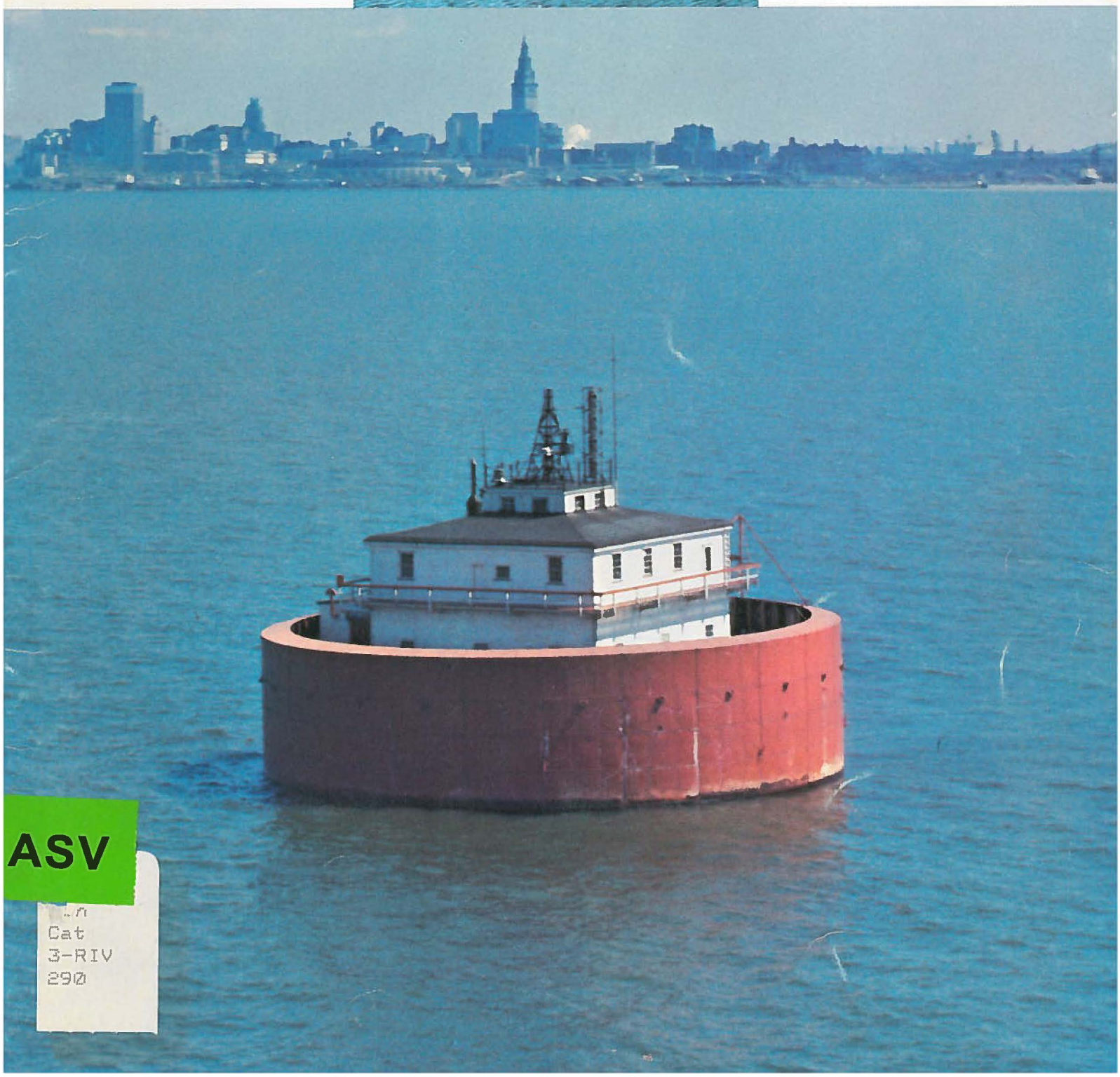
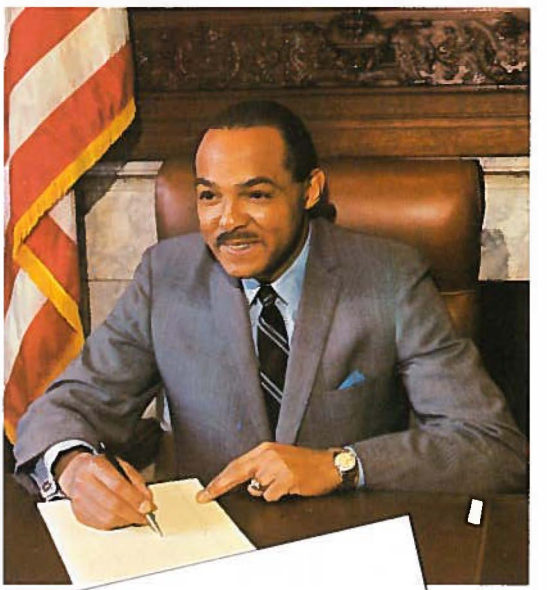
The Cleveland Water Story





City of Cleveland

CARL B. STOKES
MAYOR

Water is one of the magic ingredients that make human life and civilization possible.

The people of Cleveland are fortunate to be blessed with a water supply that is one of the finest of any major city in the world.

Lake Erie, our northern boundary, is a huge reservoir containing sufficient blue treasure to meet all our water needs for as far into the future as the most avid science fiction fan can project.

We have a more than adequate water supply for virtually unlimited population and industrial growth in the Cleveland area.

Cleveland is "water wealthy"---and happy to be so.

Carl B. Stokes

The Cleveland Water Story

This is a timeless report to the citizens of Cleveland — and to industrial leaders considering locating new plants here — on one of this community's most precious assets: water.

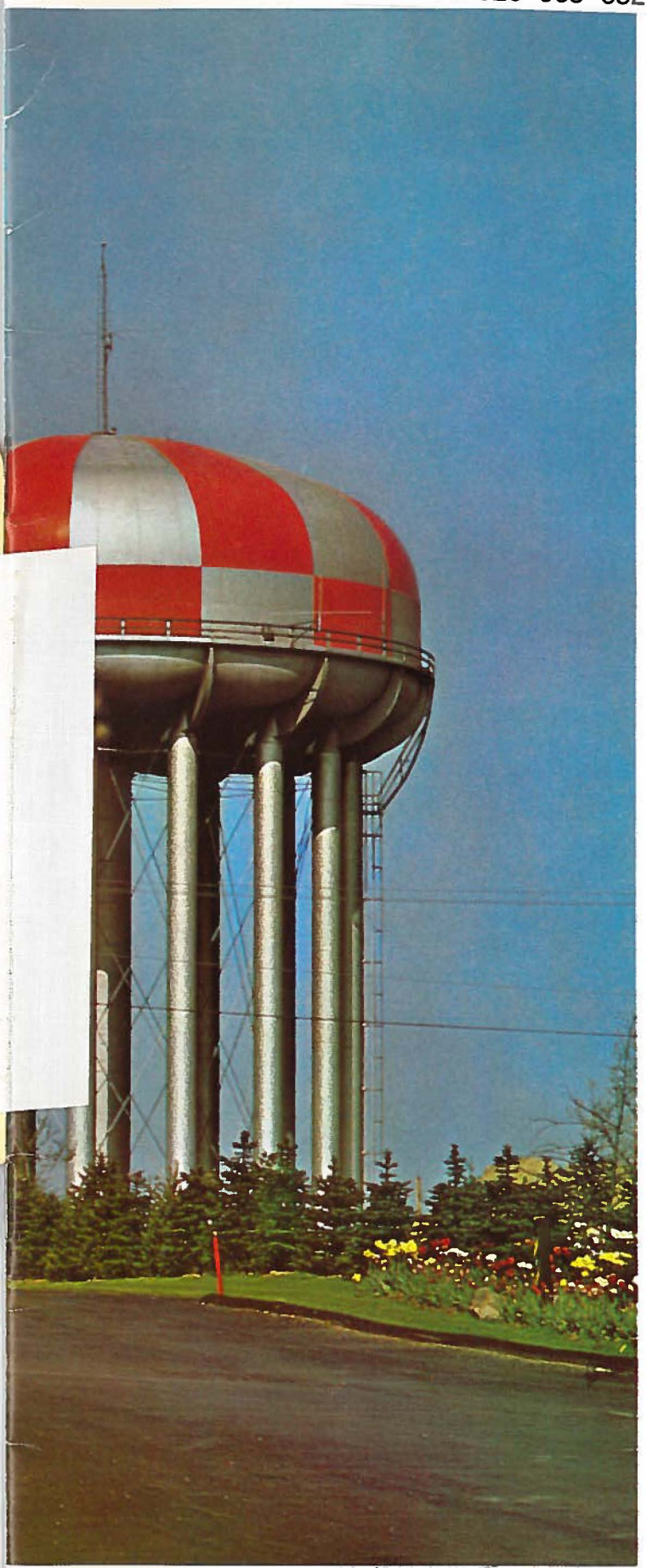
We have one of the finest water systems in the world.

