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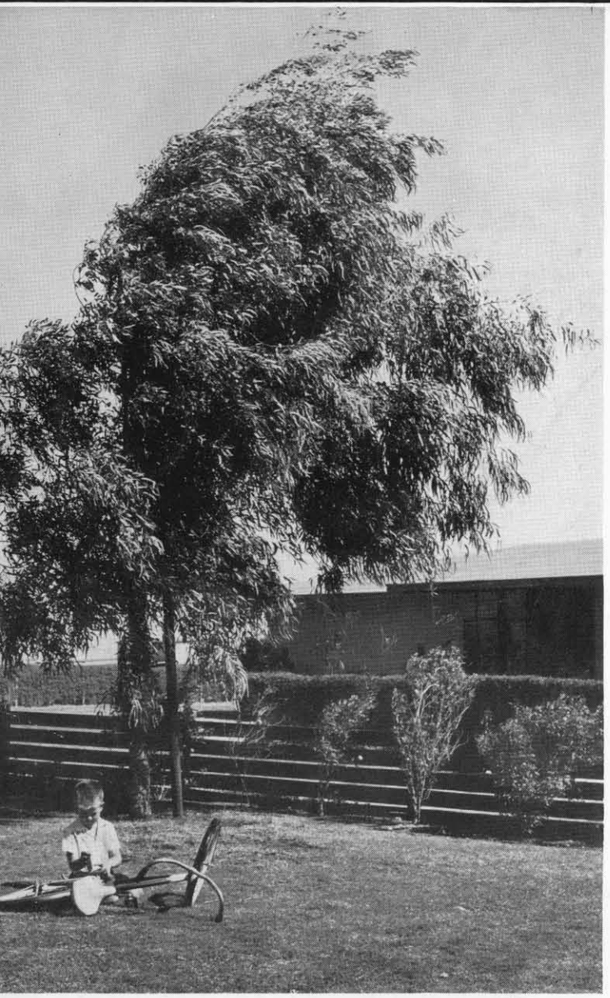


A local variety of the eucalyptus graces many Dhahran lawns. Saudi Arabs refer to it as a "gum tree."

TREES IN THE DESERT?

in Saudi Arabia, including the oases; others are imported by individuals: lemon trees, mulberries, pomegranates — to name a few.

Flowering shrubs and bushes are really something to see. Native varieties include single and double oleanders, yellow oleanders (they're called bushes, but become fair-sized trees), hennas, and three types of lantanas — aculeata, camara and alba.

As for imports, there are the yellow elder and bird-of-paradise from India, the rose of Sharon (a hibiscus) and a lavender arborea from Lebanon, and the leadwort and peacock flower from seed. The China rose was brought from Lebanon, Bahrain Island and India.

Last, and not least, but most, comes the false jasmine, which looks very similar to the privet hedge, common in the northern parts of the United States. There are miles of it in the Aramco communities, lining the residential streets. It's sturdy, grows rapidly, and is relatively easy to trim.

Flowering vines are everywhere and especially the bougainvilleas: the purple (glabra) from Italy, and the red, wine, pink, salmon or orange (spectabilis) from India.

Quite a variety of greenery, wouldn't you agree? But, as Davenport mentioned, it "took a little doing."

It was quite a process of trial and error, finding out what trees were drought-resistant, would withstand summer heat and year-around wind, and could grow in sterile soils and alkali salts. Many species withered; others thrived. The ones that could stand the "gaff" are the ones used today.

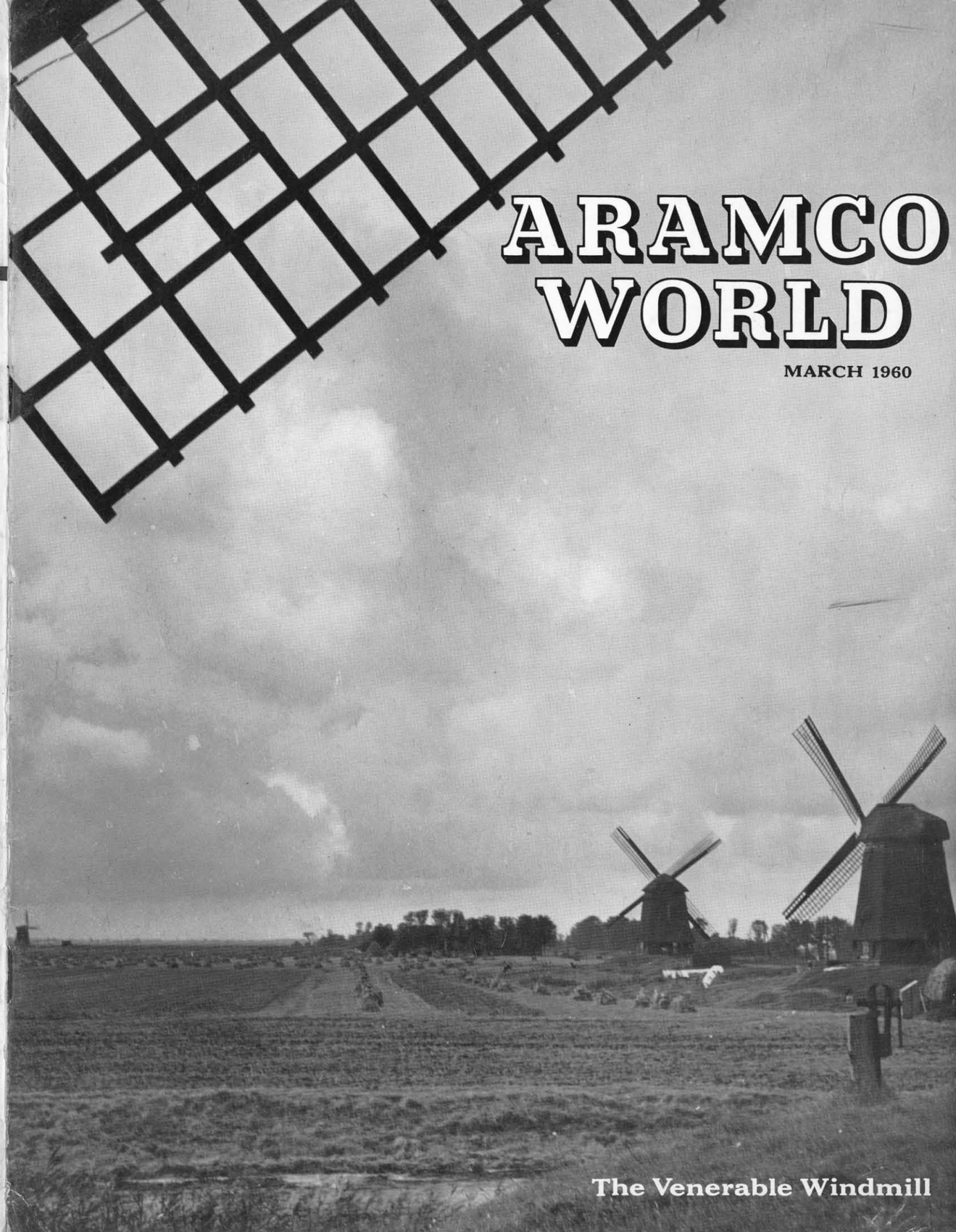
For a number of years, reproduction was carried out by Aramco, using seed, seedlings and cuttings. Now, much of the supply is grown by local contractors. They sell a bush for six Saudi riyals (about $1.33); a tree for eight riyals (about $1.78).

The big problem is soil. There isn't any—only sand and marl. So, for every planting, they have to "prepare a hole." This means digging out what was there, and substituting a mixture of clean sand and fertilizer.

This runs into an unusual procedure: They take a one-gallon tin can, perforate it all around, and then burn off the protective finish so it will rust and disintegrate more readily. They fill this with the sand-fertilizer mixture and plant the seed or cutting in it. After the tree or shrub has grown, it is planted — can and all — in the hole that has been prepared for it. This system is used so the sand-fertilizer mix won't fall away when the plant is being moved.

Most pruning and trimming is done by a local contractor. The acacias require attention twice a year; the others, once. Naturally, more watering is required than in most parts of the United States, because of the sparse rainfall — four inches or so a year. There's a little scale, but it's controlled by spraying.

The main thing is that trees are growing and living healthy lives on those same acres of sand where people said it was foolish to try.



ARAMCO WORLD

MARCH 1960

The Venerable Windmill

Aramco World

MARCH 1960 VOLUME 11 NO. 3

FRONT COVER: It's a rare Dutch landscape that has no windmill! Our cover shows a typical scene in North Holland, where a pair of windmills seems to be marching off toward the horizon. A story on the role these venerable structures have played in history begins on page 12.

THE CITY THAT GROWS AND GROWS 3

It's nothing new in Saudi Arabia, the land of blossoming communities, for a fishing village to explode into a key port and railroad terminus in just 15 years!

OUR TELLTALE FINGERTIPS 6

Did you know that only one in five of the 150,000,000 fingerprints on file with the FBI belongs to a criminal or crime suspect?

HONEY BEE 9

For all its apparent "flightiness"— buzzing around kissing flowers — there is a most serious side to the life of the honey bee for it spends almost all its existence toiling for future brethren.

THE VENERABLE WINDMILL 12

In most places, they're only part of the landscape now, but during their golden age of 800 years, those stately old towers did a real job of putting the wind to work.

KNIVES, FORKS AND SPOONS 16

Folks invited to dinner once toted their own table tools. As a matter of fact, their hosts usually urged them to do so right in an invitation postscript.

THE COMING WORLD OF MARINE CUISINE 20

Don't be surprised if in the next few years you hear someone in a restaurant ordering sea cucumber chowder along with his seaweed on rye.

TREES IN THE DESERT? 22

"It took a little doing," veteran oil folk in Saudi Arabia will tell you, with a proud glance at the fine trees shading the desert towns these days.

PICTURE CREDITS: Front Cover, pages 12, 14 (lower left and right) and 15 (bottom right)—Cas Oorthuys (Amsterdam). Pages 3, 4 and 5—Aramco photos by V. K. Antony. Page 6 (top left)—Frederic Lewis. Pages 6 (two bottom right), 13, 15 (top right and center right), 17 and 18—Bettmann Archive. Pages 7 (lower left, lower right and top right inset) and 8—UPI. Page 7 (fingerprint sketches)—from Fingerprint Identification Booklet of Federal Bureau of Investigation. Pages 14 (bottom center) and 20 (top left)—Culver Service. Page 14 (top left)—Netherlands Information Services (The Hague). Page 19 (top left)—Ewing Galloway. Page 19 (top right)—H. Nils Danish Silver, Inc. Page 19 (lower right)—Joseph Scalyea from A. Devaney, Inc. Page 21 (bottom)—A. Devaney, Inc. Pages 23 and 24—Aramco photos by E. E. Seal.

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Railroad terminus, industrial center, province capital—all combine to make Dammam, Saudi Arabia

the City that grows and grows

THE thing that sort of stumps you about the city of Dammam is that it just didn't follow the usual pattern of development.

Other cities take shape by a process of gradual growth. In the case of Dammam—well, all of a sudden it was *there*.

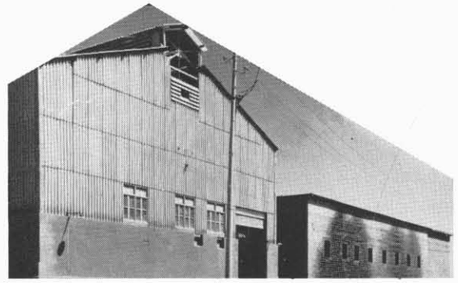
You get there by driving ten miles north of Aramco's headquarters community of Dhahran; and you find a town completely absorbed in an almost dizzying tempo of expansion.

