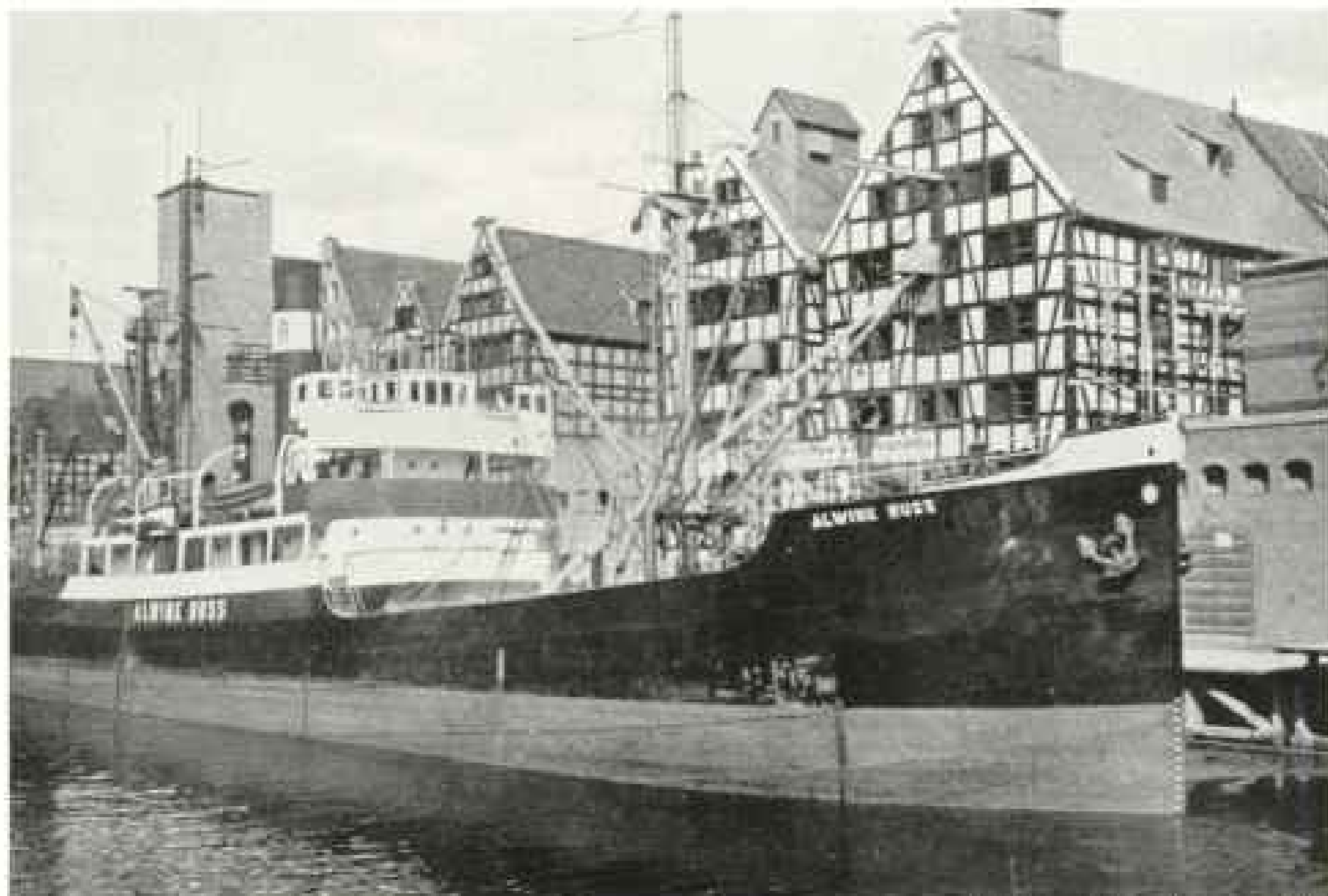
DOWN THE WAYS OF SCHICHAU YARDS SLIDE SOME OF EUROPE'S FINEST SHIPS
 Before the World War, this shipbuilding plant turned out a number of Germany's big naval vessels.



Photograph courtesy "Mare Nostrum"