For more than a century, the Water Department of the City of Cleveland has been operated by dedicated and competent men with vision and foresight.

It is no exaggeration to say that this community should be proud of the vast system that distributes water to all of Cuyahoga County and four adjacent counties. Water is the asset that has made possible the industrial and residential growth of Greater Cleveland, the "Best Location in the Nation".

Our Water Department has an outstanding record of keeping pace with the progress of this community and is continually expanding to meet the residential and industrial requirements of the future. Our motto is "always at your service".

—Ben S. Stefanski II,
Director of Public Utilities,
City of Cleveland



Cleveland Water: An Abundant Gift

The City of Cleveland and the 2,000,000 men, women and children who live in the metropolitan area are among the nation's most water fortunate people.

Unlike 1,000 other American cities which suffer periodic drouths and shortages, Cleveland has a vast body of fresh water on its front doorstep and an excellent, dependable system for pumping, treating and distributing it.

The 210-foot-deep, 240-mile-long, 57-mile-wide Lake Erie assures Cleveland a virtually unlimited supply of water — 132,000 billion gallons, according to expert measurement.

Every day, the City of Cleveland Water Division draws as much as 545 million gallons out of the lake, cleans the water, and pumps it through a network of 4,052 miles of main pipelines into homes, factories, offices, stores and other facilities throughout a 520-square-mile area — 75 square miles in Cleveland and the rest in Cuyahoga, Medina, Summit and Lake Counties.

Every day, even during the hottest summer months, people served by the Cleveland Water Division bathe, brush their teeth, wash their dishes, turn on air conditioners and mammoth mill machinery without any concern — and probably no thought — about the water they are using.

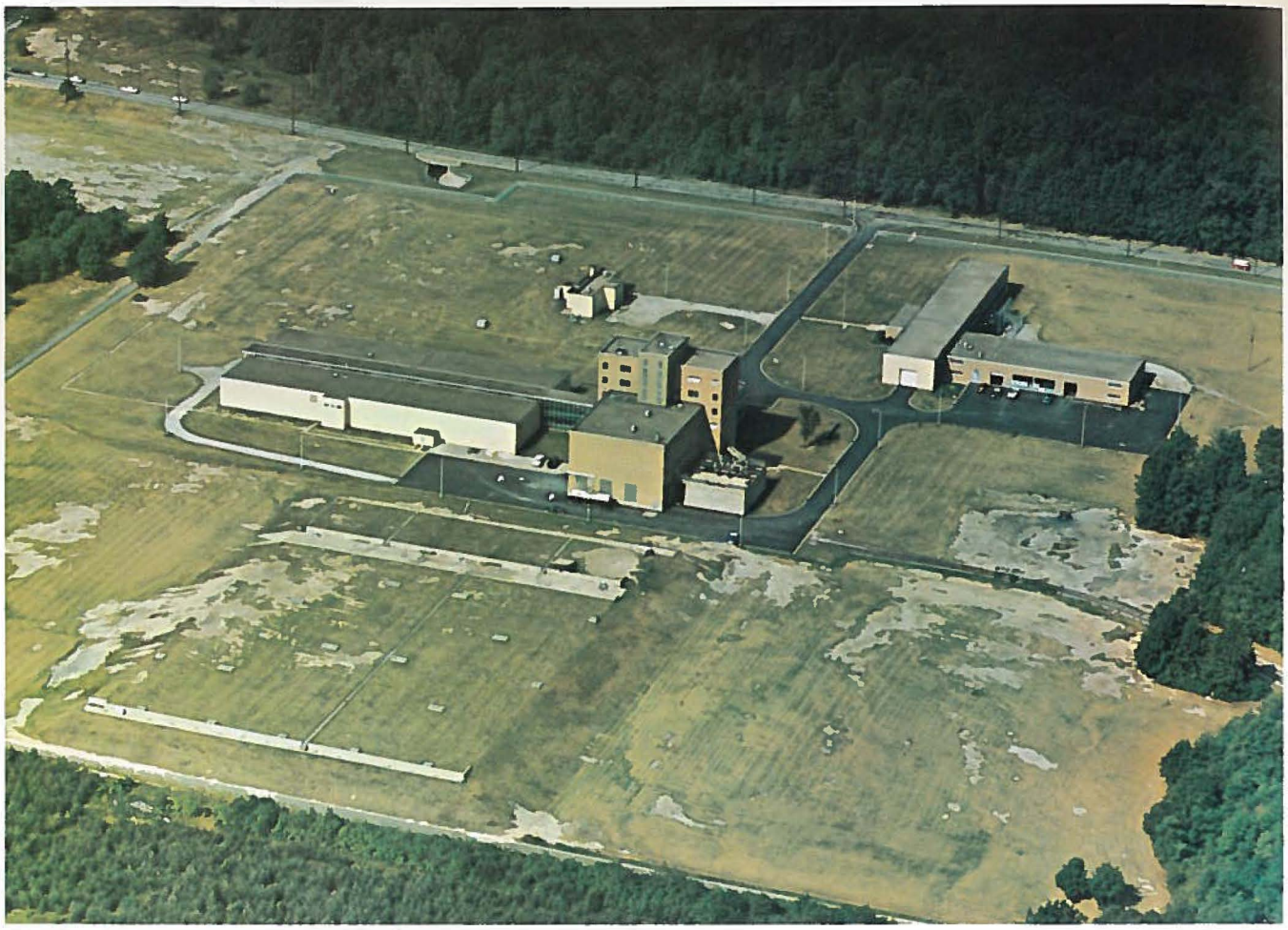
Always, the water is there, on immediate tap.

The Cleveland Water Division makes sure that it is.

Sound planning, constant maintenance and regular improvements through the years have kept Cleveland's water system well ahead of the area's needs, and the State of Ohio's and U.S. Public Health Service's standards, for clean, fresh, pure water.

One of 22 elevated towers in the Cleveland water system, the two-million-gallon Kinsman tank's colorful dome serves as an aerial landmark.

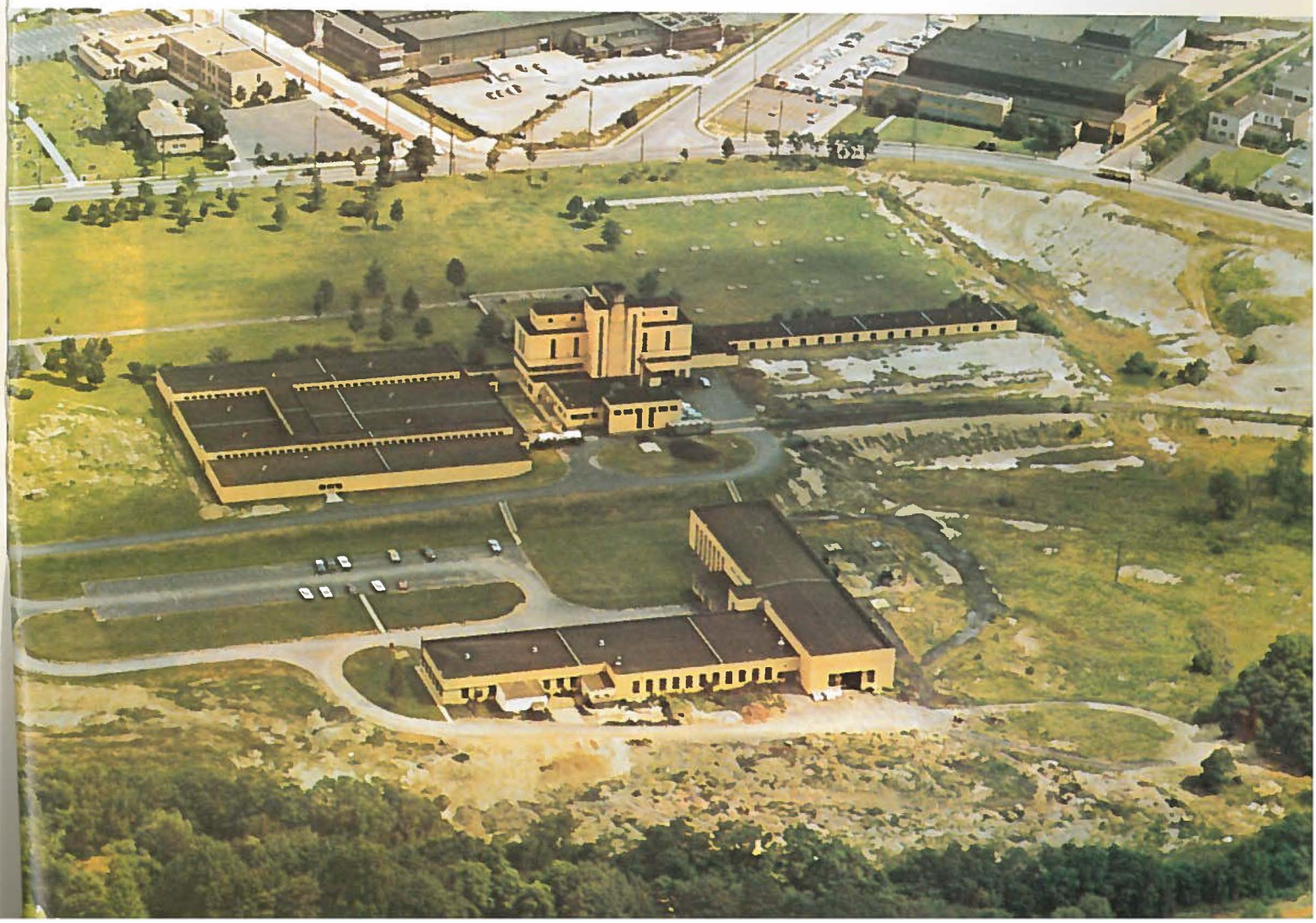
Cleveland Water System: Major Facilities