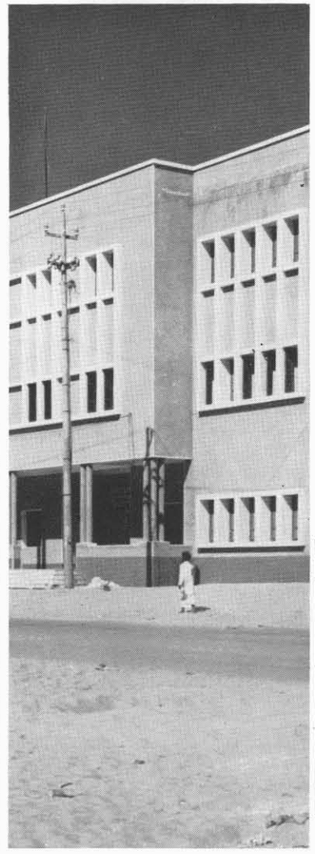
Dammam is the capital of Saudi Arabia's Eastern Province—the equivalent of a state capital in the United States. It's the largest Saudi Arabian port on the Persian Gulf and the point of origin of the constantly busy Saudi Government Railroad. It shows all the signs of a business and industrial boom town.

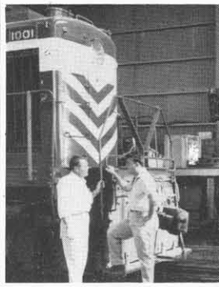
But, try to delve into its past, and everything becomes rather fuzzy. It evidently isn't *old*, as age goes in this region, and this means it has been settled only for a few centuries. The site may have been occupied by the Persians, and it's deemed almost certain that the Portuguese used the old fort, razed in 1957, to make way for a small craft pier. But, no one knows who built the fort originally. It seemed to have been a succession of structures.

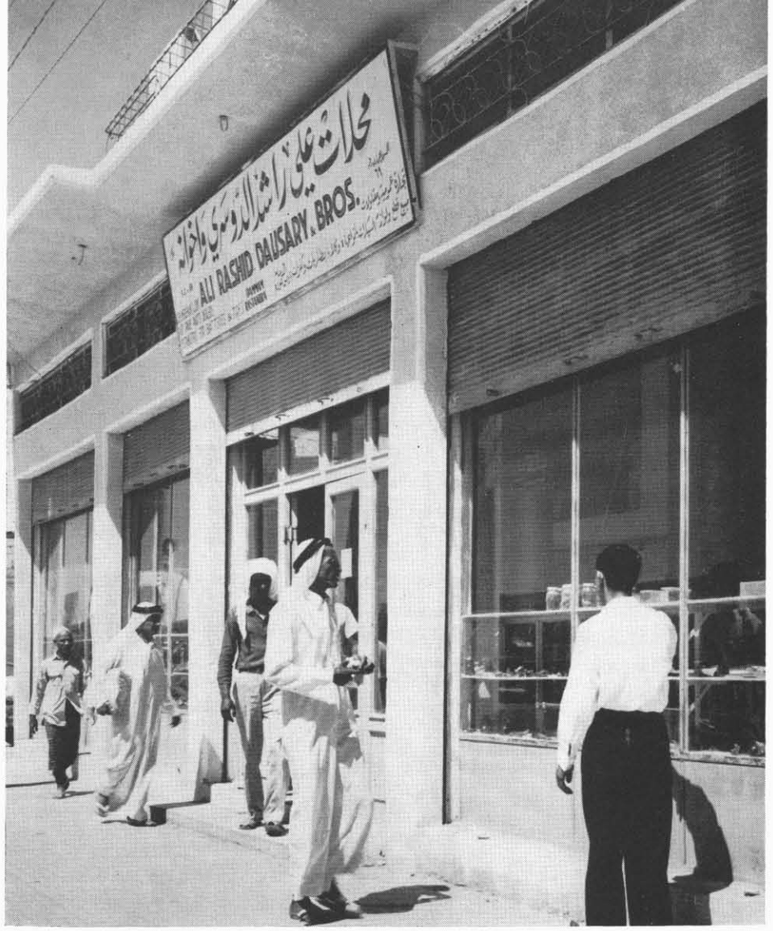
What *is* known is that, about the end of the 19th century, it had become a ghost town, possibly the result of an epidemic.

The present town — at most, 40 years old — was estab-

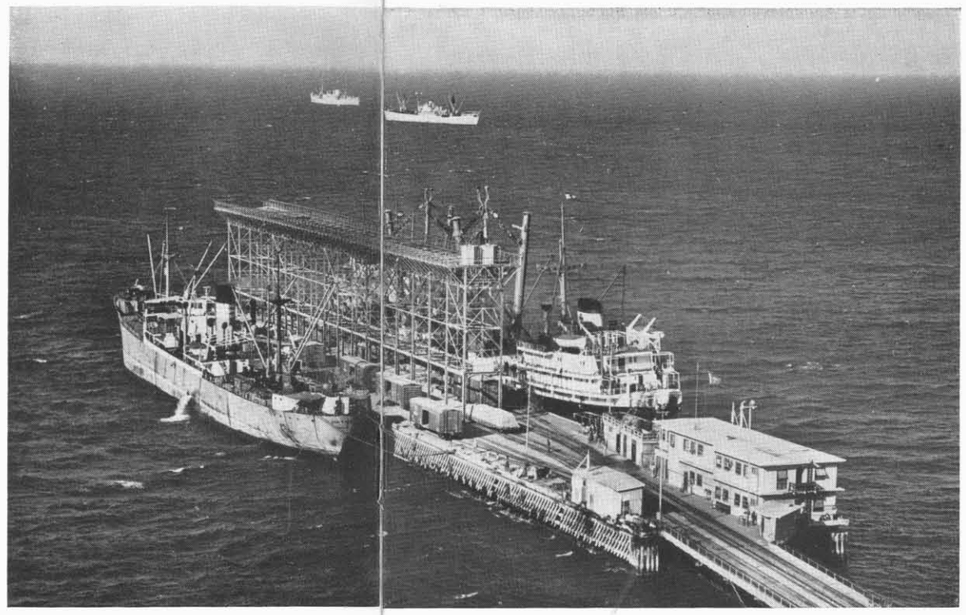








Booming Dammam boasts scores of shops which offer goods from all corners of the world: from Swiss watches to silks from the Far East.



The deep-water pier of the Saudi Government Railroad stands seven miles out in the Persian Gulf and is linked with Dammam proper by a trestle and causeway. Thousands of tons of cargo arrive here monthly.

THE CITY THAT GROWS AND GROWS

lished by members of the Dawasir tribe; and, as recently as 15 years ago, it was only a fishing village with probably less than 2,000 people.

Today, the population estimate is 35,000, and most of the growth has taken place in the last decade. It got its real start when the big pier was finished in 1950, and accelerated when the railroad became fully operative two years later.

As you ride around Dammam these days, there's so much activity — so much spreading out — so much that's either being torn down, or isn't yet finished — that you get the confused impression that things haven't jelled yet. Modern structures of steel and concrete are rapidly replacing old-style adobe buildings. The boundaries of the city enlarge day by day. Growth is taking place at such an amazing rate that the entire structural community seems to be in motion — the old making way for the new.

As one merchant put it: "We had a simple village. Then oil operations came along. Trade and commerce began to develop. More people began moving in. Houses and buildings went up rapidly — many of them.

"Then we got the pier and the railroad. The Amir moved his capital from Hofuf to here. More people, more business, more buying power.

"Before long, the 'new' houses and buildings were no longer the answer. We needed newer, better, more modern ones. We're getting them — we're just not finished."

You wouldn't call Dammam a *beautiful* town right now. It's too young and busy. But it's moving fast in that direction. Palm trees line the center dividing strip of some main streets. There are modern government buildings, including the headquarters of the Amir, His Highness Sa'ud ibn Jiluwi.

There are fine-looking large homes and apartment houses. And, you're well impressed by the good-looking schools, the municipal establishments, and the new commercial buildings that are seen in ever-growing numbers.

You see literally acres of new houses, including the sparkling development where Aramco employees are building so many homes under Aramco's Home Ownership Program. Most of the buildings are patterned on Mediterranean villa designs: reinforced concrete with enclosed gardens, sun roofs, and multicolored stucco exteriors.

As for economic activity, you can see hundreds of industrial, mercantile, contractual and service enterprises.

The principal industrial area is in the southeast outskirts: warehouses, brick and tile-making plants, concrete block makers, iron foundries and machine shops among them. It is in this area that the power plant is found, which sold more than 7-million kilowatt hours of electricity last year.

Looking in other localities, you come across bakeries and bottling plants, ice cream and ice plants, and makers of cement, doors and windows, mattresses, pillows, mirrors.

In the older sections of Dammam, small shops are scattered here and there without any apparent pattern: a tailor, a baker, a barber, operating in a tiny store tucked into the walls of an old, old building. But on the main streets in the newer parts of the city, commercial districts have been formed—long rows of retail, service, and wholesale stores handling an astonishing variety of wares; jewelers, grocers and bankers . . . mechanics, electricians, carpenters . . . cafes, restaurants, photographers . . . salesmen who handle cars, furniture, clothing, kitchen utensils, watches, television sets, shoes, bags, belts . . . all the things a growing community needs and wants.

Some of the stores, including wholesalers, are fair-sized, but most are quite small. You sense, though, that this, too, will change.

But, it is necessary to go beyond the large date gardens, past the presently built-up area, to see the biggest operations in all Dammam: the government port and railroad terminal facilities.

The 744-foot pier is in deep water, seven miles out in the Persian Gulf, at the end of a causeway and trestle. A railroad track runs all the way, and it's worth going out to watch the working of the big, steel cargo-handling tower that rises 84 feet above the wharf deck. Its job is the quick discharge of ships' cargo directly into freight cars.

At present Saudi Arabia exports very few items to world markets; most products grown or manufactured within the country find a ready market right at home. But imports keep the port of Dammam humming with activity. Raw materials and finished goods flow through this area from all continents of the world: lumber, steel, glass, cement, machinery, and a host of other items to feed the infant industries of the nation; and such things as furniture, canned foods, textiles, automobiles, and electrical appliances to answer the increased demands of the Saudi Arab consumer. Thirty-five to fifty thousand tons of cargo arrive here every month, slated for government and private importers throughout the nation.

To cope with the expanding load, a huge new pier — 1,968 feet long and 656 feet wide — is being built near the present one.

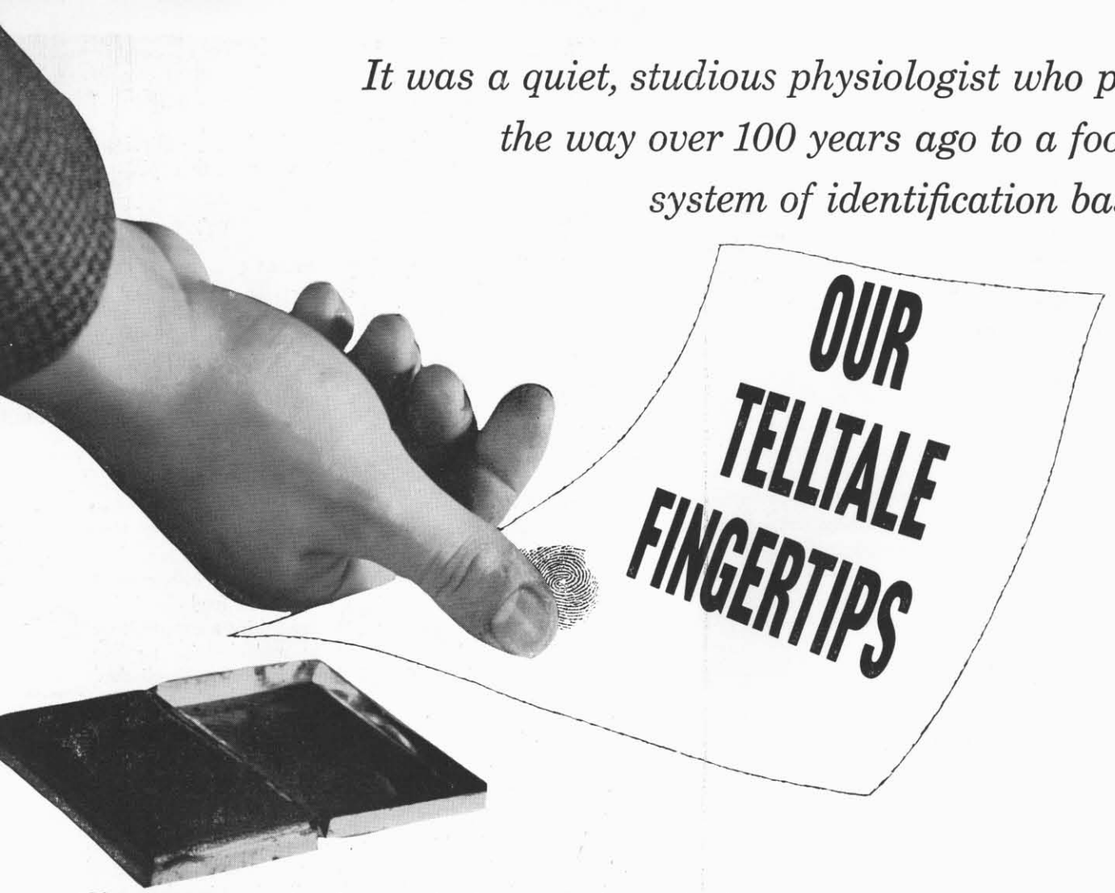
The railroad, which must haul the cargo inland, has its large terminal installations not far from the shore end of the pier. The completely modern diesel engine shop, with its massive, 25-ton overhead crane, services all of the locomotives, self-propelled cars, and rolling stock.