POLES CROWDED Gdynia'S NAVAL BASE TO WATCH THEIR FLEET IN REVIEW

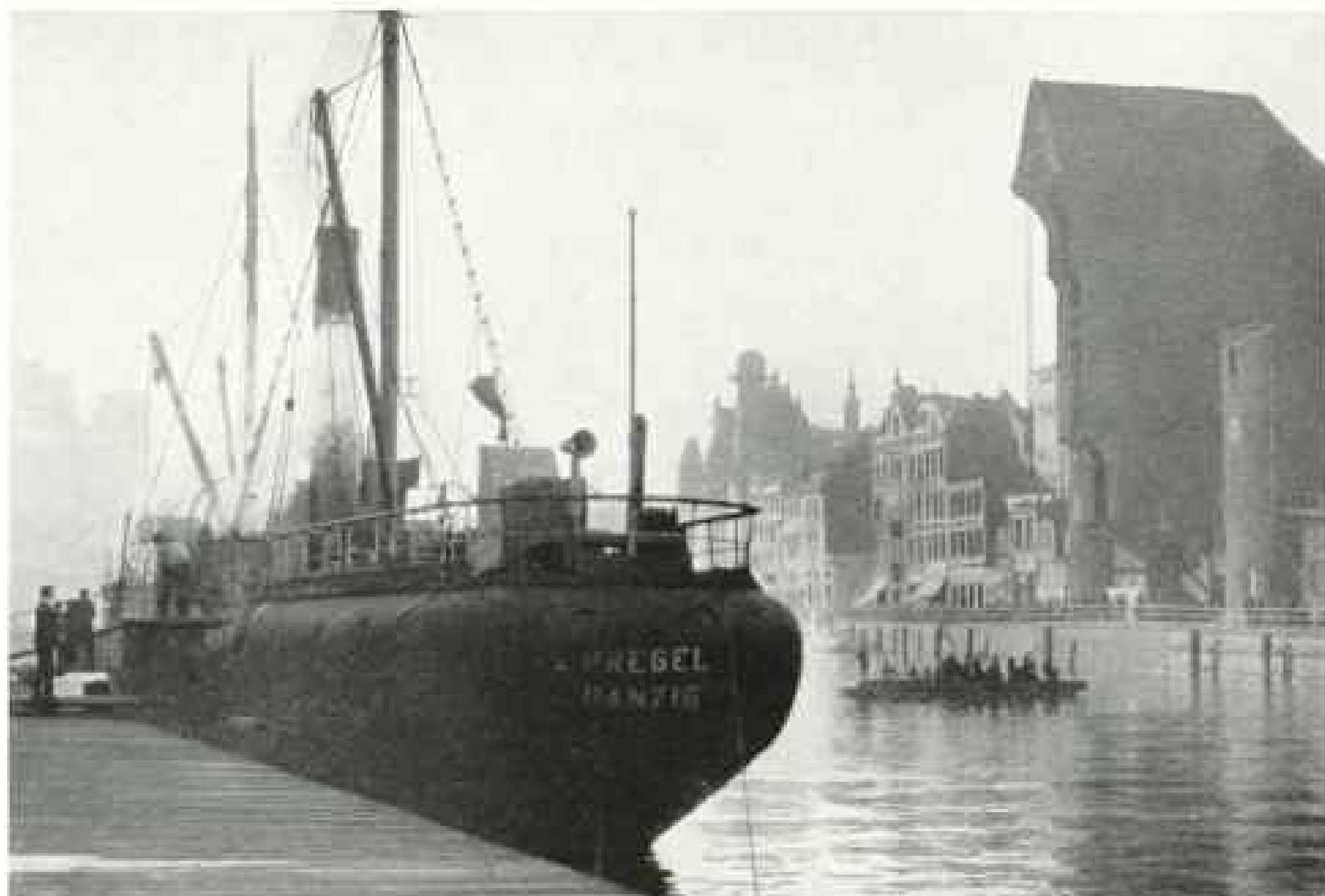
At the outbreak of hostilities, a few destroyers and submarines comprised the backbone of Poland's fighting fleet. Its base was here in the harbor of the busy Baltic port. Three Polish destroyers joined the British Fleet.



Photograph by William Franklin

WHEAT FLOWS FROM OLD-TIME GRANARIES INTO A MODERN STEEL SHIP

Wooden vessels formerly moored before Danzig's 18th-century timber-and-stucco warehouses and elevators. Then, as now, cargoes were chiefly coal, grains, timber, and wood products.



Photograph by Maynard Owen Williams

DANZIG'S CRANE TOWER IS THE HARBOR'S CITIZEN LANDMARK

For six centuries ships have discharged or loaded cargoes within its shadow. Two big treadmills furnished power for the hoisting machinery. Once the tower was used to drag a wrecked motorcar out of the Mottlau River.

areas were set aside just outside the city walls, where each good family could enjoy its own little plot and sit and gossip of a warm summer evening. The Long Garden and New Garden Streets still mark the sites of these old flower beds."

Little did we suspect that at the old City Hall (pages 686, 694) we would see one of the world's most expensive paintings. Of course, we had expected that the council rooms would be as magnificent as they proved to be, in the ornate style of the High Renaissance and in keeping with the dignity of the wealthy patricians whom even the crowned heads of Europe addressed as "Most noble and dearest friends." But thinking of the fabulous art treasures in many a world-famous gallery, we remained very skeptical about the value of Danzig's alleged prize.

Our guide was positive. "Come this way," he said, "and I'll show you the world's most expensive picture!" With our curiosity now thoroughly aroused, we followed him into a small antechamber where hung a not very distinctive portrait of Napoleon I.

"That's it," he pointed. "You see, Danzig had no choice in the matter. To avoid being wiped out by Napoleon's armies, it was forced to buy this portrait of the Emperor from a French general. The picture alone cost 80,000 gold ducats and the remainder of the tribute totaled almost 40 million marks; so that was certainly the world's most expensive picture!"



Photograph by William Franklin

FOR THREE CENTURIES THE SALMON HAS MARKED THE HOME OF DANZIG'S FAMOUS DISTILLERY

Here is produced "Goldwasser" (goldwater), a strong, sweet liqueur with bits of gold leaf floating in it.

In the famous Guild Hall, or Artushof (p. 694), we found another painting with as curious a history as one could well imagine. After first showing us the splendid collection of guild trophies, our guide stopped in front of a mural and told us this story:

"A Danzig artist by the name of Anton Möller was hired by the guilds to decorate this panel in 1602, with the plans calling for an allegorical Last Judgment scene. But



© C. Anders & Co.

THROUGH THE GREEN GATE TRAFFIC REACHES THE HEART OF DANZIG

A streetcar and pedestrians cross the Green Bridge over the Motlau River. Jealously Danzig clings to its medieval character, building new baroque façades to harmonize with old structures (page 678). In the center background loom the tall tower and spires of the Church of St. Mary (page 682); at the right rise steep eables of the English House, the city's finest Renaissance dwelling.