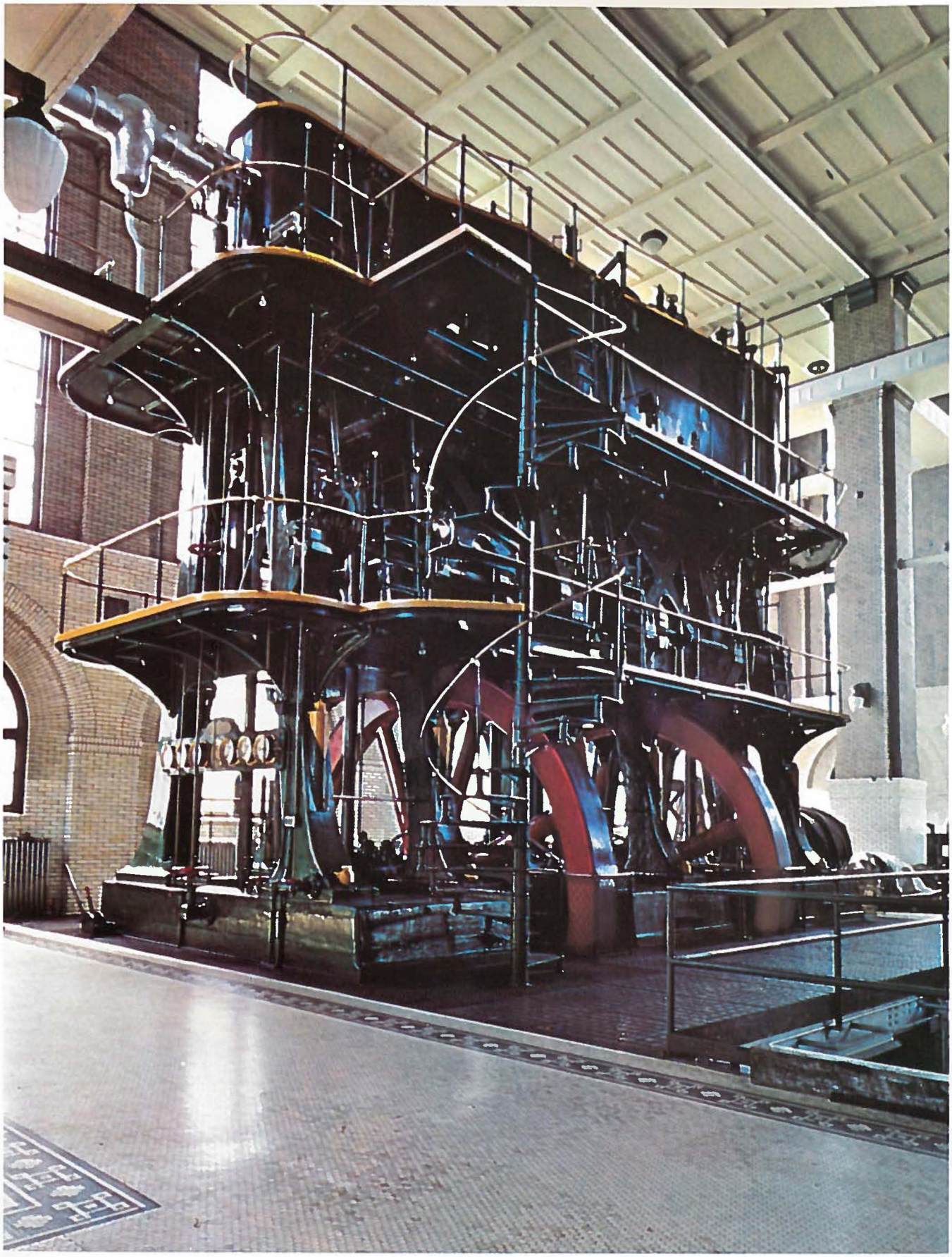


The $20 million Crown Filtration Plant and Pumping Station complex, in Westlake, is newest of the system's major water treatment facilities. The structures were designed to permit doubling of capacity, when needed, to meet westerly suburbs' water requirements.

Kirtland Raw Water Station, in service since 1904, is scheduled for replacement by a $5.3 million all-electric facility. Present steam pumps at the lakefront plant draw water through Crib No. 3 and move it to Fairmount Reservoir.

At right is Division Filtration Plant and Pumping Station. Complex features 36 newly rebuilt filters that process 150 million gallons of water daily. Plans are underway to increase the capacity by 40 million gallons. • Below, Nottingham Filtration Plant and Pumping Station, called Cleveland's engineering wonder when built in 1951, handle 100 million gallons daily. On the boundary between Euclid and Cleveland, the complex can be expanded by another 50 million gallons.





Museum-piece triple-expansion pump, still used when necessary, is an attraction for visitors to Division Pumping Station. Built in 1913, the 1,000-horsepower pump is five stories high. Its flywheels weigh 60 tons each. The "monster's" 25-million-gallon-daily capacity is equalled by today's compact electric pumps.

Cleveland Water: More Than a Century Of Progress

If stretched out in a straight line, the City of Cleveland's 4,052 miles of water supply pipelines would span the continent . . . from the Atlantic Ocean to the Pacific.

To duplicate the city's system, which includes four massive filtration plants, would cost a billion dollars today.

Yet, since 1853 — when taxpayers approved a $500,000 levy to start the service — development of the water system has been financed entirely by operating revenues.

More than money has gone into the building of the city's system. Engineering ingenuity, for one thing. The lives of 58 men for another.

From 1796, when Moses Cleaveland founded the community, until 1853, Cleveland's drinking and washing water was drawn from wells, springs and the Cuyahoga River.

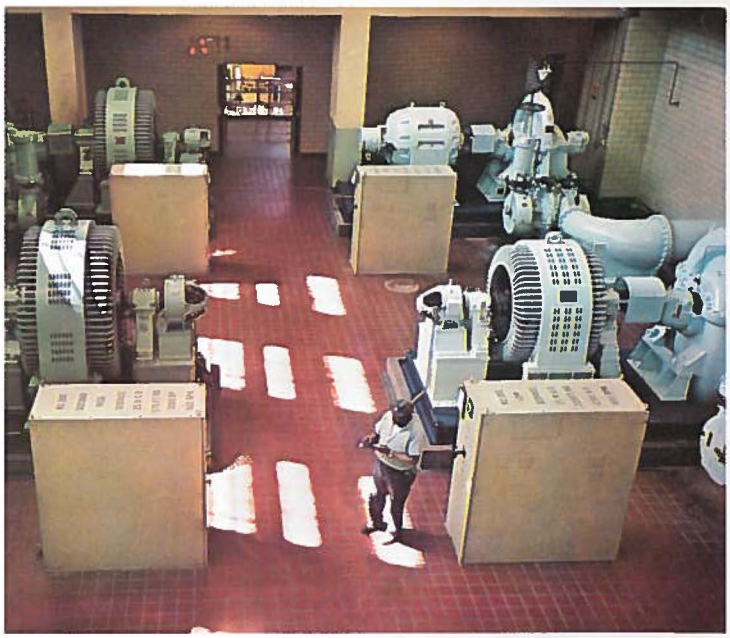
LAKE ERIE TAPPED

Lake Erie was the obvious source for a larger and more dependable supply. In 1854, after almost two decades of off-and-on studies, the first pumping station and an intake 300 feet off shore and four feet below the surface went into service. Water was drawn through 50-inch boiler plate pipe to a reservoir west of the Cuyahoga River.

The first pipeline system totaled 44 miles.

In the first full year of the system's operation, 127 million gallons were consumed. (Today's annual consumption is a thousandfold greater — almost 129 billion gallons).