All of this — the railroad, the pier, the new homes and the modern government and commercial buildings . . . the pulsating business and industry — all of it has come into being in 15 short years.

This soft-drink bottling plant serves Dammam and environs.

The railroad yards at Dammam provide maintenance for rolling stock of the 357-mile-long line, which terminates in Riyadh, capital city of Saudi Arabia.

It was a quiet, studious physiologist who pointed the way over 100 years ago to a foolproof system of identification based on



IT is quite surprising how long man has been aware of the tiny, inconspicuous ridges on the tips of his fingers. He has left evidence as old as the crude, prehistoric Indian markings on Nova Scotian cliffs and stone writings, on islands off the French coast, as well as unmistakable finger impressions on Babylonian tablets, Chinese clay seals and Japanese pottery, all fabricated before the time of Christ. Through the centuries the principal function of finger impressions was probably to add the final and properly symbolic touch of solemnity to official documents and contracts, although some authorities credit the early Chinese with devising a system of fingerprint classification for criminal identification.

In the lay mind, the entire subject of fingerprinting is inseparably and melodramatically linked with the detection of crime. True, the identification of criminals is the most spectacular of the functions of fingerprinting, and as such is a major vertebra in the backbone of crime detection. Yet only about one in every five of the FBI's 152,000,000 prints on file belongs to a criminal or a crime suspect. Furthermore, many prints are duplicates, especially those in the criminal section, where the 30,000,000 prints actually represent just 12,000,000 criminals. Although far outnumbered by the military, the solid citizen sections, totaling (with POW's and aliens) about 70,000,000, this is still a hefty contingent of individuals in anybody's statistics.

The existence of fingerprinting as a scientifically exact medium for human classification began with a thesis published in 1823 by Johannes Evangelista Purkinje, a studious 36-year-old professor of anatomy at the University of Breslau. He was the first to postulate that the fingerprints of each individual are completely immutable from before birth to after death; he further observed that all prints might be broken down into just nine different types. Purkinje was a scholarly physiologist whose single quiet purpose was to advance scientific inquiry and knowledge, not to catch crooks. But his theories anticipated almost everything that was to follow.

Thirty-five years later Sir William J. Herschel, a British civil administrator in India, started requiring nationals in his district to affix their fingerprints to contracts. This was done largely for the ritualistic impact. Herschel suggested to his superiors in 1877 that a fingerprint system be established to identify criminals; with characteristically ponderous caution, the Home Office turned him down.

Prof. J. E. Purkinje in 1823 anticipated later proof that individual fingerprints are immutable and classifiable.

Sir Francis Galton in 1892 advanced the first scientific evidence on individual and permanent nature of prints.

Three years later *Nature,* a popular British science magazine, carried an article by Dr. Henry Faulds of the Tsukiji Hospital in Tokyo, pointing out the potential value of fingerprints, because of their permanence and diversity, as a means of identifying criminals. Herschel promptly countered with an article for the same magazine outlining his own experiences with fingerprinting over the preceding two decades. Unfortunately, neither Herschel nor Faulds came up with a practical, workable mass classification system.

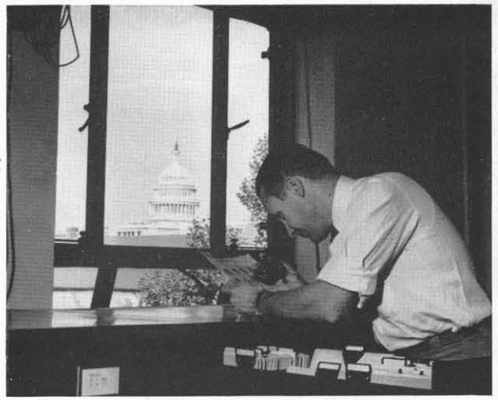
It was a third Englishman, Sir Francis Galton, who advanced the first scientific classification system for fingerprints. In *Finger Prints,* published in 1892, he gave the first scientific evidence of both the individuality and the permanence of prints. Sir Edward Henry further simplified Galton's classification system for practical, everyday use by law enforcement officials. The end product was basically so sound that it was adopted officially in England and Wales in 1901, and in the United States a few years later.

An Argentinian, Juan Vucetich, drawing from some of Galton's earlier studies, became the first police official to evolve a system of fingerprint filing for criminal investigation. He had a fingerprinting system installed and operating in Buenos Aires as early as 1891.

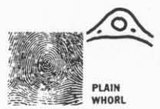
A gruesome double murder the following year at La Plata gave Vucetich the chance to put his new system to the ultimate test. Francisca Rojas, a distraught mother, herself bearing knife wounds, accused her neighbor of the murder of her two sons and of an attempt on her own life. Vucetich found a set of fingerprints on a doorpost in the house. Putting his new skills to work, the policeman first demonstrated that the bloody fingerprints obviously belonged to the murderer. With this evidence as a lever, he then confronted the assassin and eventually extracted a full confession — from Francisca Rojas.

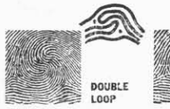
Vucetich's pioneering work became the basis of the system still in use today in the Spanish-speaking countries. And Buenos Aires police can take pride in having had their own print registry in operation ten years before the Galton-Henry system was introduced in England.

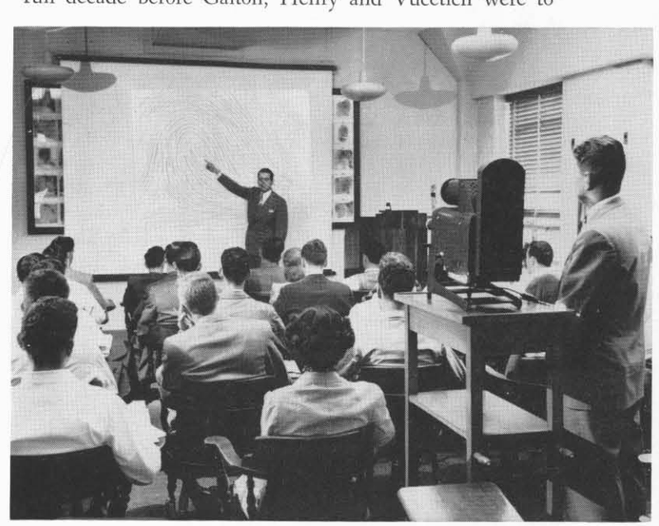
But Vucetich originally intended his print files as only a supplement to another system already in use in Argentina — the Bertillon system. This was the culmination of some brilliantly original thinking and research on the part of a young French anthropologist, Dr. Alphonse Bertillon. The system was based on three principles: (1) that certain parts of the body could be measured exactly; (2) that there would always be great differences in over-all measurements from person to person; and (3) that measurements of the male skeleton remained fixed after the age of twenty. Measurements (width of right ear, for example) and description of physical characteristics (scar six centimetres to left of fifth vertebra) were combined with photographs to insure identification. The Paris prefecture of police had adopted this entirely different approach in 1882, almost a full decade before Galton, Henry and Vucetich were to



The eight basic types of fingerprints are somewhat like the eight notes that make up a piano's octave. Out of these eight comes an infinite variety — not of melodies — but of fingertips. The Federal Bureau of Investigation employs this eight-type system for identification. The agent (above) is classifying one of the more than 152,000,000 prints on file in the capital. This is the largest collection in the world.







Students at the FBI Fingerprint Division (above) learn how to spot fingerprint characteristics by examining greatly magnified slides.

Fingerprinting of children (left) is carried out in many areas for identification in emergencies.

OUR TELLTALE FINGERTIPS

bring *dactyloscopia* — the science of fingerprint identification — into practical use.

The abandonment of the Bertillon system in the United States, where it was introduced in 1885, was hastened by the classic case of a prisoner named Will West, just committed to the penitentiary at Leavenworth, Kansas, in 1903. Will West claimed that this was his first such enforced visit, even while prison officials were producing the complete and virtually identical Bertillon measurements and photographs belonging to a William West already in Leavenworth, and in fact, there for two years past, busily serving a life term for murder. To clinch the argument for the superiority of the newer system, a comparison of the fingerprints of William West with those of Will West showed no similarity; they belonged, unquestionably, to two different people. In time, other weaknesses showed up in the Bertillon system: its cumbersomeness; its vulnerability to human error, instrument inaccuracies and inadequate personnel training, among others.

It was an instance of the nearly perfect in theory being not quite good enough in practice, since infallibility had to be the goal when a human life could turn upon the reliability of identification.

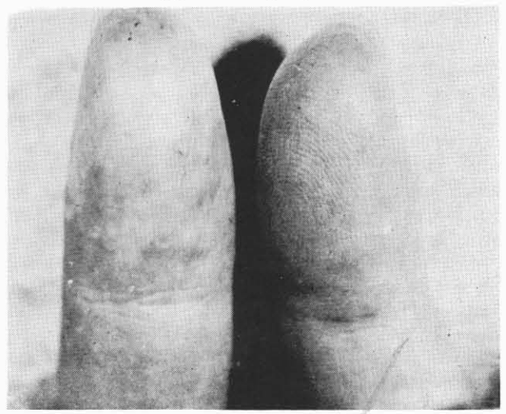
What makes fingerprinting the ultimate system of identification? It is not merely that no two identical fingerprints have ever been recorded (true), or that prints never change from birth to death (also true), or that they can never be obliterated (no longer true); probably no two limbs or organs are *exactly* alike in each minute detail when scrutinized closely by a skilled observer. But fingerprint impressions are relatively simple and easy to take, for one thing; they can be typed, classified, indexed, filed, and found again — all with great exactitude and considerable speed. And most important of all, the average criminal is far more likely to leave fingerprints behind than, say, nose or toe or elbow impressions, or a clear pattern of hair follicles.

The Galton-Henry system breaks prints down into only eight basic types of loops, arches and whorls. This has become, with some modifications, the system adopted by the FBI, which keeps the most massive fingerprint collection in the world. After each of the ten fingerprints on every card is noted in code by carefully trained technicians, the ten codes are combined to form one single code, the complete, final formula under which the card will be filed.