Photograph by Summa

OPERA IN THE WOODS—A SCENE FROM "LOHENGRIN"

Justly famed is Zoppot's "Forest Opera," of which the natural setting deep in a forest glade is ideal for presentations of Wagner (page 696).



Photograph by Reinke

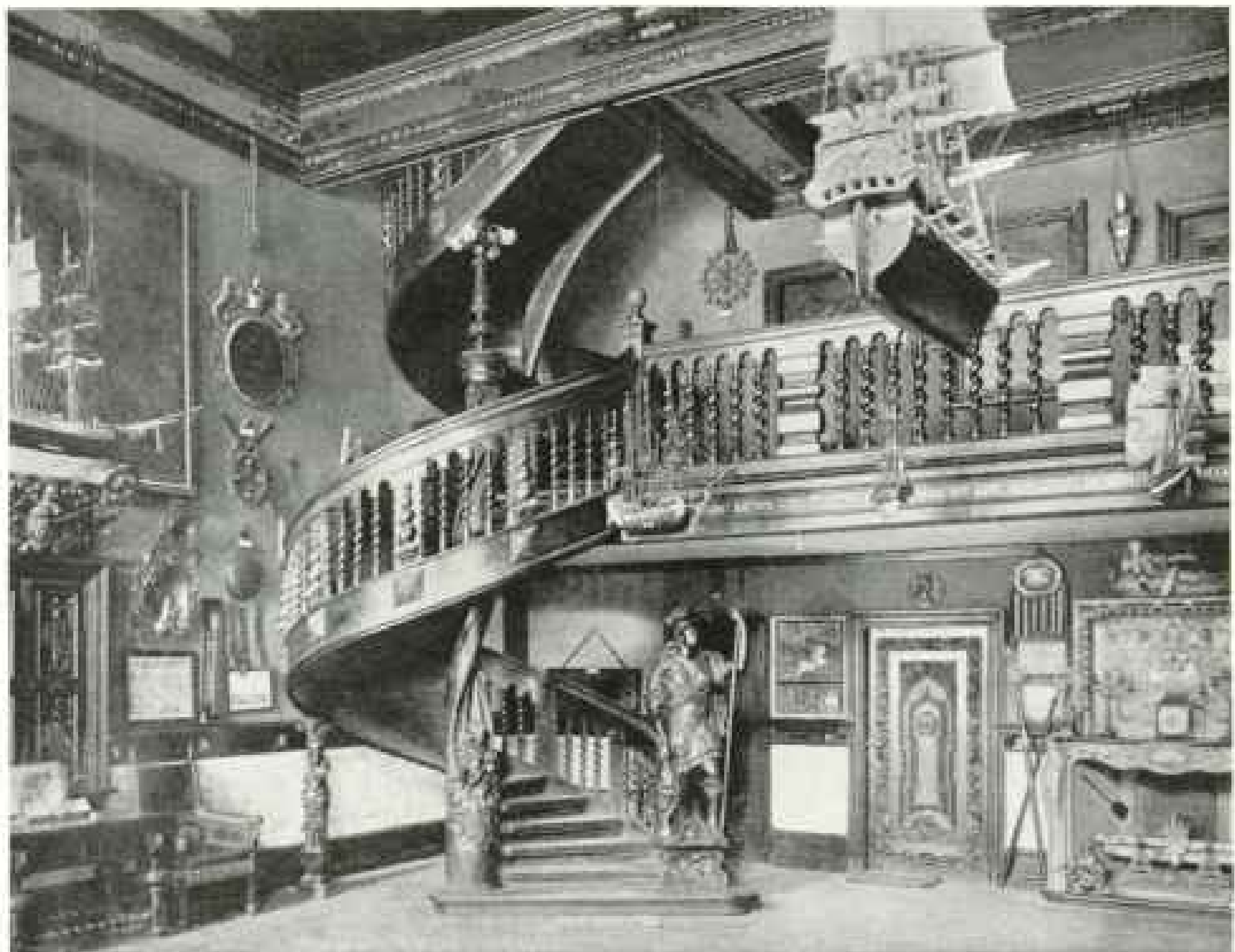
EVEN BASEMENT DOORS BEAR EXQUISITE CARVINGS

Danzig's architecture is noted for its wealth of ornamental detail. Merchant princes employed Europe's best artists and craftsmen to decorate their houses, churches, and public buildings.



Photograph by William Franklin

"IN HARMONY SMALL STATES GROW AND IN DISCORD GREAT ONES FALL"
 So reads the inscription over Langgasser Tor, through which Danzig troops are riding.



Photograph by Berthold M. Henne

PRICELESS TREASURES OF ART ARE DISPLAYED IN THE DIELE OF DANZIG
 The house is preserved as a fine example of the richly furnished old homes of the patrician merchants.



Photograph from William Franklin

A SHIP APPROACHES ZOPPOT, THE REGION'S MONTE CARLO

Beyond the pier jutting into the Baltic Sea lie the beach and Casino of Danzig's second largest city.



Photograph by Paul from Three Lions

POLISH POST BOXES WERE INSTALLED IN THE FREE STATE

On the card beneath the eagle was printed in Polish and German: "Only for letters to Poland."



Photograph by Wazo © C. Anders & Co.