(Continued on Next Page)



Top, mural by nationally recognized enamelist Ed Winter of Cleveland graces Crown plant's administration building. Two other murals by Winter are displayed in Nottingham plant. • *Center, meters and gauges in Nottingham's modern control room provide at-a-glance information on water levels and pressures.* • *Below, each of these 25-million-gallon-daily pumps could supply the entire water requirements of a small city. Pump painted green has 3,000-horsepower and draws water to an elevation of 575 feet. Blue pump, 1,250-horsepower, is used in low service.*

Cleveland Water: More Than a Century Of Progress

(Continued from Previous Page)

Beginning in 1885, the water system was expanded periodically to meet increasing demand. At the turn of the century, annual consumption was pushing the 20 billion gallon mark.

To satisfy the city's thirst for water, new and bigger intakes were started.

Construction of the intakes, tunnels and cribs resulted in six major disasters which claimed the lives of the 58 men.

TRAGEDIES RECOUNTED

The first tragedy occurred May 11, 1898. While 6,280 feet off shore and deep in the soft clay bed of the lake, eight "sandhogs" were fatally burned in a tunnel explosion.

Two months later, on July 11, a second explosion took eleven more lives.

On August 14, 1901, just before the tunnel was finally completed, a fire in the crib superstructure resulted in ten more deaths — five by fire and five by drowning.

Eight other men, trapped in the tunnel, managed to escape when the fire subsided. Almost six days later, two others believed lost were rescued. They had been entombed a quarter-mile deeper in the tunnel, without food, breathing foul air and drinking muddy water tasting of gas. They were found slumped in the mud, barely clinging to life and hope.

Another gas blast five days later ripped the lining out of the shaft and instantly killed four men. The force of the explosion hurled the 78-ton shaft lining 50 feet through the crib roof.

Just as the tunnel was nearing completion another gas explosion, on December 14, 1902, claimed four more lives.

Two years later, finally, the tunnel was put into service.

On July 25, 1916 during construction of the second of the present four intake tunnels, 21 more men were killed when diggers encountered a gas pocket.

An indeterminate number of other "sandhogs" were believed to have died from the "bends", caused by extreme variances in air pressures.

By the late 1920s, three huge, multi-million-dollar pumping stations were in operation — Kirtland, Fairmount and Division — as well as numerous booster stations.

With completion of the 135-million-gallon Baldwin Reservoir, gouged out of solid rock and believed to be the world's largest covered reservoir, the system's water storage capacity was increased to more than 328 million gallons. That's enough water to fill a good sized lake.

The third intake, 70 feet under the lake bed, was started in 1949 — and laid without any human toll. Its three and one-half mile pipeline supplies 150 million gallons of water daily to the Nottingham Filtration Plant. Built at a cost of $27 million, the plant-pipeline complex went into operation Sept. 1, 1951, and still ranks as one of Cleveland's outstanding engineering feats.

The fourth pipeline, extending two and one-half miles into the lake, feeds 50 million gallons daily to the Crown Filtration Plant, completed in 1958 at a cost of $20 million and named for Emil J. Crown, a former Director of Public Utilities.

THE WELL IS FULL

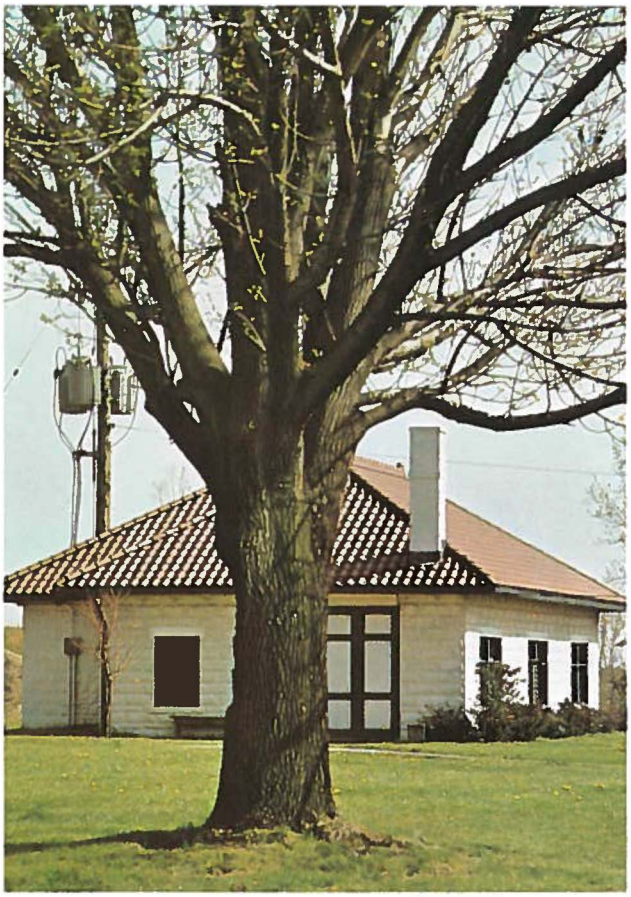
Today, a maximum of 615 million gallons of water can be drawn daily from the lake through the four intakes, eight to ten feet in diameter.

Improvements in the system continue. Under construction is a new Supervisory Control Center, which will monitor and record water pressures and levels throughout the entire system, as well as determine flow conditions and to control valve and pump operations.

Today's Cleveland Water Division is equal to tomorrow's challenges. It maintains its ranking as one of the country's most efficient water services. The entire system is metered. As a result—and aided by a continuous waste detection program—unaccounted for water is less than 10 per cent, compared to a national average of 15 per cent.

The payoff: Cleveland's water rates are now the lowest among America's 40 major cities.

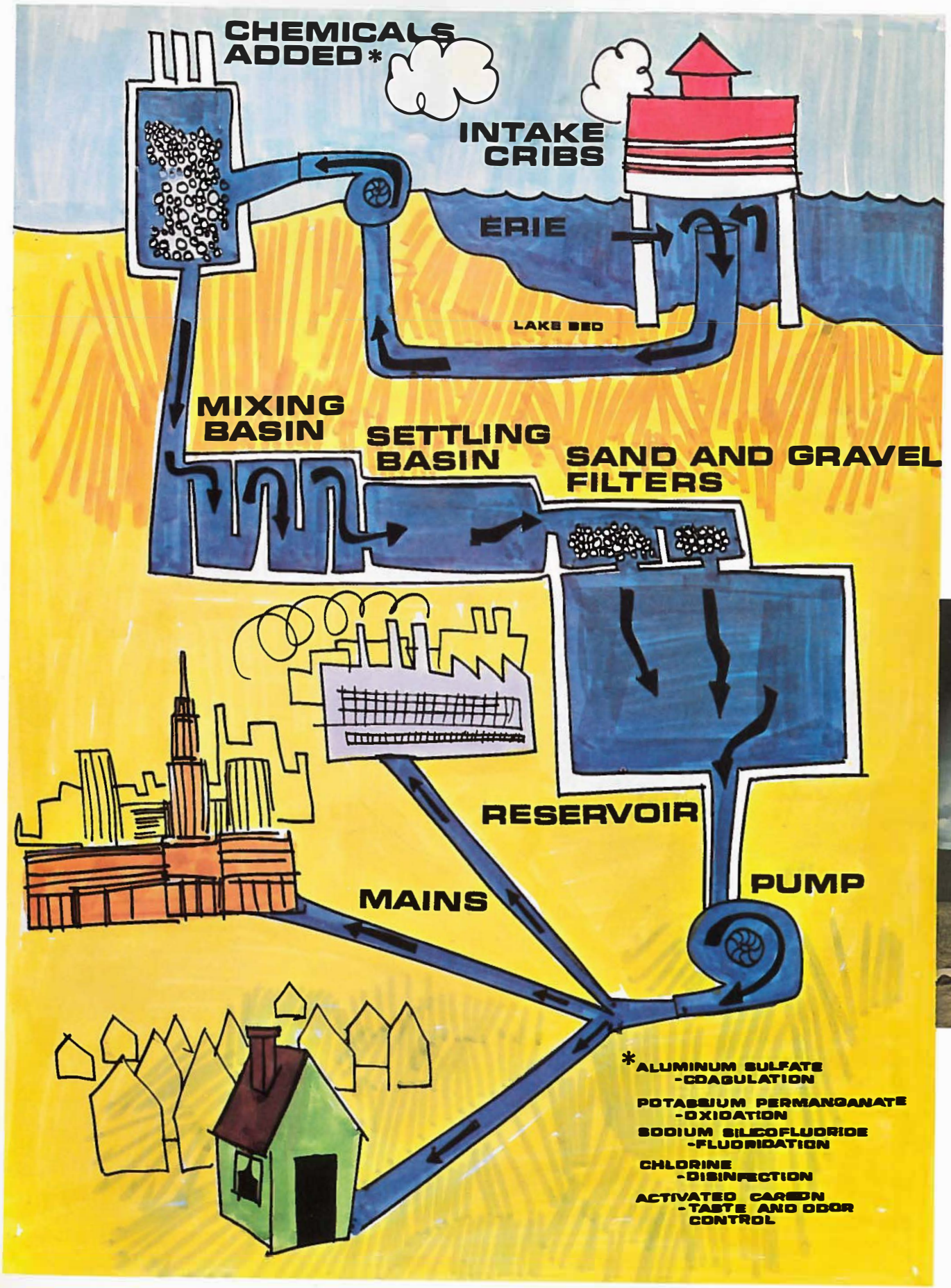
And Clevelanders need not worry that their well may go dry.