But suppose a thoughtless criminal leaves fewer than ten identifiable prints at the scene of his visit? Suppose he leaves but one print, and an inconspicuous, rather messy one at that? If it's a *latent* print, that is, scarcely discernible, it must be made more clearly visible with the aid of powders, chemical treatment, or special lighting, so that it can be photographed and enlarged for closer examination. Now the print photo heads for a special set of files kept for just such cases by the FBI, the Single Fingerprint Section. The technicians are among the FBI's most expert; they can pinpoint a known criminal from no more than a part of the print from one fingertip. This section must restrict its files only to the more notorious criminals; since the print for *each finger* is separately classified, there must be ten cards for every criminal it files. With approximately 12,000,000 offenders in the main file, things could otherwise get out of hand.

The days of the delicate touch, the special powders, the careful dustings with the soft camel's-hair brushes to bring out the latent prints may be numbered by the omnipresent push-button spray can. There is now a powder spray which brings latent prints out instantly and clearly; what's more, as many powder outlines as needed of each print can be picked up on ordinary cellophane tape, right at the scene. Simply applying a small piece of clear plastic to the prints on the adhesive side imprisons the outlines, thus permitting them to be handled without damage.

John Dillinger paid $5,000 to have his fingerprints obliterated by acid, and failed; others have tried surgery, sandpaper, skin grafts, razors and knives, and have failed. But Dr. James W. Burks, Jr., of the Tulane University School of Medicine discovered one method. In the course of treating horny growths on the hands of two male patients, Dr. Burks applied a high-speed wire brush to the



Fingertip whorls and ridges can be planed smooth (left) but the absence of fingerprints can be a dead giveaway for criminals who use this dodge.

surface of the skin, in a technique known as skin-planing. This is the same treatment sometimes used on the face to remove acne and smallpox scars. Dr. Burks noted, in the *Archives of Dermatology,* that the healed skin on the fingertips of the two men *had no ridges;* they showed instead only faint criss-cross lines left by the wire brushes.

Of course, this scarcely changes the picture for the average criminal. One does not just pop into a doctor's office and have one's prints destroyed; it takes special skills, special techniques, and — hardest of all to find — a willing specialist. And if a set of fingers so treated should show up during a fingerprinting session, it would be about as inconspicuous as three heads on one neck. "It wouldn't work," says one FBI agent. "Planed tips would red-flag any police officer in the country the instant he spotted them."

And that would seem to settle that.

In praise of the indestructible, indispensable, indefatigable

Honey Bee

THANK your genes that you're not a bee. Your whole life would be dedicated to toil — for the endlessly oncoming generations.

After six or seven weeks of life, you, an ordinary bee, would die — wings tattered — just plumb worn out. The next generation would sweep you out of the hive and carry on the instinctive pattern of chores: feeding the young, making wax for the combs, toting nectar and pollen from the blossoms, fanning air through the corridors of wax, fighting off intruders in the hive, being mother's little helper on her never-ending rounds of laying eggs.

If you were a male, you would not be plagued by this compulsion to work. As a drone, you would loll around home, gorging yourself on honey, unaware that your busy sisters might suddenly slay you.

An ancient and admirable animal, the bee is probably older than humanity. Prehistoric man recorded her in his rock drawings. Indeed, the scientists believe the bee was in business even before the Tertiary period, the Age of Mammals. While the ponderous lizards were expiring, the bee was jauntily perpetuating her line. She even survived the glacial deep freeze.

The bee world functions as a well organized matriarchy of a queen mother surrounded by thousands of infertile female workers. The few drones are tolerated as necessary sires of the future.

Buzzing down the centuries, the bee has been vital to humanity's survival. Man might easily have become extinct through starvation, if she had not been around pollinating his food plants. In this age of vitamins, modern agriculturists deliberately enlist the bees' help, with hives placed strategically in orchards, groves and farms.

Bee watchers calculate that a normally industrious bee will visit 200 to 300 flowers an hour, storing the sipped nectar in a tiny sac in front of her stomach. Pollen is collected on the hairs of her legs.

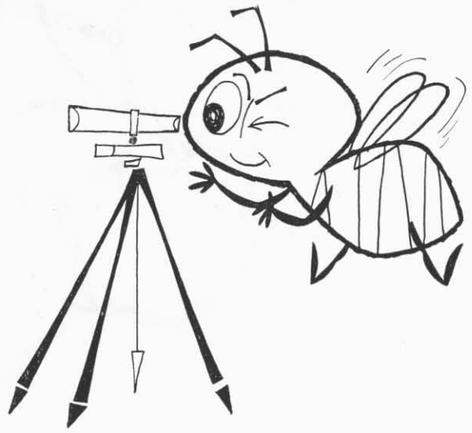
Laden with sweet treasures, she wings unerringly back to the hive, though she may have wandered two miles from home. A proved fact about this amazing creature is her mathematical accuracy, her "bee line" sense of direction, based on precise orientation and meticulous observation of objects. Images are stored in her memory through some 13,000 eyes — 6,000 to 7,000 facets on each side, plus a third Cyclopean eye in her brow.

When the little blossom-pilferer returns to the hive, she mounts through waxen corridors to the upper levels of 120,000 storage cells for honey, pollen and that hearty mixture of honey and pollen known as "bee's bread."

She disgorges the nectar, while other workers scrape the pollen from her hair pockets. The nectar, transformed in her honey sac from sucrose to levulose and dextrose, has to be wing-fanned violently to evaporate moisture before it is pushed into a cell. As the pollen is stored, the workers with sensitive artistry never mix different colors in the

same cell. Scientists have noted that these cells are tilted upward about five degrees — to prevent spillage, of course.

The bee is an expert engineer, as well as artist, mathematician and on-the-beam navigator. The hexagonal cells she builds — about 55 in a square inch on each façade of the comb — is mathematically the most proper form. Each cell bolsters the other and mutually resists the outward pressure of the semi-fluid contents.



Along the lower walls of wax are the brood cells: 10,000 empty cradles for the queen to lay her eggs, 15,000 to 16,000 cells with larvae and 40,000 with nymphs about to emerge as full-fledged bees.

Deep in the warm darkness are the few, large royal brood cells — three to a dozen, usually — where future queens are nurtured. Apparently there is no royal lineage. A queen is developed by a miraculous diet during her pupal state. A glandular secretion from the heads of young bees, royal jelly, seems to be the secret of a queen's longevity (four to five years), her extra size (twice as large as the worker) and her physiological difference (special organs, such as the spermatheca, for her sole mission in life of perpetuating the race.)

When fresh, royal jelly is milky white and has the consistency of cream, with a high content of nitrogen and vitamin B-complex components.

The eggs hatch in three days, and for two days all larvae are fed the regal diet. The nutrition experts then switch those destined to be workers and drones to a coarser repast of honey and pollen, with intermittent fasting days. The princesses — two of which are seldom, if ever, born on the same day — are lavishly surrounded with the de luxe fare during eight gluttonous days of larva-hood.

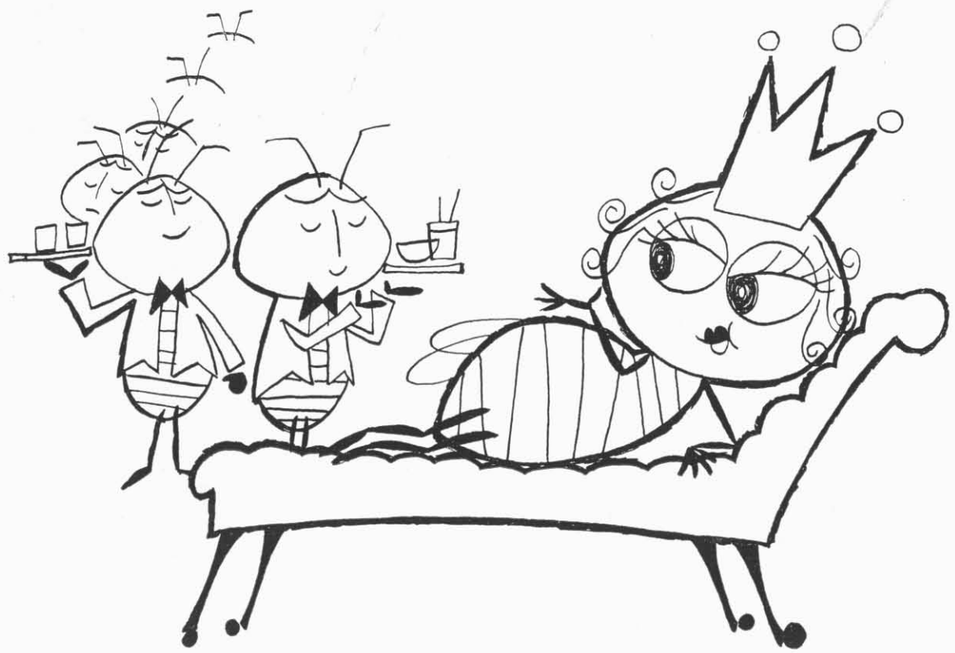
Throughout her life, the queen never feeds herself. She's too busy laying eggs — as many as 3,000 a day. Her watchful helpers keep feeding her honey and tidbits of pollen, day and night.

In the pupal period, when the legless grub is being transmuted into the winged adult insect, nobody gets fed.

According to one entomologist, the queen develops to adulthood more rapidly than the worker. She emerges as a full-fledged queen after eight days of pupal change and 16 days from the time when she was a tiny blue comma-shaped egg. The workers, on the other hand, require 21 days to complete the cycle from egg to adult, and the drones procrastinate until the 24th day to get on their brand-new legs and start ambling around for food.

As soon as the new little worker chews through the waxen veil of her cell, she starts fanning her wings with her older sisters. For the first two days she is occupied with cleaning out the brood cells. Bees, excepting the drones, are fanatically neat.

For two weeks the worker serves as a nurse, feeding the larvae and the queen. If the hive needs more cells — who determines that? — she may in this period become a wax maker or sculptor. In this wax industry, the young bees



cluster in a mass, like an inverted cone, from an overhead anchorage. The compact bodies generate a fiery heat.

Four pockets on the young bee's abdomen secrete white transparent scales of wax, which she masticates to malleable consistency. Climbing over her sisters' backs, she mounts to the working area, rolls and straightens her wax and attaches it. As she disappears, another proceeds to hollow out the block and model it into the classic hexagon. What determines which bee draws which assignment is still unrevealed.

In her third week the versatile chemist, sculptor, engineer and nurse becomes a janitor, sweeping dead bees, dirt and debris out of the hive. Then she is sworn in as a member of the security police, guarding the entrance against enemies.

Bees are fearless. They are afraid of nothing, except smoke. Outside the hive they will avoid trouble, but inside their home they will pounce madly on any intruder, be it ant, moth or man.

Completing her life cycle, the bee becomes a field worker. Before taking off for the blossoms, she makes several experimental flights, filling her windpipe with air for the first time and becoming "a bride of space," as Maeterlinck lyrically saluted her in his *Life of the Bee*.

A virgin queen will move to the hive entrance about three days after emerging from her pupal palace. She, too, is terrified by vastness and sunlight, after the cozy gloom of the hive. She tests her wings, at first flying backwards, then spiraling around the hive. She is not yet ready for her audacious nuptial flight. That adventure she'll face a few days later, never more than 20 days after birth.

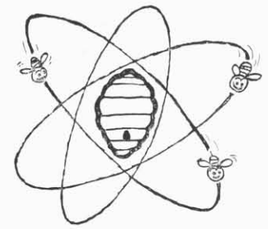
There's great excitement in the hive when a young queen decides to take off. Everybody senses the momentous event. At dawn of a sunny morning she embarks, flying straight up, higher than any worker bee would dare. By some magnetic telepathy, the drones, suddenly alert, take wing in pursuit. Besides the hundred or more drones in her hive, males from nearby colonies take up the eternal chase, until she may have 10,000 would-be suitors struggling to the lofty altitudes, "unhaunted by birds."

Only one of her reckless lovers, strong enough to catch up with her, will she choose as her mate in flight — whereupon he gives his life for posterity and falls lifeless through the void.