DANZIG BOASTED THIS SKYSCRAPER WHEN MANHATTAN WAS BOUGHT FROM THE INDIANS

The City Hall's slender spire with its chimes has towered above Long Market for 380 years. Through this square have tramped the armies of many nations during Danzig's turbulent history. When Adolf Hitler welcomed Danzig into the German Reich on September 19, 1939, he spoke to Nazi throngs in this plaza from the 15th-century Artushof, or Guild Hall (building above the wagon).

the artist had recently been jilted by the burgomaster's daughter and he consequently got his revenge by painting her as the central figure being carried off to the eternal fires.

"The resemblance was unmistakable and the old burgomaster in a spluttering rage informed the artist that he would have to cover the features of his central figure. Whereupon Müller returned to his work and painted the transparent glass globe which you see around the lady's head, just below the cross which he mercifully added.

"When the city council wrathfully sent him back to change his vengeful masterpiece a second time, the incorrigible artist painted the faces of the city councilors on the sorrowing inhabitants of his snake-infested Purgatory."

Just what then happened to the lover-artist we couldn't find out; though the worthy councilors must have had an unsuspected sense of humor to permit the mural to stay as it was.

LAND BELOW THE SEA

One shouldn't forget that Danzig, the city, was by no means all of Danzig, the state, though the terminology is often confusing. The remainder of the area lay in almost equal halves to east and west of the muddy



© Douglas Chandler

A WROUGHT-IRON EAGLE DECORATES THE CITY HALL.



Photograph courtesy Danzig Archives.

DANZIG'S OLDEST SEAL—USED IN 1299

Vistula as it rolled north from Poland to the Baltic Sea.

Our first excursion was into the eastern part of the state which bordered on the broad, shallow lagoon called the Frisches Haff.* Strikingly Dutch is the appearance of this flat farming area, most of which lies from two to five feet below the level of the near-by sea. Many of the early settlers were in fact Flemish, and even the Teutonic Knights adopted the Dutch types of dikes and windmills for controlling the unruly Vistula and protecting the low-lying plains.

We were surprised to find that Danzig had not a single bridge over this elevated river which divided the state. Since the only suitable spot for a bridge lay under Polish control at Tezew (Dirschau), 20 miles up the river, the citizen of Danzig had to use one of the three primitive ferries which joined the lifelines of road and railway in his little state.

But far from primitive is the system of flood control along the Vistula. Ever since the 14th century the restless stream has felt the hand of man, with the result that today almost two-thirds of the area which formed the Danzig state owes its existence solely to the man-made levees.

Like the Netherlands' Zuider Zee, the great lagoon of the Frisches Haff has also been forced to beat a steady retreat before the land reclamation projects of the ambitious Danzigers.

SOPHISTICATED ZOPPOT

We returned from our little junket to the sub-sea villages of the Vistula Delta with the impression that the Danzig state was as quaintly primitive a farming area as we had ever visited. But our impression was only half correct, for in the western part we found one of Europe's most sophisticated

* The Haff (*i. e.*, lagoon), lying between Danzig and Königsberg, is 52 miles long, 4 to 12 miles wide, and 310 square miles in extent. A narrow spit, with a navigable channel, separates it from the Baltic. Several rivers flow into the Frisches Haff, so named from one of them, the Frisching.

† See "War Clouds over Danzig and Poland's Port," NATIONAL GEOGRAPHIC MAGAZINE, October, 1939.

‡ The local term for the distributary branches of the Vistula. They have practically no current.

cities. Zoppot, the state's second largest city, boasted a bathing beach, one of the best on the Baltic, a gambling Casino, which sought to rival Monte Carlo, and an open-air opera (page 693).

Better judgment dictated that we should not tarry too long in the palatial Casino with its glittering wheels and laughing crowds. In such an atmosphere immunity vanishes like ice in August and the spreading contagion paralyzes the arithmetic sense. Feeling already slightly under the influence, we fled to the safer ground of grand opera.

Deep in the wooded hills outside of Zoppot we saw a performance of Wagner's *Tannhäuser* which for beauty of setting could hardly be equaled. The curtain of living green with castle turrets against a background of primeval forest would certainly have delighted the romantic heart of the great master of the music drama (page 691).

HARBORS OLD AND NEW

To complete our tour of the Free City with a taste of its ancient harbor, we decided to leave by boat.

Boarding our little vessel at the wharf near Speicher Insel, "Granary Island," we watched the modern freighters loading cargoes from 18th-century warehouses. Down the canal-like Mottlau River we sailed, past the picturesque Crane † and the infinitely mightier cranes of the newer ship-building yards (page 687). At the piers in the so-called "Dead Vistula," ‡ we saw ships from literally all the Seven Seas, for Danzig was still an important export center for coal, timber, and grains.

At the very tip of the deeply indented harbor we saw the last remnant of Danzig's Hansa days; the fort that guarded the heavy-laden galleons which were once the Free City's pride.

As the spires and towers of old Danzig faded into the twilight, we entered a new port and a new world. The new port was Polish Gdynia, captured shortly afterward by the Germans, and the new world was the 20th century whose engineering had enabled Gdynia in its short life of thirteen years to outstrip in commercial importance the last of the city-states, historic Danzig.

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Articles and photographs are desired. For material which The Magazine can use, generous remuneration is made.

In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researchers have solved secrets that have puzzled historians for three hundred years.