Left, Warrensville Pump Station, one of 20 in the system that help maintain water pressure at 70 pounds per square inch. • *Above, pipe for system's transmission and distribution lines is supplied from Harvard Avenue Yard.*

Baldwin Filtration Plant and Fairmount Pumping Station complex includes a covered reservoir (under lawn) believed to be the world's largest. When an electrification program is completed, treatment capacity will be 200 million gallons daily.

Cleveland Water:
From Lake Erie Intake to Kitchen Faucet



Left, top, largest mobile crane in system makes child's play of handling 30-inch cast iron pipe. • Left, bottom, $1 million Supervisory Control Center is nearing completion in Parma. Several million dollars' worth of automatic equipment, including a computer and telemetering, recording and remote control devices, will be installed here to automatically control the flow, elevation and pressure characteristics of the system's water. • Right, top, home-like Engle Road Booster Station, one of system's newest, was designed to blend with its residential location. • Right, center, meter shop where 17,000 of system's 338,000 meters are repaired each year. • Right, bottom, dispatch center, which maintains instant communication with 122 radio-equipped vehicles operated by Cleveland Water Division.

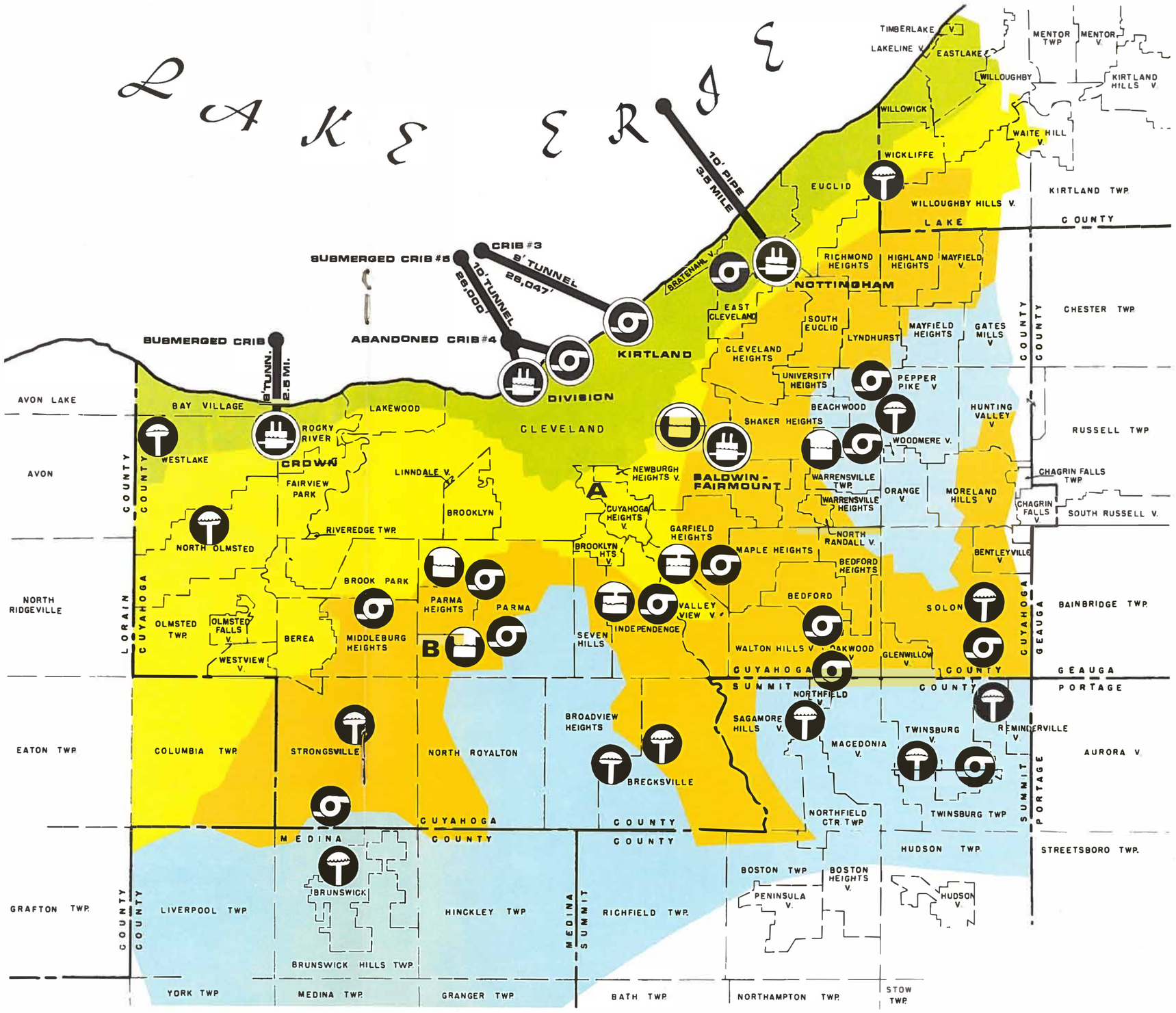
A Billion-Dollar Water System Owned By the People of Cleveland

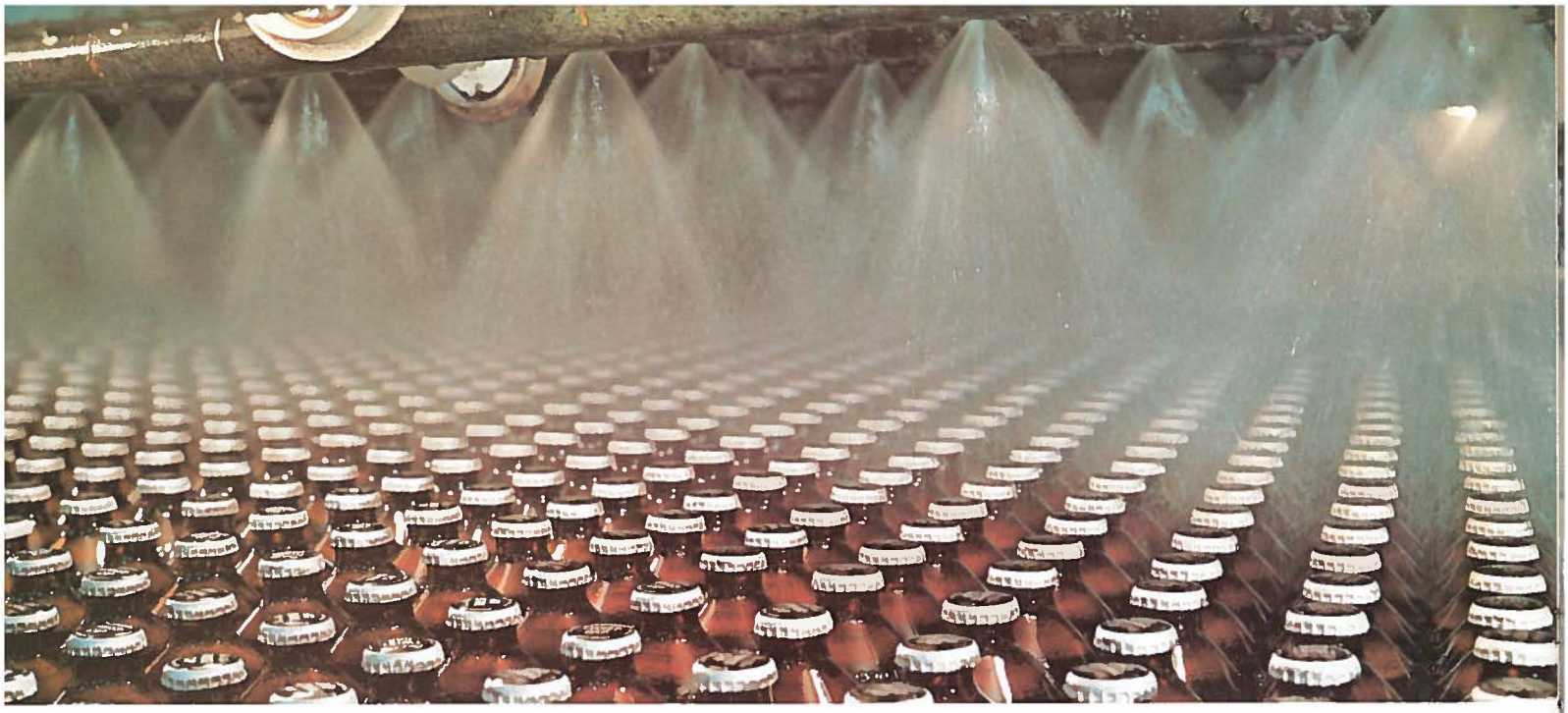
SERVICE DISTRICTS

- Low Service (Lake level to 120 feet)
- 1st High Service (120 to 250 feet)
- 2nd High Service (250 to 500 feet)
- 3rd High Service (500 to 810 feet)

INSTALLATIONS

- Tower
- Pump
- Filtration Plant
- Reservoir
- Tank
- Major Facility
- **A** Harvard Distribution Yard
- **B** Supervisory Control Center





Cleveland Water: The Mainstay Of Our Community

In Cleveland, water is almost as plentiful as air.