Three days after returning, the queen starts laying eggs. She will never leave the hive again, except perhaps to accompany a swarm. Apparently she can control the sex of her offspring: fertilized eggs for the workers, unfertilized eggs for the larger drones. She is supreme as producer of progeny — millions in her lifetime — but she is really not boss of the hive. The deference to her and her function, with the organization of skills and housekeeping chores, is dictated by some mysterious collective authority, be it intelligence or instinct.

Though Homo sapiens has been watching Apis mellifera for thousands of years, he still doesn't know what makes her life-clock tick. Aristomachus, according to Cicero, watched bees for 58 years. Virgil tried to compile what previous scholars had learned about the bee. The Egyptians were fascinated with the hexagon cell, depicting it on tomb walls and in their hieroglyphs.

Within the past century, man has become more scientific in his bee-watching, but the durable little creature continues to amaze him. In her cosmos, the bee probably has as many unrevealed secrets as the atom.



The Venerable Windmill

These sturdy old structures have forever been putting the wind to work on the landscapes of the world.

ON the high plain of La Mancha, a knight in armor, riding the traditional charger, approaches what he takes to be a mammoth, whirling, groaning monster. The knight is none other than Don Quixote, a little eccentric perhaps, but very brave. Despite the frantic pleadings of his faithful servant, Sancho, the don decides to attack. He lowers his lance and spurs his beast to a pitiful charge.

Rider and sail collide . . . for the monster is one of the great windmills of La Mancha. The sail boom snags his armor and he is scooped skyward. As the boom brings the don closer to earth, Sancho runs forward in a frantic attempt to pull him free. But all that is freed is a solitary boot. The don rises again. As he completes his second sweep, Sancho attempts another rescue, only to have his master kick him in the seat of the pants. The don rises again a third time. As this turn is completed he falls free, right on top of poor Sancho. Dazed, they roll in a tangle across the mill yard.

This comic episode has been tickling risibilities since Miguel Cervantes penned it in 1615. Gruff and grotesque as it might be, it highlights the fact that 17th-century Spain turned to wind power when it came to grinding the staff of life just as Germany and England did at that time.

Windmills were brought to Europe late in the 12th century by knights returning from the Third Crusade. This implies an Eastern origin. Beyond that, records are contradictory. For instance, Hero of Alexandria, writing in the 1st century, B.C., credits himself with inventing the windmill. At the same time, the Hindu Kautilya, writing in the 4th century, B.C., describes water being raised by "contrivances worked by wind power."

Despite its vague beginning, once the windmill took root in Europe it ground flour, pumped water and powered light industry right up to the Industrial Revolution. It was, and always has been, the essence of simplicity. Its mechanics are fundamental. The wind revolves the sails which turn what is called the wind shaft. The torque, or twisting force, created in the shaft is then transmitted, through a series of gears, to the grind stone, the pump, the loom or the wood saw. The same principle powers a bicycle. The rider's legs correspond to the twirling sails; the

Don Quixote of Cervantes' Spanish classic mistook a windmill for a monster. When the romantic knight of La Mancha speared one of the sails, he got an unexpected ride and a fall. This encounter won for the windmill an immortal place in fiction.

bicycle's gears and chain match the windmill's gears and shaft; and the bicycle's rear wheel equals the spinning mill stone.

During their golden age of 800 years, the windmills followed three general designs. Most popular, especially in Germany, was the post mill. In this type the entire machine pivoted freely on a post which was sunk deep in the earth. Thus the miller could face his sails to catch the wind from whatever direction it might be stabbing.

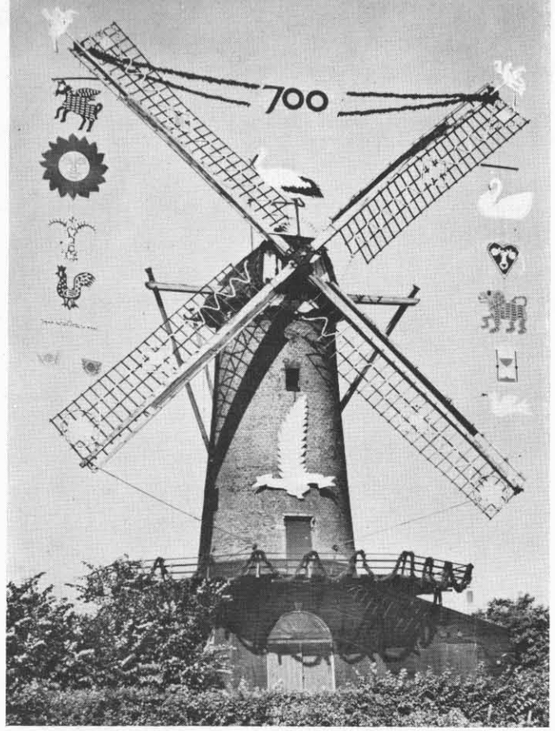
Post mills literally left their stamp upon the earth. Here's why: The foot of the post rested on two crossed timbers which reached out like the blades of anchors to assure a firm foundation, just as the roots of a tree keep a quivering trunk from toppling in a storm. But trees do fall and so do windmills. When violent winds uprooted a post mill, the crossed timbers were wrenched to the surface. Hence, two crossed trenches, resembling intersecting quake cracks, were left gaping in the landscape. Such sights still are common in parts of Germany.

Second in popularity, and favored in England, was the smock mill on which only the cap or dome at the top of the mill was mobile. The design enabled the miller to swivel his sails while the mill itself remained stationary. This model sat on a stone foundation infinitely more solid than the wooden anchors of the post mill.

Finally there were the tower mills. Fixed completely, they were built to face prevailing wind currents. Although they lacked the versatility of the post and smock mills, they were used successfully in the North Sea low countries where on-shore breezes were fairly reliable.

The practice of pivoting a windmill's sails to capture the wind is called "luffing." The term is nautical. At sea, it means steering a ship into the blow so the sails will bloom to full bellow. And, as the ship is steered by a tiller, the windmill was maneuvered by a similar handle called the tailpole. It was simply a long timber which protruded from the rear of the mill. Once the miller had luffed his sails, he chained the pole to one of many stop posts spotted at regular intervals about the mill yard.

The miller had no easy task. Jockeying a tailpole demanded the strength of an Atlas and the nerves of an astronaut. The timber weighed half a ton and the miller had only his own shoulders with which to lift it. There was constant danger that temperamental gusts would pivot the sails without warning and if an unlucky miller caught between chain posts could look forward to a wildly flailing



Windmill decoration is an outdoor art that the Dutch have devised. This structure was decked out to mark celebration of The Hague's 700th anniversary in 1948.

THE VENERABLE WINDMILL

tailpole and probably a bad injury. Broken necks were common for centuries, until the tailpoles were fitted with yokes for oxen. But even the chunky beasts proved a poor match for the uncontrolled mill tails. Imagine one of Quixote's monsters, wagging its ponderous tail to snuff out the life of a mere human or a dumb brute.

The problem eventually was eliminated by a device resembling the conventional weather vane, whose mock rooster revolves to announce the wind direction. The windmill vane was much larger than the rooster, but the physics were the same. The vane had a broad, flat surface which offered the wind resistance, but since it was mounted on a pinion, it swung clear to allow the wind free passage, like an unbolted door. As the vane was driven aside, it turned the dome of the mill and brought the sails into play.

There was still another problem. If winds reached gale force the canvas of the sails had to be furled. Otherwise the mill would be torn from its foundation and tossed on its side. Sea captains faced the same danger. Unless they trimmed their sails, the masts would squirm out of their sockets and tumble overboard. The captain could pipe his riggers aloft to shorten canvas, but the miller's task was not that simple. First, he had to shut down his mill. This was achieved by braking the wind shaft. The brakes were two wooden blocks called cheeks. If the cheeks were applied too quickly the sails would come to an abrupt stop, snare the gale and spark disaster. Or, if the sails withstood the blast, the grind stone, stopping just as abruptly, would leap from its mountings and crash through the side of the mill, often taking life and limb.

Both dangers were removed by redesigning the sails. In place of canvas, wooden blinds were adopted. As modern window blinds control the passage of light, so the wooden mill blinds controlled the passage of air. If a storm arose, the blinds were opened and the blast passed harmlessly through the sails. If winds were calm, the blinds were closed to capture every breath.

Wooden blinds and the tail vane were workable by the 18th century. Although safer, the perfected windmill saw no change in its essential duties. However, it did contribute immensely to the culture and folklore of Europe. It provided such surnames as Miller and Muller. It gave rise to the expression "First come, first served," meaning the farmer who carted his grain to the mill first, would also be first to have it ground. Windmills even developed their own language, known as the sail code. When sails were stopped so they formed a cross, they told the countryside the mill was ready to accept work. When sails were set at 45 degrees, forming the letter X, they told clients the mill would not be taking work for some time. Through subtle variations, millers could relay news and even carry on conversations. As late as World War II the sail code still was performing a vital role. The Dutch underground used it to convey information to Allied pilots.

In Portugal, where crude tower mills with canvas sails still grind the staff of life, native fishermen find exciting sport in grabbing a passing sail and riding it like a ferris wheel. If a mill has six sails, six men will climb aboard, and by shifting balance, keep the wheel careening through cycle after cycle. Modern Quixotes, they fly through a four-story arc, and the spectacle draws the sighs and gasps of every peasant in the vicinity.

When the steam engine revolutionized industry, use of the windmill declined rapidly. In England alone, some 10,000 windmills disappeared from the landscape. Holland, which also boasted 10,000 windmills, saw the number drop to slightly more than 1,000. Those which survived were needed to pump water and keep the nation's vast network of canals in delicate balance.

Just as Europe started demolishing its windmills, they began to sprout up in the rural United States. They were introduced by a miller named Daniel Haliday. His mills were used chiefly as well pumps and the arc cut by their sails seldom exceeded eight feet in diameter. As electrification spread, however, the little mills faced extinction. Then some unknown soul realized windmills could generate the very electricity which threatened them.

By 1920, windmills were producing enough electric power to light one or two rooms in a typical farm house. Initial experiments yielded such challenging results that several nations strove to build windmills which could light entire cities. In 1929, France erected its Darrieus wind turbine with two sails spanning 63 feet, and in 1933 the Soviet Union opened a similar plant at Yalta. This one had two sails spanning 100 feet.

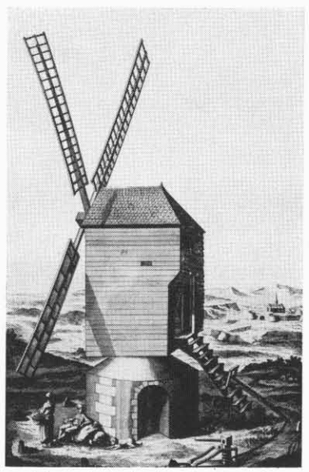
The world's largest windmill was constructed in 1941 at Grandpa's Knob in the foothills of the Green Mountains near Rutland, Vermont. Known as the Smith-Putnam Project, it consisted of a 110-foot tower and two sails with a span of 175 feet. The mill generated 1,250 kilowatts, a sufficient amount to serve a small town. Although it proved technically feasible, it provided no economic advantage since it was built in an area already abundant with water power.

Today, windmills still operate auxiliary generators in rural areas. They still regulate the Dutch canals, and in some parts of the world they still perform industrial duties. Just what the future holds is difficult to predict, but one thing is certain. As long as the earth keeps spinning, the winds will prevail, and as long as man can tame the winds, he can put them to work for his own betterment.

Smock Mill

Smock mills are stationary, except for the dome, which is turned to face wind.

Post Mill



The whole body of this mill rotates on an upright post.

Tower Mill

The only movable parts of the tower mill are its sails, also called arms.

The ubiquitous windmills of the Low Countries stand as backdrops in scores of paintings of the Dutch and Flemish schools. This canvas dates from early 1600's.

Atlantic breezes provide wind power for this old mill in the hills near Lisbon, Portugal.