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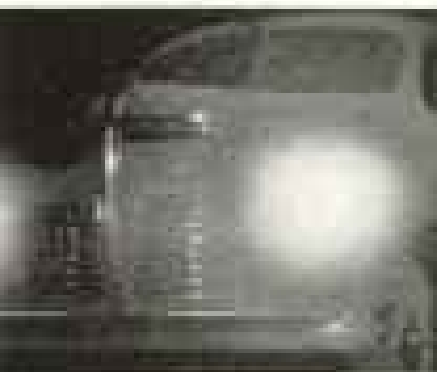
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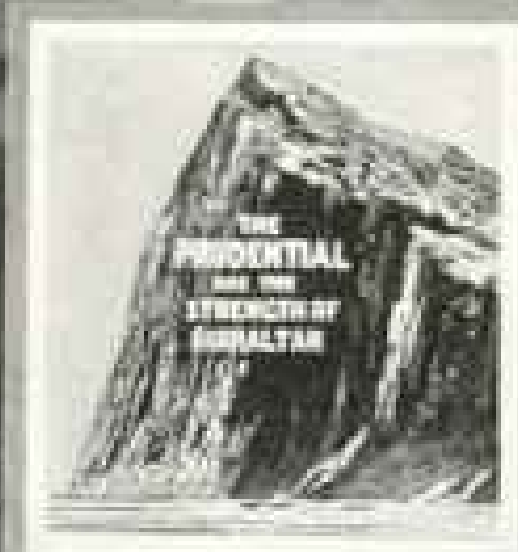
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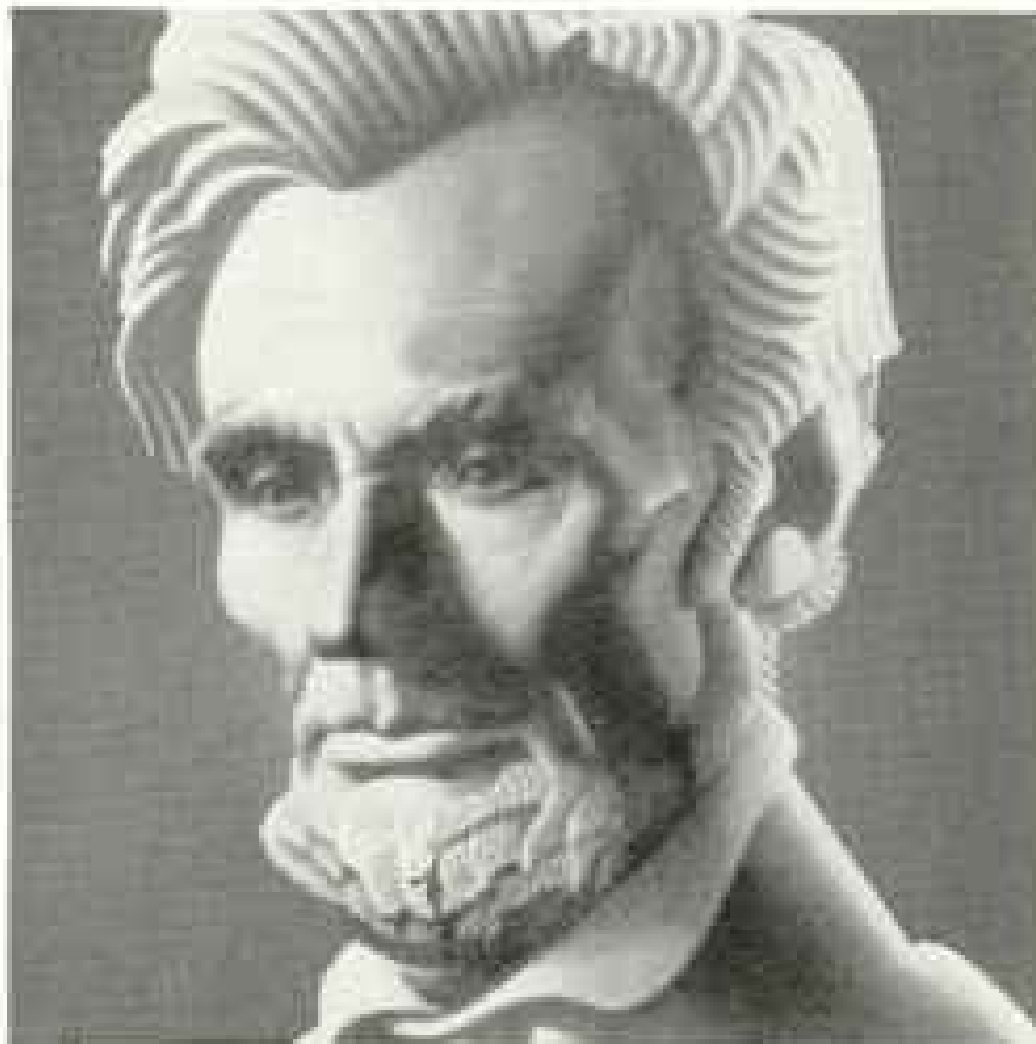