And almost as inexpensive.

Water is so abundant that Clevelanders hardly give it a thought.

Turn on a faucet and it's always there: clean, sparkly, two parts hydrogen, one part oxygen, coming in streams.

Yet, take away that taken-for-granted water supply and Cleveland would be in trouble. Like whole civilizations that vanished when the Tigris and Euphrates rivers went dry, Cleveland would bite the dust.

Without water to drink, men and animals would perish — the humans in seven to ten days. Factories, schools, offices and stores would have to close—and homes couldn't operate, either.

Without an efficient water system, Cleveland could never have grown as it has in the last century.

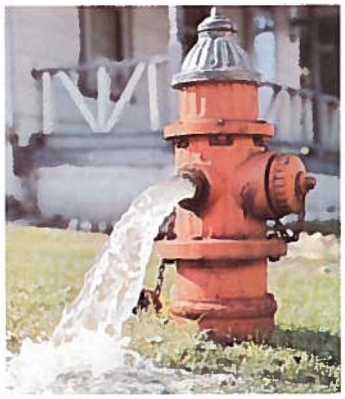
Always, water supply has paced the city's growth.

Since 1854, use of Cleveland water has increased an average of 12 billion gallons per decade. At that rate, today's annual consumption of 129 billion gallons will be enlarged another 13 billion gallons by 1980 to support a burgeoning industrial-commercial-domestic complex.

The water required for population and industrial expansion is here (take a look at the photograph on the cover) — and so are the facilities required to process and distribute it.

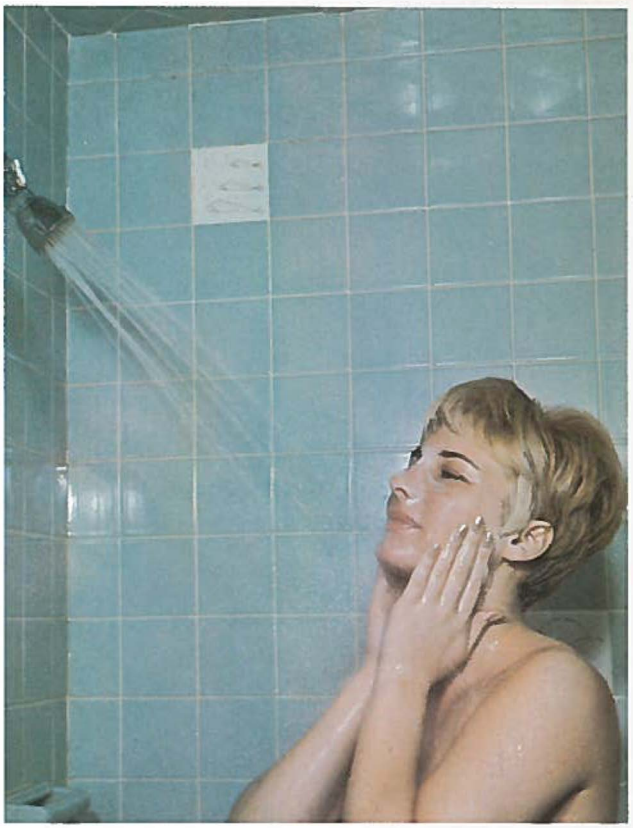
True. Clevelanders don't give much thought to their water.

But it's something to think about.



Abundant Cleveland water's many uses range from (top) cooling and pasteurizing bottled beer to (bottom and opposite) recreation and cleaning everything from autos and streets to human bodies.


WASHMOBILE

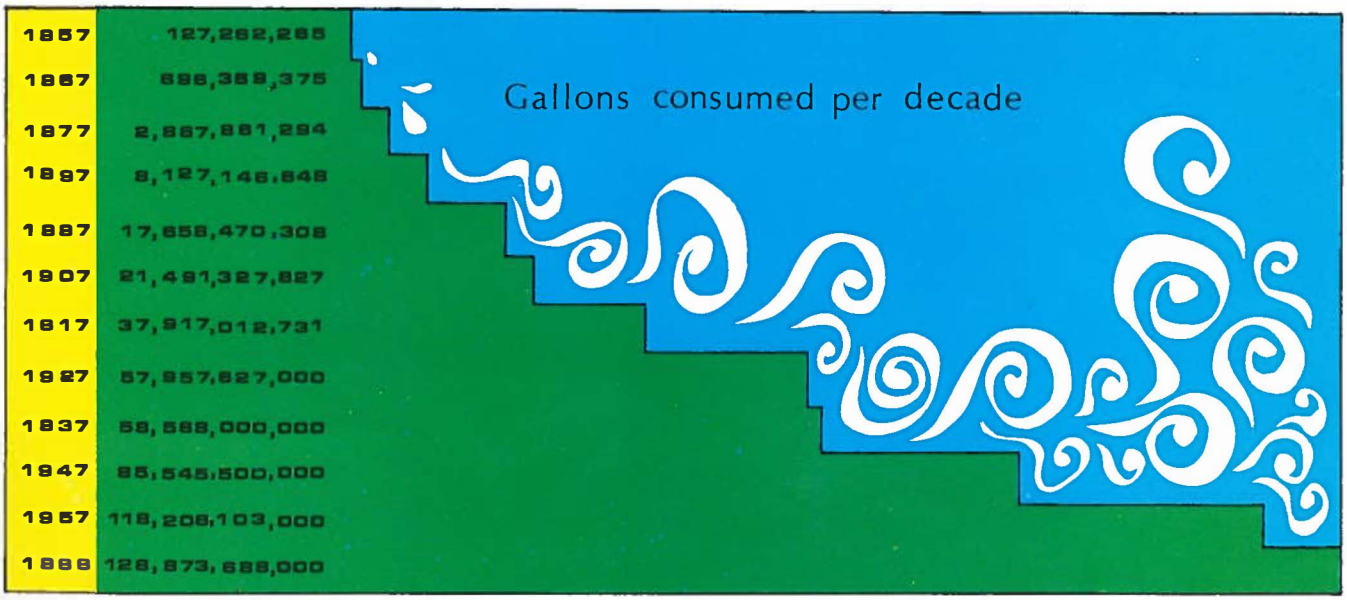


Water makes the green greener and everything prettier, as witness the lawn (top) and flowers (below) in a City of Cleveland Park Department greenhouse. Clevelanders are proud of their green lawns and the products of their "green thumbs" — made possible by Cleveland water.

