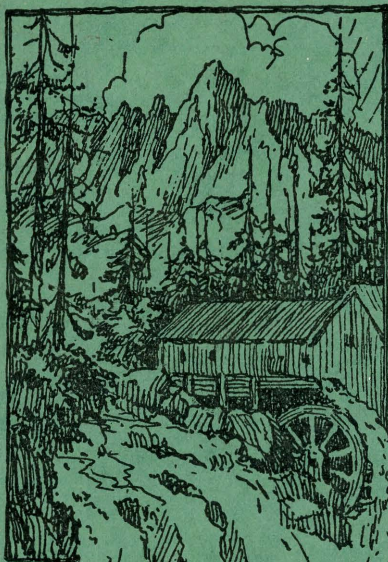


LOS ANGELES, CALIF. - WATER SUPPLY

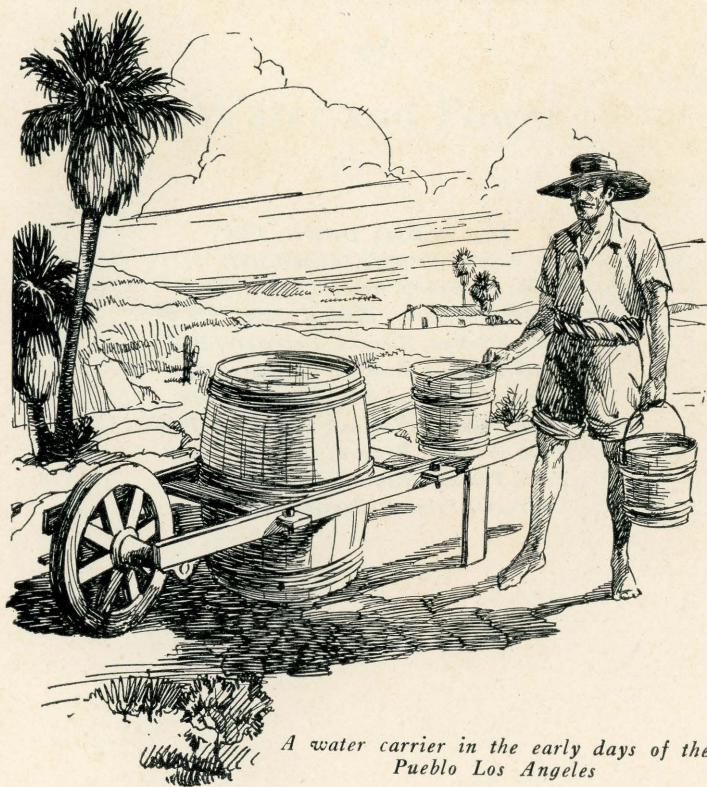
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*The*  
ROMANCE  
*of*  
WATER &  
POWER

By DON J. KINSEY





*A water carrier in the early days of the  
Pueblo Los Angeles*

*First Printing, October, 1926*  
*Second Printing, August, 1927*  
*Third Printing, Revised, April, 1928*  
*Fourth Printing, Revised, July, 1928*  
*Fifth Printing, Revised, December, 1928*  
*Sixth Printing, Revised, February, 1929*  
*Seventh Printing, Revised, June, 1929*  
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*Ninth Printing, Revised, December, 1930*  
*Tenth Printing, Revised, September, 1931*  
*Eleventh Printing, Revised, July, 1932*

The Romance  
*of*  
Water and Power

*A brief narrative, revealing how the magic touch of water  
and hydro-electric power transformed a sleepy, semi-arid  
Western village into the metropolis of the Pacific*

By DON J. KINSEY

THE DEPARTMENT OF WATER AND POWER  
CITY OF LOS ANGELES  
Copyright 1926



*One of hundreds of lakes in High  
Sierras whence come Los Angeles'  
water and hydro-electric power  
supplies*

## CHAPTER I.

# Spanish Settlers



AN INDIAN woman with an earthen jar balanced upon her head constituted Los Angeles' original water distributing system.