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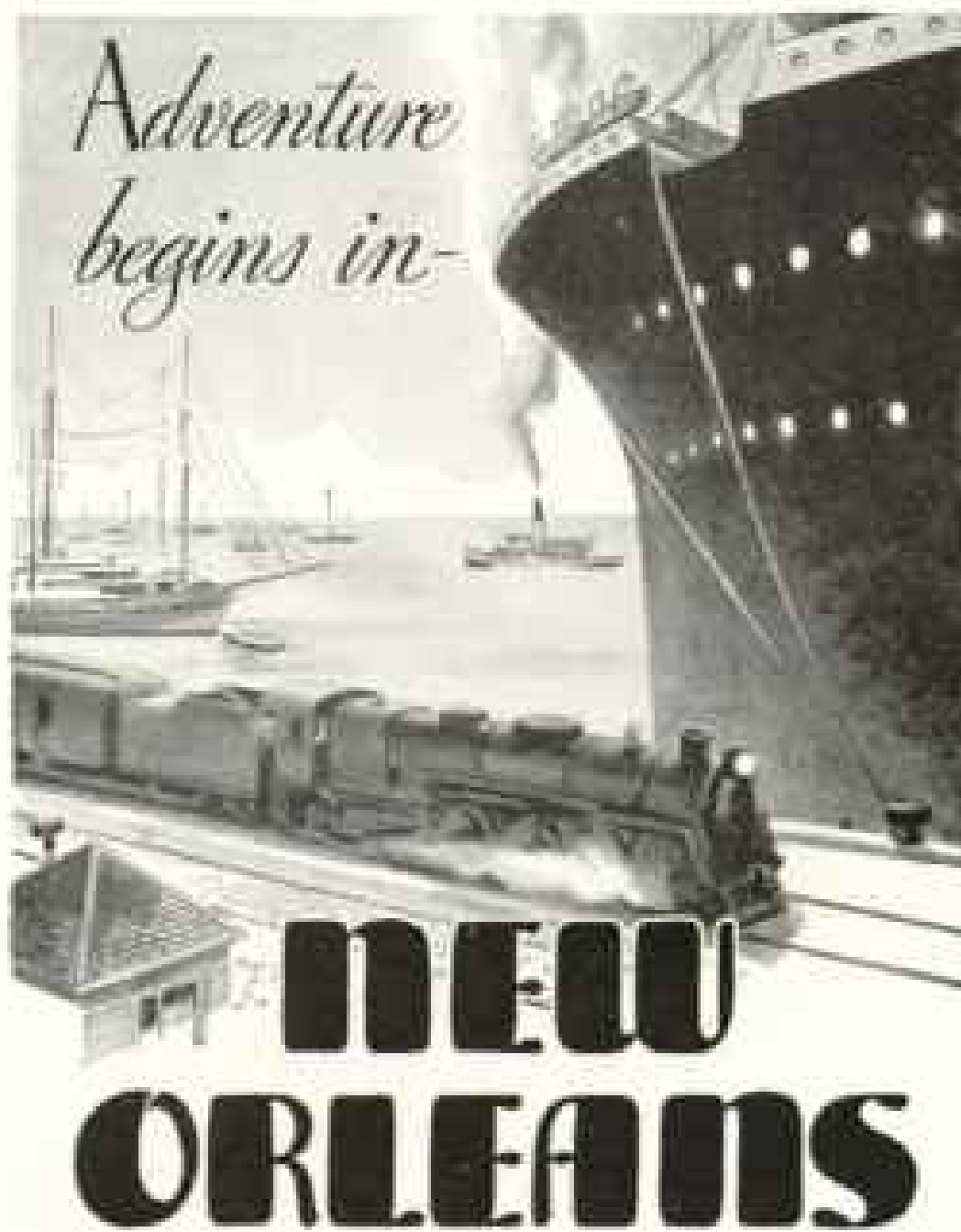
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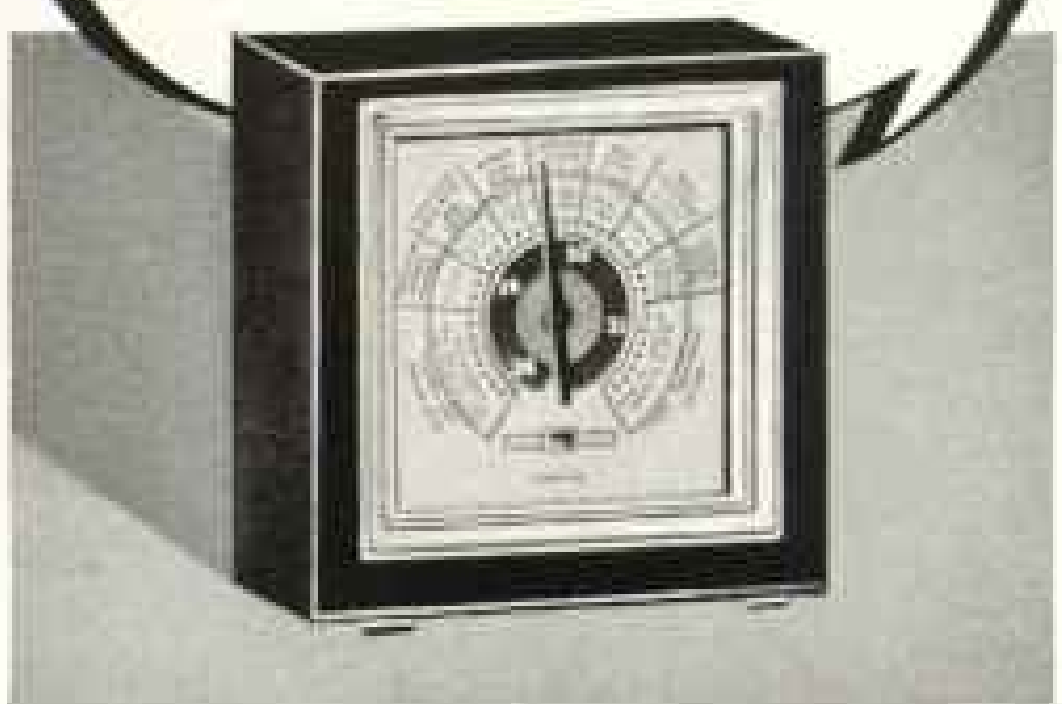
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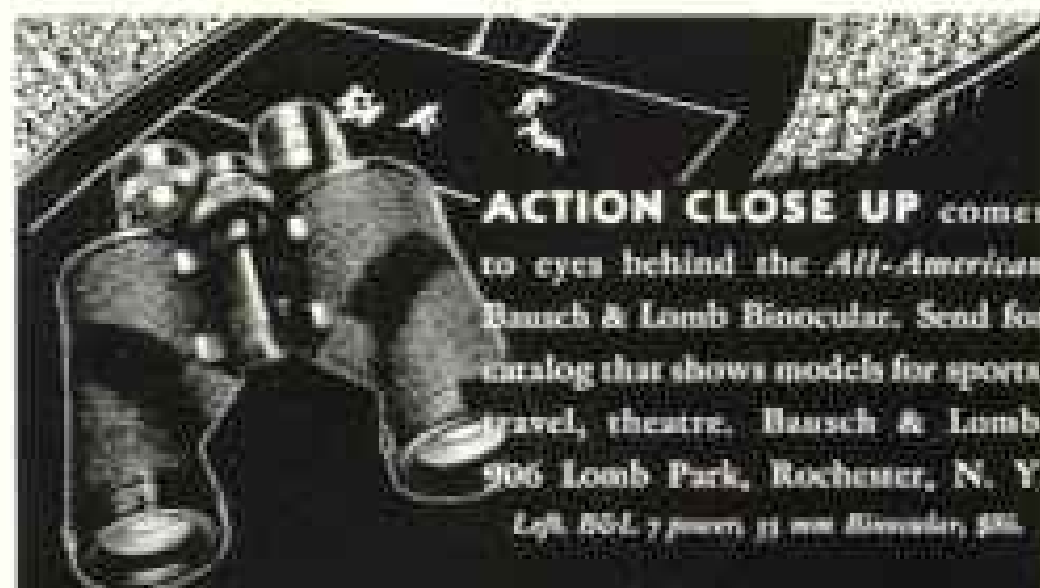