Cleveland Water: How It Is Used

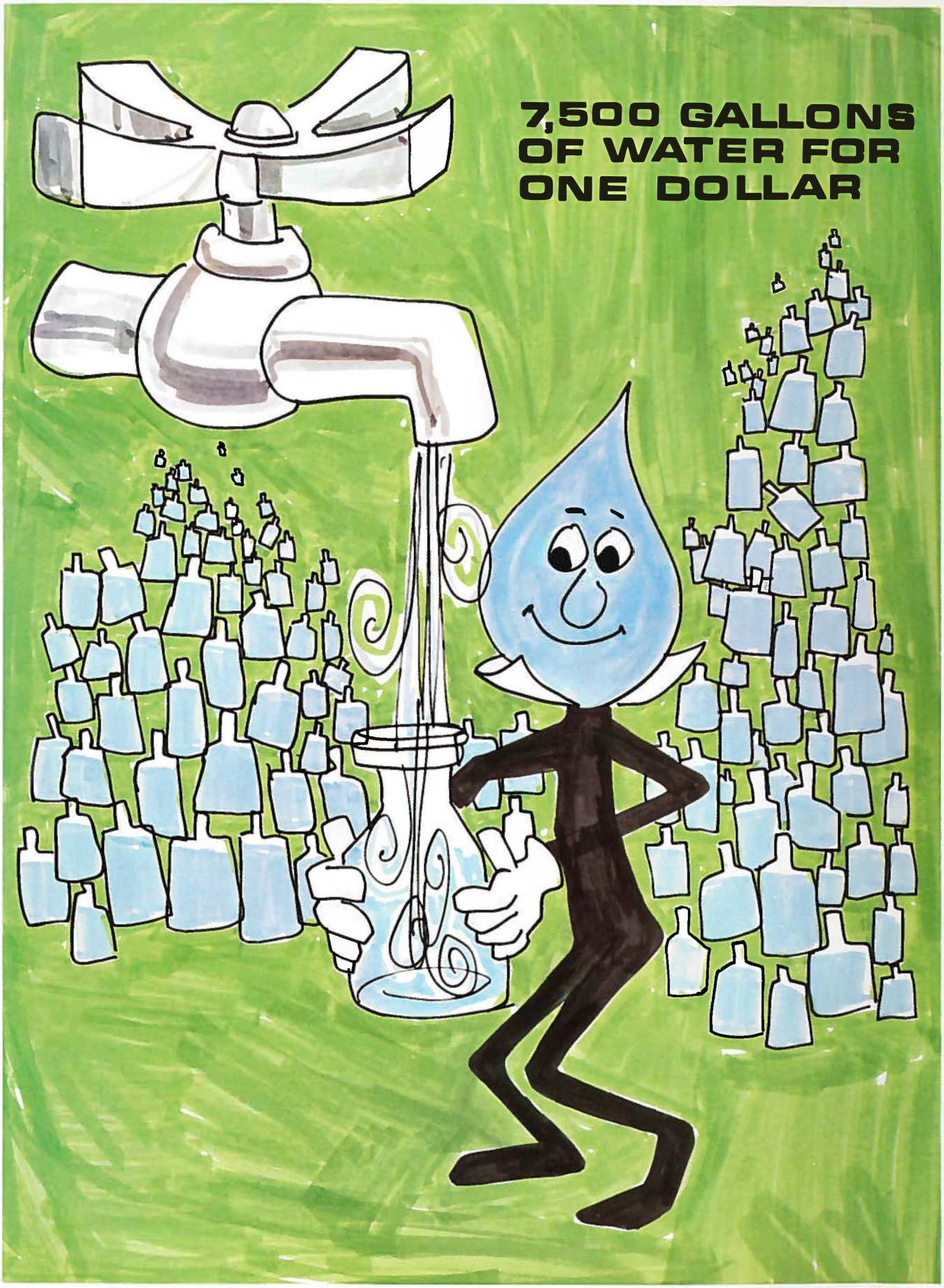
Water is an artistic medium used for beautification and ornamentation. Water-splashed monument (foreground) and fountains create a soothing scene on the downtown Mall. The spectacular plaza is atop the underground exhibit hall and convention center.

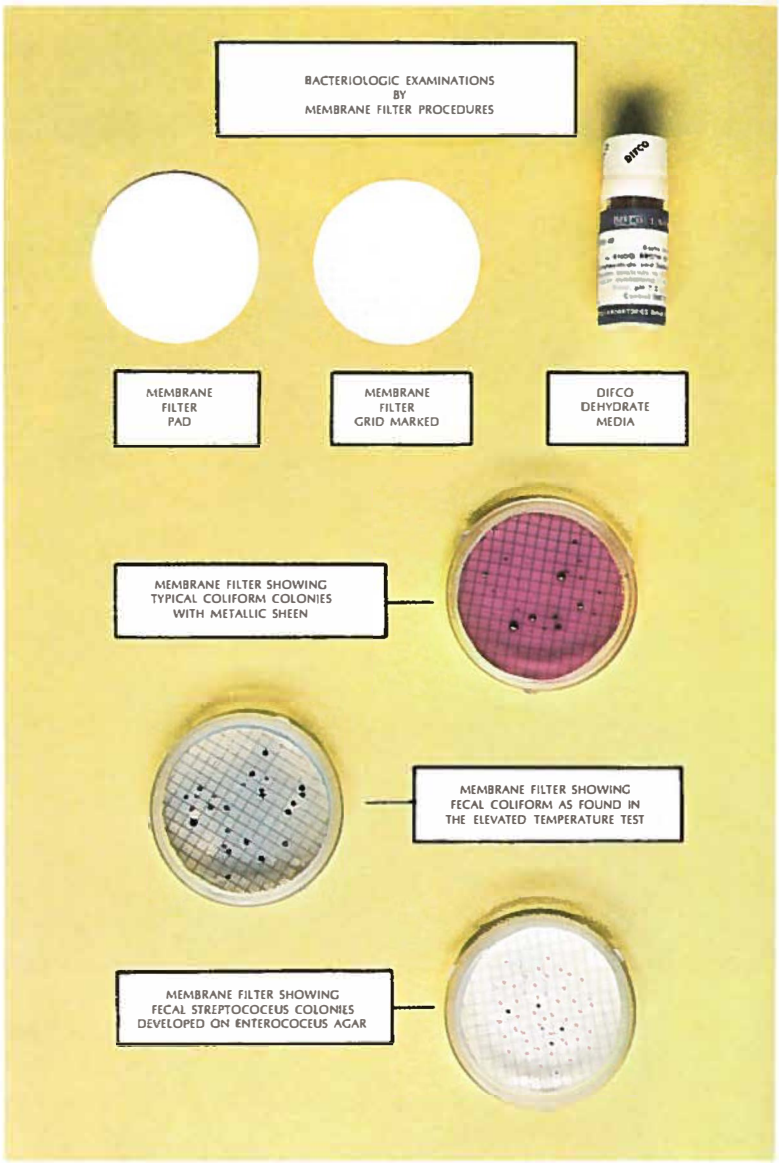
Cleveland Water: Plenty For Tomorrow

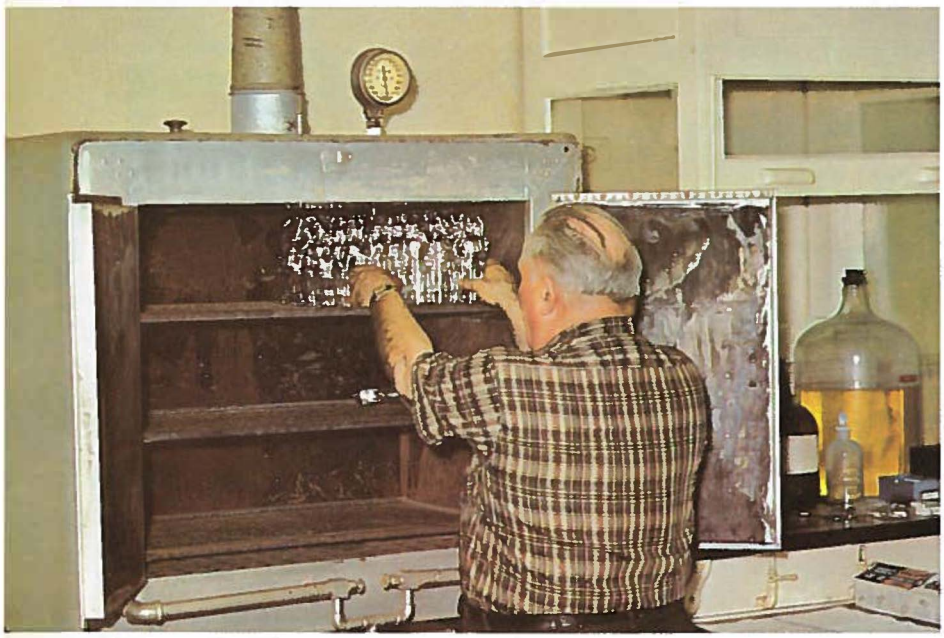


Cleveland area water consumption has increased an average 12 billion gallons per decade since 1857, the system's first full year of operation. The city's water supply division anticipates — and is already prepared for—an even greater growth in the usage rate in the next two decades.

Cleveland Water: Inexpensive But Invaluable







Daily check on Cleveland's water quality is made in modern laboratories staffed by accredited professionals and technicians. Top, left, a chemist examines a bacteriological culture following the process illustrated at right, above. • Left, bottles used to collect water samples throughout the distribution system are sterilized. Cleveland Water Division makes more than 7,000 bacteriological examinations annually.

Cleveland Water: Makes a Healthier Community

The City of Cleveland Water Division purifies Lake Erie water in four treatment plants. Lime, activated carbon, alum and chlorine are added to the water and mixed, causing most impurities to coagulate into a fluffy mass about the size of a snowflake and settle to the bottom of huge sedimentation basins. The cleaner water flows to rapid sand filters, where it passes through a bed of sand and anthracite media to further remove impurities. The filtered water is treated with chlorine to assure it being bacteria-free, and with activated carbon to eliminate possible taste and odor-producing substances.

In 1956, in response to popular demand, the Cleveland Water Division began adding small amounts of fluorine (sodium silicofluoride) to the water supply. This fluoridation process, carefully controlled, has resulted in a 60 per cent decrease in overall teeth decay and a 300 per cent increase in perfect teeth among six-year-old children.

The Cleveland Water Division is proud of its contributions to improving the health of the entire metropolitan area by vigilantly maintaining an abundant supply of aqua pura.