American-type windmills are skeleton frameworks having more sails than the Old World varieties.

knives, forks and spoons

Who would think

that our workaday trio of table tools

could throw such unexpected sidelights on the history of eating habits

SUPPOSE you should open your mail and find an invitation to dinner. At the end, a postscript says: *". . . and please bring your own knife, fork and spoon."*

Would you be shocked?

Today you most certainly would. And yet not too many generations ago, Americans and Europeans saw nothing unusual about taking their silverware to dinner. The reason was: few hosts had any to spare. Before leaving home, a guest might tuck into his pocket, or hang from his waist, two knives (one for meat and one for bread) and a spoon. Then, if he owned one, he would also include one of those wonderful new inventions: the table fork.

The knife-fork-spoon table-setting that we know today is quite a new idea. The Pilgrims who landed at Plymouth in 1620 brought knives and spoons, and possibly a few huge kettle forks for stirring. But so far as is known, they had no forks. Recent excavations into Pilgrim sites have turned up lots of knives and spoons, but not a single fork. And some of the homes were in use as late as 1703.

How, then, did people eat? The answer is that even well-bred people until quite recently in history ate with their fingers and off the tips of their knives. Rules of etiquette were quite explicit. One was: "Never use more than three fingers in picking up meat."

By George Washington's time, table-settings of handsome silver knives, spoons and forks were becoming fairly common in well-to-do households. But the forks Washington used at Mount Vernon did not look like ours. They had only three tines, which was an inconvenience since peas fell through or rolled right off. And they had "pistol grip" handles, as did the matching knives. The shape of this grip suggests that Washington ate with his fork in his left hand, as the custom was (and still is) in Europe.

Even in Washington's time, sets of knives, forks and spoons were rare enough to be displayed as ornaments. The Father of his Country, in ordering table silver from London, specified that it come in a handsome case suitable for display in his Virginia mansion.

Forks were not generally known in England until 1611, nine years before the Pilgrims sailed. In that year a traveler returning from Italy reported having discovered:

" . . . a custom in all Italian cities that is not used in any other country that I saw. The Italians doe always use a little forke when they eat their meate."

It was this traveler, Coryat, who introduced forks to the general public in England — only 250 years ago.

But for a long time forks were scorned. Men continued to eat as before, calling forks effeminate. The English clergy even branded them as sacrilegious because they were a substitute for human fingers.

Nevertheless forks slowly gained acceptance. In those days they usually had only two tines; these were long and dangerous-looking. If you would see what a Dutch table fork of 1650 looked like, open your cupboard and take out your *carving* fork. This is a throwback to early tableforks, which, in turn, were throwbacks to a vicious twin-pointed battle spear. The four-tined forks that we know today did not come into general use until something over a century ago. As a matter of fact, it is newer than the railroad train.

The teaspoon you use has an interesting history. It was introduced in 1650 when Americans and Europeans began drinking tea. Teaspoons then were only one-third the size of ours, and often had perforated bowls. After stirring the tea these "strainer-bowls" were used to lift any stray leaves from the cup.

Other teaspoons had long, pointed handles used as ramrods to open the spouts of teapots when they became clogged with leaves.

Such handles were not new. In early Greece or Rome, spoons with a spike-like handle were found very handy for prying open shellfish. Some folks bored a hole in the handle so they could hang the spoon from the waist or from a peg on the wall.

It is not known when the first spoons appeared, but they were used on Egyptian tables 4,000 years ago. How did they originate? One clue is found in the Anglo-Saxon word *spon,* which meant chip or splinter. Another clue comes to light in the old-fashioned family sugar spoons which had bowls shaped like shells. Chips were the early spoons in northern Europe. But in Mediterranean countries men used shells to which they attached sticks as handles. (Shells were still being used as spoons early in this century; grocers used them to "spoon" sugar from barrels.)

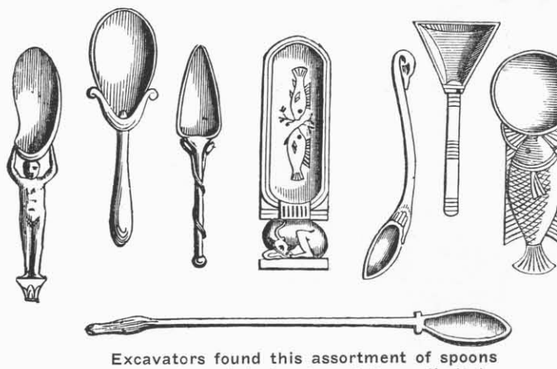
The list of different spoons men have used is almost endless. King Henry VI affixed his royal seal to the tip of his spoon handle. To seal a state paper, he would reach for his spoon, stand it on end and press the seal down into the soft wax. For a while in the 15th century "apostle spoons" were popular. Cast into the end of each silver handle was a large bust of one of the Twelve Apostles. Rich godparents gave each godchild a full set of Twelve Apostle spoons. A thirteenth spoon, the Savior spoon, was introduced, but today only one complete set of 13 spoons is known to exist.

Like forks, Apostle spoons soon became a center of controversy. Puritans claimed that their use was sacrilegious. They sawed the heads off, leaving only stump handles, which can be seen in museums today. Not long ago, at Plymouth, Mass., archeologists excitedly dug up an Apostle spoon used by the Pilgrims. This one had not been "beheaded."

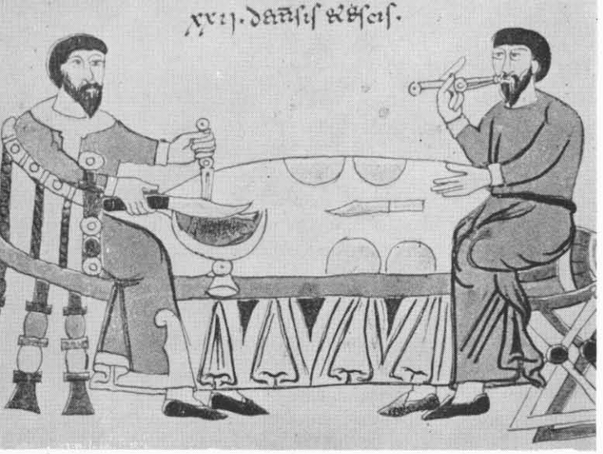
Wealthy Egyptian women once used special spoons for dipping perfume. Prosperous Romans ate eggs from long-handled, "egg-spoons," holding the egg in a cup-shaped bowl as you would hold an egg in an egg cup today. During the Middle Ages spoons of juniper wood became popular because they gave salad a special flavor when eating it. A few American colonists had salt-shaker spoons with handles that could be uncorked to shake out the salt.

The Arabs early began using spoons to sip sherbet. Per-

A 16th-century German poster (left) on good table manners showed knives as the only eating utensils.



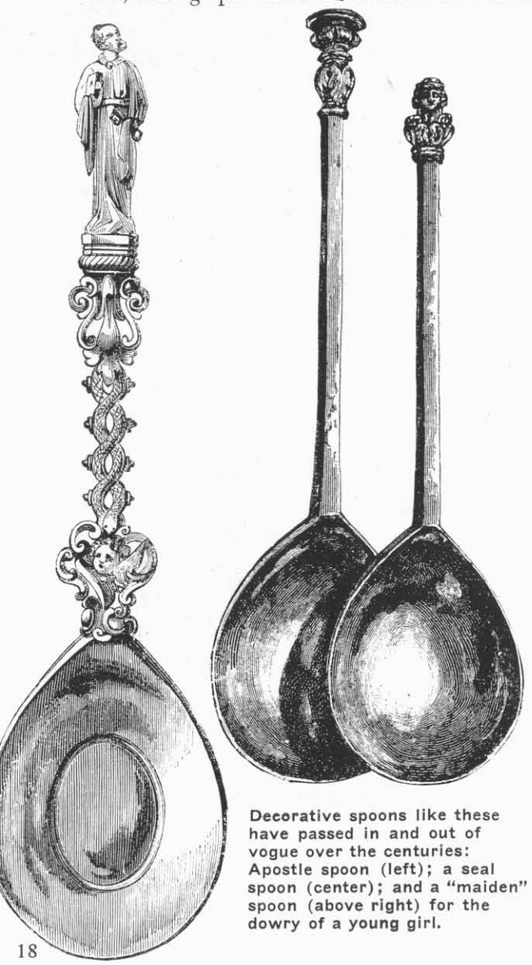
Excavators found this assortment of spoons in the lava-choked ruins of Pompeii, Italy.



This medieval painting depicts what scholars believe to be the first representation in art of a fork. The fork itself is preserved at the Monte Cassino monastery near Naples, Italy.

KNIVES, FORKS AND SPOONS

sians drank from spoons to quench their thrist. Coronation spoons were used in Europe for anointing medieval kings. And a century ago the "jokespoon" became popular in Europe. This was often given to an unsuspecting dinner guest. When he dipped it in hot soup the soft metal wilted in his hand, causing uproarious laughter around the table. "Snuff-



Decorative spoons like these have passed in and out of vogue over the centuries: Apostle spoon (left); a seal spoon (center); and a "maiden" spoon (above right) for the dowry of a young girl.

spoons" had perforated bowls through which you sniffed your favorite brand: this was thought to be neater than taking a pinch. The handle of the spoon was the stopper of your snuff bottle. It became popular to ask your friends: "Won't you take a spoonful?"

Like knives and forks, spoons have been made of every conceivable material, including gold. India once used leather spoons. Arabs had spoons of tortoise shell. The first English reference to silver spoons was published in a will exactly 701 years ago . . . in 1259. China, along with its chopsticks, still uses thin porcelain spoons that remind you of a hollow celery stalk. Some Americans keep a set of these for soup. If you've never used a porcelain spoon in hot broth, try it some day. The cool porcelain makes it possible to sip the hottest broth in perfect comfort.

Spoons have become part of the language. In parts of Britain today you are "spoon-hale" if you have recovered from an illness — at least enough to resume eating from your spoon. A witless man is called a "spoon." Many spoons have been made of fine horn, and in the north of England people used to say of an ambitious man: "He will make a spoon or spoil a horn."

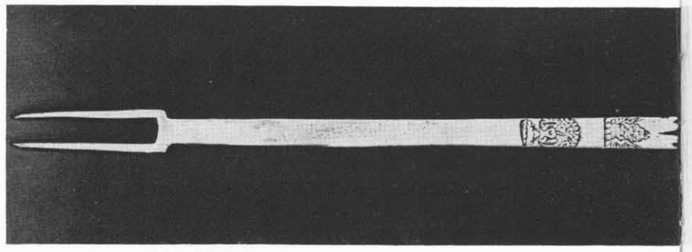
Nobody knows for sure, but the knife may be far older than either the fork or spoon. Some authorities say the knife was invented not by man but by higher forms of apes, who are believed to have used stones for tearing long before man's time. Man was making stone knives 45,000 years ago and some authorities think that even then he held chunks of meat in his mouth, slicing off what he *didn't* want to swallow. He continued this style of eating right up through the Middle Ages in Europe, using his hunting knife or fighting dagger to separate himself from his steak.

So many guests used to bring pointed knives to dinner about 1700 that France's Louis XIV nervously issued an edict against them. Thus began popular use of the round-ended knife you use today. These had been in limited use for 250 years, and some had wide flat ends that were almost like spoons themselves.

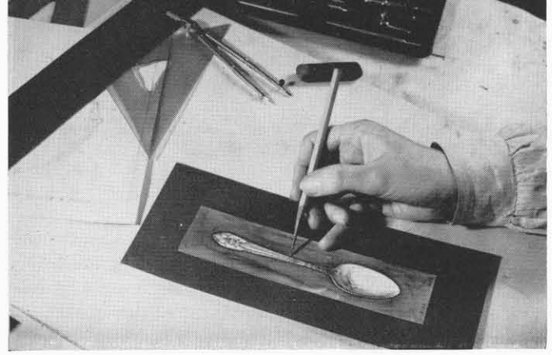
The wide-ended knife solved a problem for many people for it was found to be excellent "for the eating of peas & jellies." Some knives were even shaped with troughs in the blade — to make it still easier to eat those troublesome peas!