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Among predisposed persons diabetes is more likely to appear in those who are stout. Anyone who knows or suspects the occurrence of diabetes in his family history should be especially careful to avoid overweight. The extensive records of one physician show that only 5% of his adult diabetic patients were underweight before developing the disease.

Early discovery is another protection against the dangers of diabetes, because in the beginning many cases are mild and not difficult to control. Physicians usually advise anyone with diabetes in the family to have periodic health examinations, including a urinalysis and a blood sugar test.

The outlook today is extremely hopeful for the person who develops diabetes. Treatment is based, in

part, upon a simple diet of common foods prescribed by a physician. The modern diabetic diet is planned to keep the patient at, or slightly below, the normal weight for his age and height. In addition, insulin is usually required to supply what the body lacks. This combination has happily done away with the old-time starvation diet.

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Today diabetes can be controlled if full use of modern medical knowledge is made in time and patients cooperate with the physician during treatment.

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IN CHINA. By studying the cracks on the back of a tortoise shell after it has been cast into a fire, the Chinese soothsayer interprets the future. But though attempting to trace the pattern of things to come, he, like all his fellows, does not attempt to *do* anything about it.



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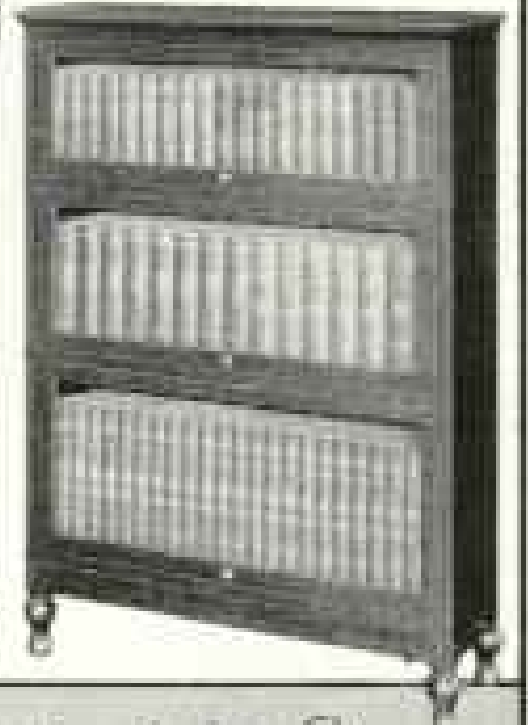