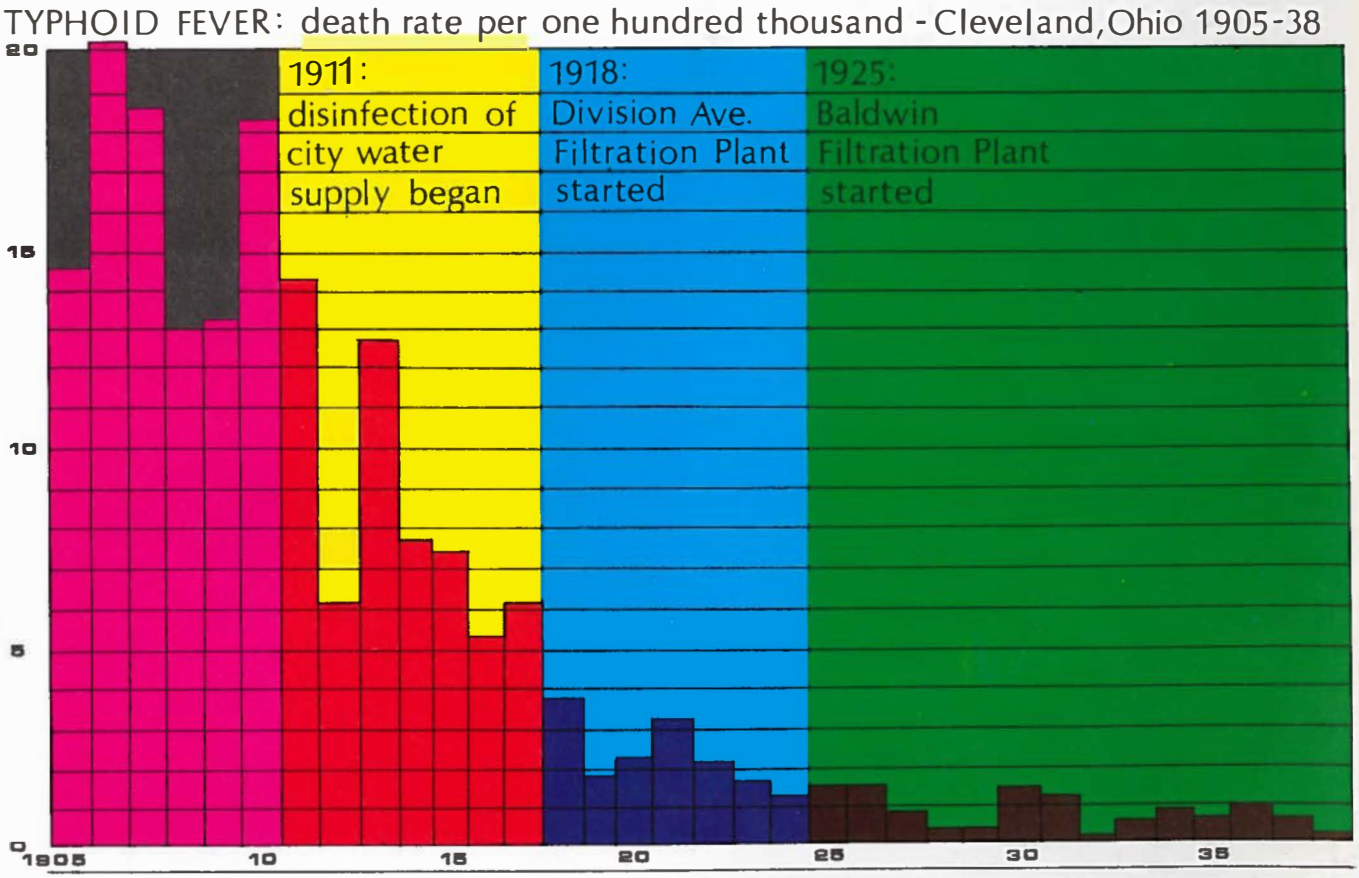
At certain times of the year, Lake Erie water is so bacteria-free that it could be consumed even without treatment.

However, the water is analyzed and treated the year around.

The following results are typical of physical and mineral analyses of the water:

	Before Treatment	After Treatment
	(All units expressed as parts per million except turbidity and ph.)	
Turbidity	9	0.1
Total solids	209	198
Alkalinity Total ($CaCO_3$)	96	85
Hardness ($CaCO_3$)	126	130 (7.5)*
Ph—as received	8.2	7.2
Ph—after ($CaCO_3$)	8.0	7.9
$CaCO_3$	3	0
Calcium	38	42
Magnesium	6	9
Sodium	12	12
Iron	0.7	0
Manganese	0	0
Sulfate (SO_4)	22	26
Phosphates	0	0
Nitrates (NO_3)	0	3.2
Chlorides	22	25
Fluoride	0.2	1.0

*—7.5 grains per gallon



Typhoid, once a dread malady, has been eliminated in the Cleveland area since the introduction of chlorination. The Cleveland Water Division, by its purification program, has made a substantial contribution to improving the health of the community.

through the ages...

With a twist of the wrist, you turn a faucet, and . .
ALAGAZAM!

A seemingly endless supply of water flows out.

It's magic — but rather commonplace magic. You accept it as completely normal and ordinary.

Only a century ago, this faucet trick would have been considered a miraculous feat.

Today, water supply systems are among the most casually accepted miracles of modern civilization.

An audience applauds when a magician pulls a rabbit or a dove out of a hat. But it doesn't surprise anyone when a small child performs the far more remarkable trick of drawing water from a faucet.

* * *

Throughout history, water supply has played an important role in the life and development of civilizations and cities.

All cities that have grown to greatness have developed water supply systems which are engineering masterpieces.

Cleveland, like every major city, owes a debt of gratitude to the bold thinkers and doers who planned, built and successfully operated the water supply system which made it possible for this metropolis to become a center of commerce and culture, as well as one of the great workshops of the world.

* * *

Man has always depended on water for survival.

In pre-historic times, cave men settled near springs and streams, instinctively picking only those where animals drank.

The valley of the Nile River has continuously supported a great population since long before written history began. Fed by heavy rains and melted snow of the African mountains, the Nile frequently overflows, irrigating the fields.

On the other hand, great civilizations which once flourished in the valleys of the Tigris and Euphrates Rivers disappeared, as did several African civilizations, when the climate changed and much of the land turned to desert.

Long before the Christian era, the people of Persia, Palestine, India and China dug wells as deep as 1,500 feet to provide a public water supply.

In 2000 B.C., water was treated in India to make it safe. The people were directed to "heat foul water by boiling and exposing to sunlight and by dipping seven times into it a piece of hot copper, then to filter and cool in an earthen vessel."

Egyptians in 1450 B.C. siphoned clear water from jars after thick sediment from the Nile had settled to the bottom.

The Persian army of Cyrus the Great carried along boiled water in great silver flagons on their marches in 600 B.C.

Hippocrates, the father of medicine, warned the Greeks 200 years later to boil and strain rain waters. Otherwise, he said, the water would smell bad and would cause sore throats.

Water was no less a consideration in Biblical times. According to II Kings (20:20), Hezekiah "made a pool and a conduit and brought water into the city" of Jerusalem.

The ancient Romans built notable water systems, some still partly in use today, to support their society. The water moved by gravity from mountain springs to the cities, crossing valleys on imposing stone arches.

* * *

The first piped water supply system in America was built in Boston in 1652 along what is now known as Conduit Street. The water was brought in conduits, or pipes, from springs and wells to a wooden tank 12 feet square, from which people filled their water buckets.

The country's first water works was built at Bethlehem, Pennsylvania, in 1764.

In 1796, when Cleveland was founded, the country had only nine water works. Cleveland didn't have its own until a half-century later.

Until the first successful filters were developed in 1872, water consumed in this country was untreated, resulting in numerous deaths from typhoid.

A breakthrough in purifying water came in 1885, when scientists showed how filtration removed bacteria and larger impurities.

Cleveland's water supply system in 1911 became one of the country's first to use liquid chlorine to destroy disease-producing bacteria.

Today, more than 19,000 water systems in the country supply the public with billions of gallons of

through the pages...

We'll never know the worth of water till the well is dry.

—James Kelly, Scottish Proverbs

The noblest of the elements is water.

—Olympian Odes, inscribed over the pump-room at Bath, England.

Water is the only drink for a wise man.

—Thoreau, Walden

Water, water, everywhere, Nor any drop to drink.

—Coleridge, Ancient Mariner

The water owns a power Divine.
And conscious blushes into wine.

—Sedulius

Drinking water neither makes a man sick, nor in debt, nor his wife a widow.

—H. G. Bohn

And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. And God called the dry land Earth; and the gathering together of the waters called he Seas; and God saw that it was good.

—Genesis, Chapter 1, Verses 9, 10

When Artist Francis Langel of Cleveland was commissioned to portray how Cleveland's abundant water supply is always at your service, he saw it this way: an overflowing gift from above, providing homes, farms, factories and businesses with all the water they need now and in the future.

The Cleveland Water Story *is published as a public service by the City of Cleveland Water Division.*
Carl B. Stokes, Mayor of Cleveland.
Ben S. Stefanski II, Director of the Department of Public Utilities.
Thomas E. Stanton, Commissioner of Water and Heat.

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