Bells and whistles were put in some knife handles a century ago. If a man bragged, or told tall stories at table you rang the bell or blew the whistle. Then with much ceremony you presented him the knife — to keep until a bigger braggart came along.

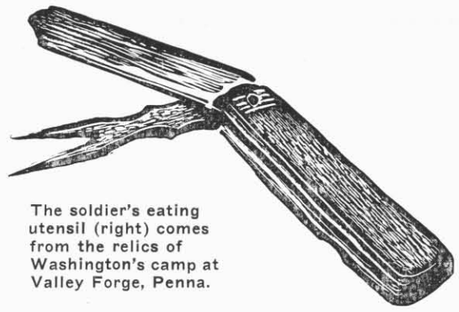
Knives for centuries were used to seal bargains. "Attestation by knife" was almost equal to taking an oath. When you gave a man the knife with which you ate and pro-



This English utensil, dated 1632, marks the half-way point in the evolution of the fork from the knife. From this two-tined affair, the fork developed its present-day four prongs.



The business of selling modern silverware is keenly competitive. Manufacturers seek the services of commercial artists (left) who design exciting pattern innovations.



The soldier's eating utensil (right) comes from the relics of Washington's camp at Valley Forge, Penna.

tected yourself it was a serious matter. A young man gave a knife to his bethrothed as we give engagement rings. And "wedding knives" were exchanged at the time of marriage, often with poems inscribed on the handle. Preserved in a museum in Paris is a knife given in proof of the donation of land to Notre Dame cathedral.

New shapes are appearing today in knives, forks and spoons. From Finland and Sweden recently have come knives and forks with handles curved in slender wave-like patterns that suggest the sea.

A new American fruit spoon has a small sawtooth edge to help you cut out juicy orange or grapefruit sections without first having to have your fruit scored inside with a knife.

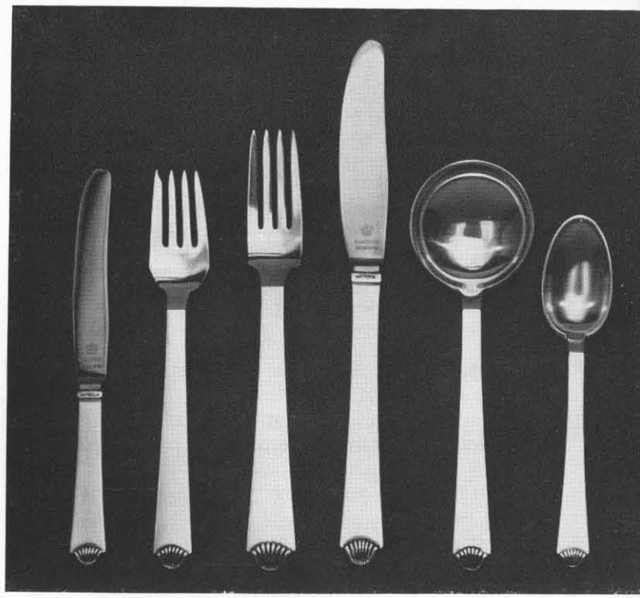
Another new idea is a "tippy-taster" spoon. This has two bowls — one at each end of the handle. This spoon, rapidly becoming popular, is for mothers and babies to use together. The mother first tastes her baby's food in one bowl, to see if it is too hot, then feeds the baby from the other bowl.

Gone from some knives within recent months is the familiar sharp-cornered "heel" on the blade, just where it joins the handle. The blade is streamlined right into the handle. This is considered new — but if you will look at one of George Washington's "pistol-grip" knives you will see that its blade was streamlined, too.

Differences of opinion still exist over the proper use of knife and fork. Was Washington's way best?

Today most Americans follow what etiquette experts have called the "zig-zag" method of eating: (1) we cut our meat, (2) place the knife on the plate, (3) transfer the fork from left to right hand, and then, (4) eat the meat.

Sleek lines with traditional shell motif . . . the table setting (below) is characteristic of contemporary Scandinavian design.



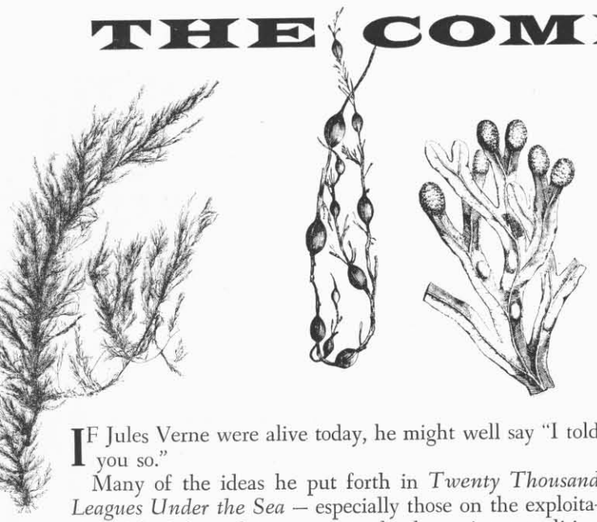
In Europe, people still use the "left-hand fork" system. But even here there is disagreement. People in England convey meat to their mouths with the tines turned down, while in fashionable schools in France girls are taught: keep the fork in the left hand but always keep the tines up.

Some people feel that the left-handed use of the fork looks gauche. But to others, the zig-zag method looks gauche, too.

Which method do you prefer? Zig-zag, left-hand-with-tines-down, or left-hand-with-tines-up? Today you may take your pick. One top etiquette authority in America prefers the left-hand method, tines up or down. But another says any of the three methods, gracefully done, is now considered correct.

. . . and some things, like corn on the cob, taste so much better eaten without benefit of knife, fork or spoon!

THE COMING WORLD OF MARINE CUISINE



IF Jules Verne were alive today, he might well say "I told you so."

Many of the ideas he put forth in *Twenty Thousand Leagues Under the Sea* – especially those on the exploitation of food from the sea – are today becoming actualities. And well they may, for there is much alarm in the world today over the exploding increases in population which are far outstripping food production. Therefore foraging the sea for food is not at all as fantastic as it may have seemed in 1875 when Verne's classic appeared.

Probably if Verne were alive today, he might well be asked to help conduct experiments for he was truly an expert on marine animal and plant life.

Sea produce was more than a culinary curiosity to Verne. It was an integral part of the daily menu on the submarine *Nautilus,* and the implication was that it was destined to become a staple in the diet of all men everywhere. One of Verne's imaginary meals consumed on the *Nautilus* consisted of: fillet of turtle, dolphins' livers, preserve of Holothuria (sea cucumber), cream from the milk of a sea-going mammal, sugar from the great seaweed of the North Sea, and a preserve of anemones, equal to that of the most delicious fruits.

Although Mr. Verne did not describe how a whale may be milked, turtle meat is considered a delicacy today by many gourmets, the liver from dolphin or porpoise is not impossible to obtain, sea cucumbers are now being considered for use as a basis for chowders, and the industry of the collection and cultivation of edible seaweed is developing rapidly.

In many countries, particularly in the Orient, where the industry is several hundred years old, algae or seaweeds are consumed in large quantities. Hawaiians use over 70 varieties of seaweed for food. Seaweeds are also eaten almost daily by people of Australia, New Zealand and Chile. The Chinese and Swiss discovered that algae was a prevention against goiter long before the cause of the disease was understood.

In Japan, edible seaweed is of such importance commercially that the natural yield of seaweed is not sufficient for the supply and demand. Thus, edible algae is actually "farmed" and has become a major industry in Japan. More than $2,000,000 worth of seaweed is marketed there annually. Much of this is exported to China, Hawaii and the United States where it is mostly used by Chinese restaurants.

In Chinatown, New York City, the only seaweed available in fact is imported from Japan. It is commonly known as *gee-toy*. It is black in color and must be soaked in cold water for an hour to allow it to swell. It is then added to pork or chicken soups to which it imparts a definite and delicious flavor.

Two red algae, Irish moss and agar-agar, are the chief seaweeds eaten in the United States although many Americans are unaware they eat them. The flourishing center of the Irish moss industry is in Massachusetts where the moss is collected, dried and shipped off to various parts of the country for making "sea moss farina," puddings, blancmange, and the basis and solidifying agent in jellies and ice cream. Irish moss is also used by brewers in the United States for purifying beer.

Agar-agar is the commercial name given to dried, partially bleached, gelatinous extract of red algae. The agar-agar industry has for many years been located in Japan, China, Malaya and Ceylon. But now, there are two more recent agar-agar centers, in California and Massachusetts. Unfortunately, not much seaweed is consumed in America because few Americans are aware of the high nutritional values of edible algae.

According to V. J. Chapman in his book, *Seaweeds and Their Uses* which describes the varieties of edible seaweed in all parts of the world, a jelly is extracted from the South African red seaweed, *Suhria vittata*. Early Cape colonists learned about it from Malayans who called the jelly *chinchow*. It grows in deep rock pools or on the stems of the "sea bamboo." After being cast up on the shore and left to dry in the sun, it bleaches white, but can be used for jelly-making, whether bleached or fresh, wet or dry.

In Hawaii, edible seaweed is known collectively as limu. And *luaus,* or Hawaiian feasts, are considered incomplete without several varieties served as a relish with meats or poi, which is a paste made from the root of the taro plant. Of the 75 varieties of limu, forty of them are in use daily. Most of these are red algae. The most popular dishes are limu-eleele, limu-kohu, and limu-lipoa. None are eaten alone, but are finely chopped in a raw state and used as a relish in combination with other foods. One limu dish is the needle type of seaweed, baked in red clay, and mixed with ground kukui nuts and served as a vegetable. Another dish is limu cooked with fish and soya bean sauce. Most limu requires different preparation: limu-kohu, for example, has to be soaked for 24 hours to remove the iodine taste, limu-manauea is chiefly used for thickening chicken broth, limu-huna is boiled with squid or octopus, limu-fuafua and limu-lipoa are used as relishes because of their tangy, spicy flavor, while limu-eleele is eaten uncooked.

At the famous "Luau 400" Hawaiian restaurant in New York City, green limu is flown in from Honolulu. In it, properly seasoned chicken or pork is wrapped and steamed. On the menu it is called simply South Sea Chicken or South Sea Pork.

Southwest of Hawaii, in New Zealand, some varieties of green seaweed are eaten in soups and salads. One species, known as *karengo* is highly relished by the Maoris in New Zealand. It is normally cooked by steaming and eaten for special occasions. And during World War II when Maori servicemen were stationed in North Africa, *karengo* was shipped to them from New Zealand to be used on long marches through the desert. This they chewed, as one chews gum, to quench their thirst.

In Japan, where the population has always been a problem because of the small size of the country, the people have had to rely almost entirely on what the sea offers in order to survive. Seaweed is used extensively there as a food. Many of their seaweed dishes are called kombu. Kombu is green, and shredded like cabbage before being cooked with meats, soups, or served as a vegetable.

Another Japanese seaweed called *hoshi-nori* is baked or toasted over a fire until the color changes to green. It is then broken up, added to sauces, soups and broths. In many Japanese railway stations, hotels and restaurants, *sushi* is served instead of a sandwich. *Sushi* is prepared by spreading boiled rice and strips of meat or fish on a sheet of *hoshi-nori,* then rolled up and cut into slices.