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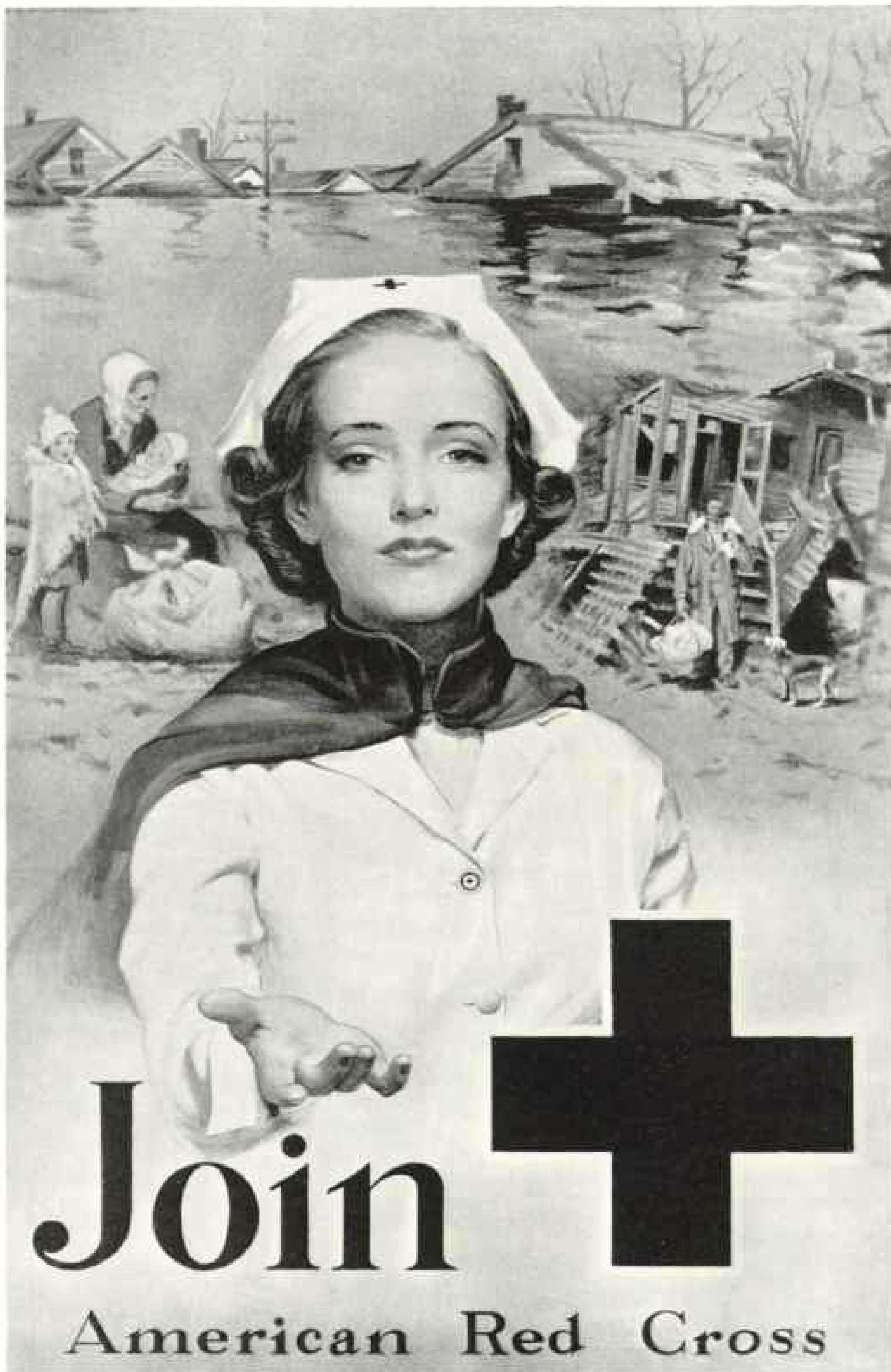
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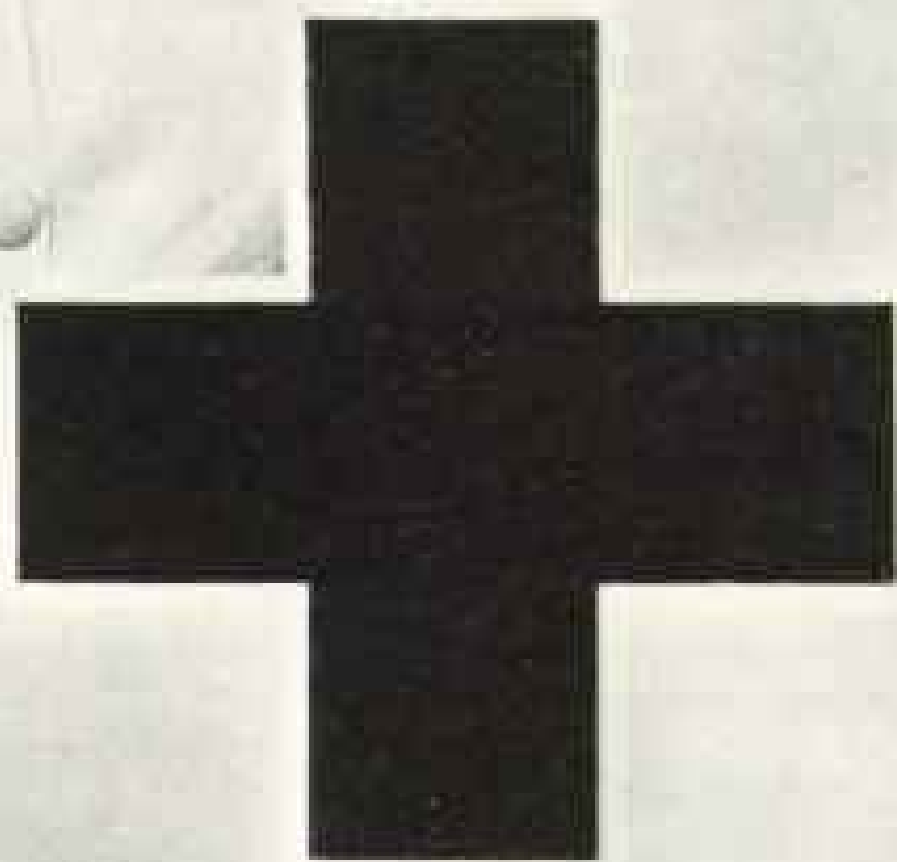
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