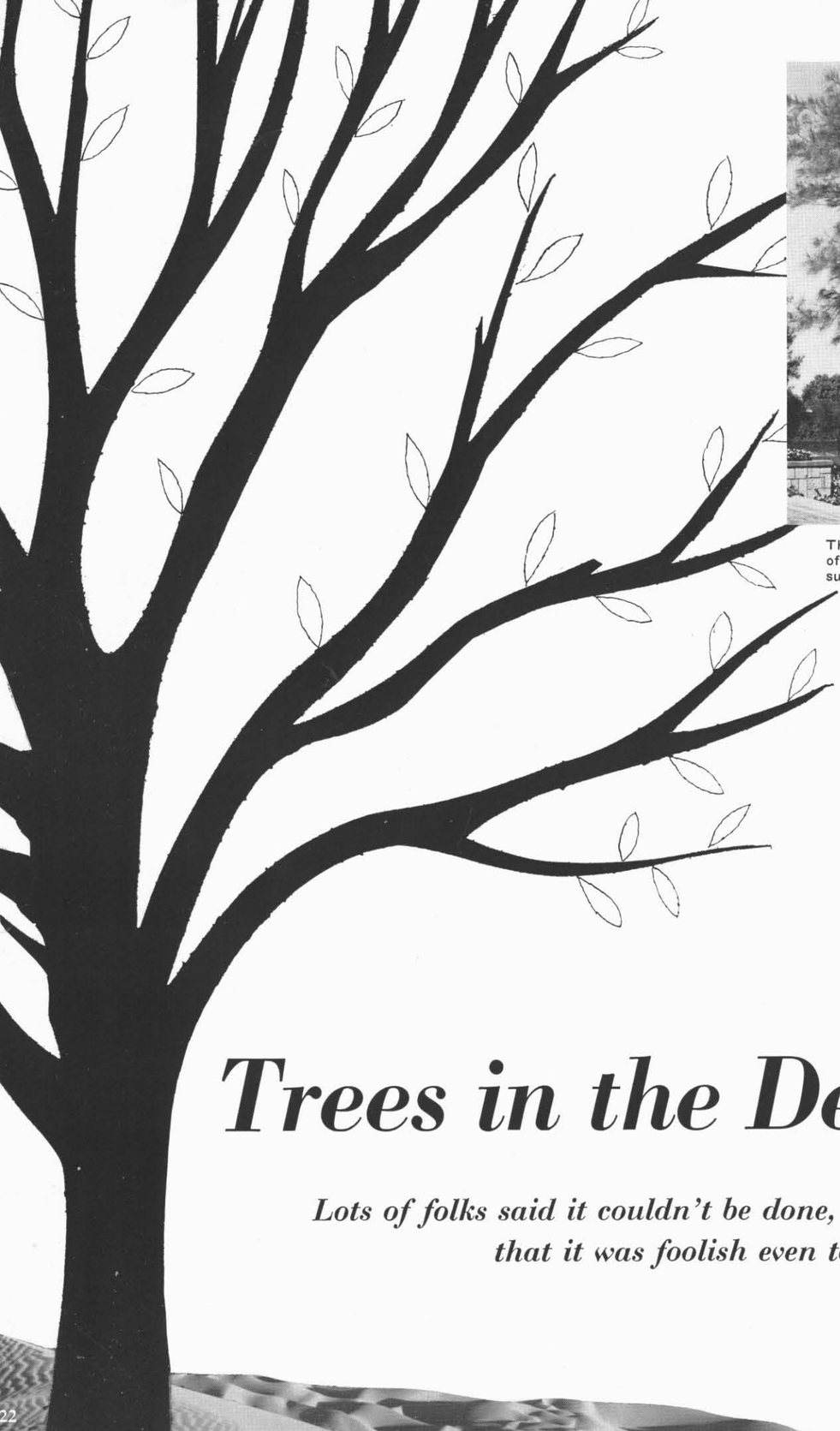
The consumption of seaweed is not confined to the Orient or near-Orient. One British author, writing in 1830, mentioned the frequently heard cry of the fishermen in Edinburgh calling: "Buy dulse and tangle." Dulse and tangle were the young stalks of the sugar wrack or brown seaweed with the almost modern name of Laminaria saccharina. The author claimed its taste was sweet with a similarity to peanuts. And during World War II, the Germans, while occupying Norway, collected seaweed, dried, ground, and desalted it to make "bread."

One thin delicate red seaweed—laver—is a culinary delight in parts of south Wales and can still be found on sale in the Cardiff market. It is eaten either as a salad or cooked and made into a breakfast dish. Laver is normally washed in fresh water to remove sand, steeped in water for three or four hours, then boiled gently until tender. Water is poured off, salt added to the pulp, then it is mixed with oatmeal and fried in the form of flat cakes; or it can be served on toast with the addition of vinegar or lemon juice, a few drops of olive oil and seasoning. It is said to taste like a mixture of olives and oysters. Another method of preparation is to cook the laver and add it to the gravy with lemon juice, salt and pepper. This is a cherished accompaniment to Welsh roasts.

Fresh-water algae, too, can now be converted into food as a supplement to flour used in baking. Edith Schuele, a 15-year-old high school junior from Memphis, Tennessee, recently won a prize at the National Science Fair in Hartford, Connecticut, for her development of fresh-water algae as a food. She said she grew the algae, spun it in a centrifuge, and heated it to obtain the powder which tastes similar to broccoli. When aged, it sometimes tastes like prunes. Edith exhibited a variety of cookies, French bread, and cheese biscuits at the American Medical Association. Doctors and scientists were interested in her exhibit not only for her scientific achievement but because algae is being considered as a food to be grown aboard rocket ships for crews on extended journeys into outer space.

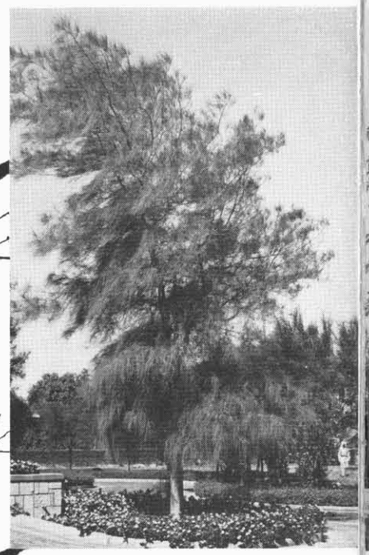
For in addition to its nutritional value, algae grown aboard a rocket ship could reconvert carbon dioxide, exhaled by the crew, into the oxygen, so essential to extended flights in airless outer space.

It won't be surprising, then, during the next 25 years if one is overheard in a restaurant ordering sea cucumber chowder and seaweed and chicken on rye. It will, in fact, probably be taken for granted by a world that has grown accustomed to produce from the sea.



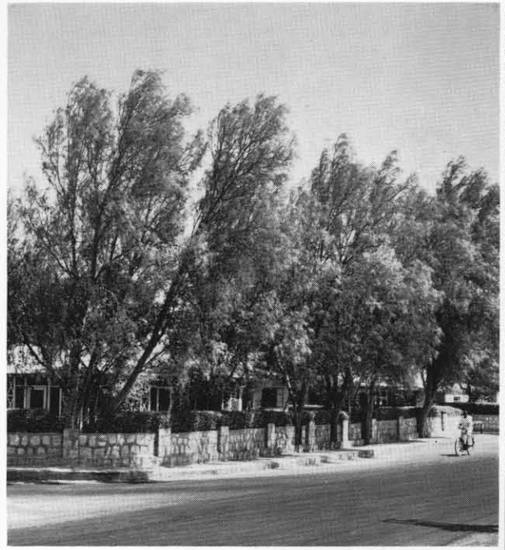
Trees in the Desert?

Lots of folks said it couldn't be done,
that it was foolish even to try.....

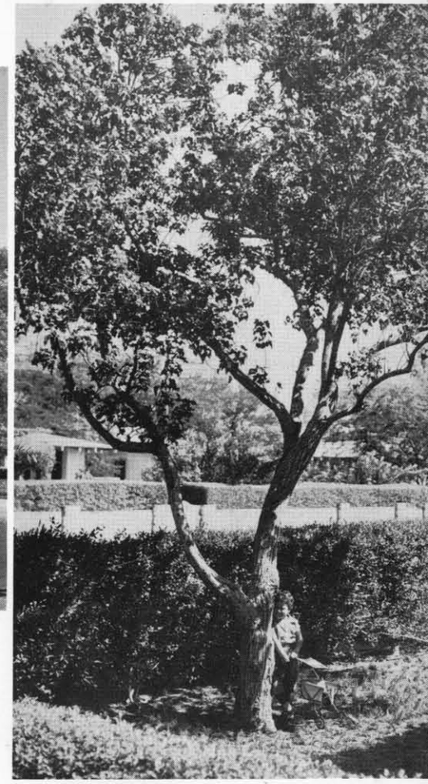


The casuaria is one species of tree that is grown with success in oil town Dhahran.

Trees and bushes in Saudi Arabia need much water to survive the arid climate.



Native to Saudi Arabia is the tamarisk tree, which serves as a practical sand break during the windstorms of spring.



Under an unbrella tree, this Dhahran youngster (right) finds the blessing of a shade tree in a tropical land.

IT'S probably safe to say that most people like to have some trees around the yard, and around the town. Aramco's pioneers felt that way. The trouble was they didn't have any.

Oh, there were many trees in the large oases, not far away. But, if you could have seen the acres of sand now occupied by the oil communities of Abqaiq, Dhahran and Ras Tanura, you'd have felt certain that these were the last places a tree would ever grow.

Well . . . they were not.

Of course, as one quickly learns from Dhahran's supervisor of landscaping, T. J. Davenport:

"It took a little doing."

Nevertheless, there they are: a dozen and a half varieties of trees, more than a dozen kinds of flowering shrubs and bushes, and an abundance of flowering vines.

Most surprising to the newcomer, perhaps, is discovering how many of the trees are native to Saudi Arabia: the shade-giving acacias — you see them all over the place; the antalocas, almonds and native cherries.

Numerous and local, also, are the tall tamarisks (much like a pine) that seem always to look dust-powdered — as, in fact, they often are, for they are frequently planted closely in rows as a screen against blowing sand.

There's nothing unusual, of course, about finding palms, especially the stately date-producing variety; and even some banana palms and Washingtonias. But it's a little amazing to come across paloverde, the flame of the forest, and a eucalyptus type, known locally as a "gum tree," which are also local.

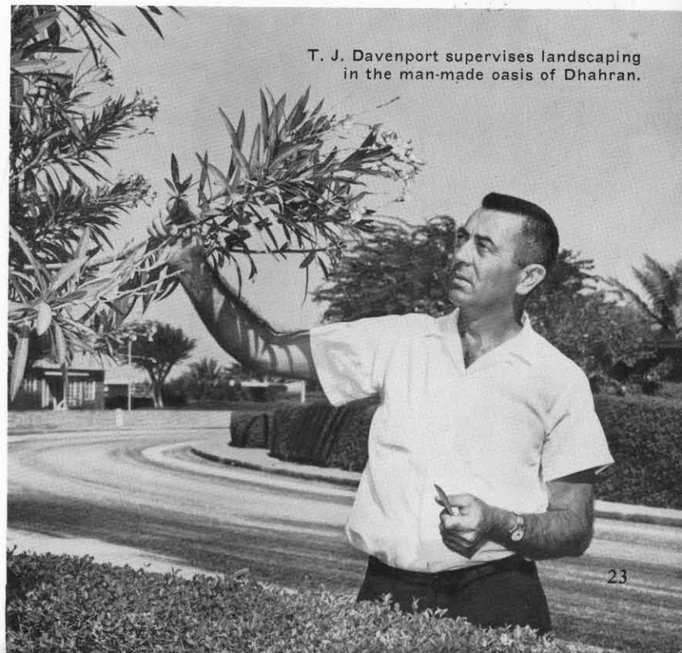
But, there are other surprises: you begin to get acquainted with exotic species from the Orient.

From India, for example: umbrella-like shade trees such as the banyan, with its thick, rather long leaves and its small, inedible figs . . . the smaller-leaved pepultree . . . the raintree, with its full-bodied foliage . . . and, sure enough, the umbrella tree, itself.

Also from India (and Ceylon) are the long-leaved, beautifully white-flowered frangipanni, and the coconut palm.

The delicate-looking *shisham* came from Egypt; the ornamental palms from Eritrea; the casuarinas and flamboyant trees from seed.

There are a number of other trees that grow elsewhere



T. J. Davenport supervises landscaping in the man-made oasis of Dhahran.