To the inhabitants of the Pueblo Los Angeles in those early days, the Indian water-carrier was the most important of all civic function-

aries. Then, as now, every activity depended upon and revolved about the maintenance of an adequate supply of water and water power.

It was, in fact, the discovery of the Los Angeles River that brought about the establishment of Los Angeles in 1781. Here it was that Gaspar de Portola, on August 2, 1769, found water on his historic march of exploration from San Diego to Monterey. When Governor Philip de Neve of Alta California, some ten years later, came to inspect this water-blessed area, he immediately marked it as the site of a new settlement and sent word to Mexico to organize a band of colonists. The colonists, consisting of eleven families, arrived in 1781.

In recognition of the vital importance of the Los Angeles River, as the basis of the new community's life and growth, ownership to all the water of this stream was officially granted to the pueblo for all time in a royal proclamation signed by King Carlos III of Spain, the same year the pueblo was founded. Since that distant day the

City of Los Angeles has held continuously in community ownership the sole right to the water from this source.

Los Angeles' first water supply system was municipally owned and operated. It consisted of an irrigation canal, known as the "Zanja Madre," or the Mother Ditch, built through community effort, and extending from the river to a point a short distance northeast of the old Plaza. The Indian woman who dipped the water from the canal to carry to the several households, was the city's first municipal employee.

As the years rolled on and the original colony grew in numbers and demanded a constantly increasing supply of water, it may be that the water-carrying ladies went on a strike. At any event, they were relieved of further duty as water distributors. Their place was taken by men who soon devised a method of delivering each family its daily quota of water by means of a barrel swung between the handles of a wheelbarrow.

Still later these barrels were succeeded by an ox-drawn water cart. The water wagon had made its first appearance in Los Angeles.

In the early part of the nineteenth century a group of enterprising residents constructed a dam across the Los Angeles River and installed the pueblo's first water-wheel. Buckets were attached to the paddles of the wheel and, as it was revolved by the force of the flowing stream, it lifted water from the river and spilled it into the intake of a canal. By this means the townspeople were able to irrigate land situated at an elevation considerably higher than the level of the river.

Shortly after the completion of the water-lifting device came the installation of water-driven mill wheels in the Mother Canal itself. Power from this source was used



to operate flour mills, and, incidentally, it is recorded, one of the town's first newspapers was printed on a press driven by this form of water power.

It is a far cry from the water cart and the slow-moving water-wheel to the gigantic water and hydro-electric systems now owned and operated by the City of Los Angeles. Where once a single barrel on wheels sufficed to meet the people's needs, today 3,700 miles of mains are maintained to carry water to the city's residents. Where once a crude old mill wheel supplied the power demands of the village, today the largest municipally-owned hydro-electric generating and distributing plant in the world flashes energy over eleven thousand miles of copper wire to light the homes and operate the factories of more than a million people.

## CHAPTER II

### The Search for Water



**I**N RECENT years the Los Angeles River has been pictured by local wits as a stream whose bed must be sprinkled regularly to keep down the dust.

Despite all the merry quips coined at its expense, the fact remains that, save for a few scattering wells, the Los Angeles River, for a period of 133 years, served as the sole water source for this community. From the day the pueblo was founded, in 1781, the river continued

faithfully to serve the town until, at last, the increasing needs of a growing city exceeded its limited supply.

To the casual observer, it is true, the river, except in flood time, appears to be in a chronic state of aridity. This is because much of its water flows through the gravel beneath the surface of the stream bed. This peculiar characteristic of the Los Angeles River makes it all the more valuable as a domestic water source, for the reason that its water, while being purified through natural filtration channels, is protected also from surface contamination.

From the date of its establishment as a rude Spanish village, Los Angeles operated its water distributing system under community ownership until 1865. In that year, the town council decided to lease the municipal system to a private operator, and again, in 1868, turned over the City's water works for a period of thirty years to a privately owned concern, later known as the City Water Company.

In 1898, the 30-year period having elapsed, the City sought to regain its water system. After four years of negotiations and litigation, the City purchased the private company's distributing lines and equipment, in 1902, for \$2,000,000, and immediately put into effect a 63 per cent reduction in domestic rates.

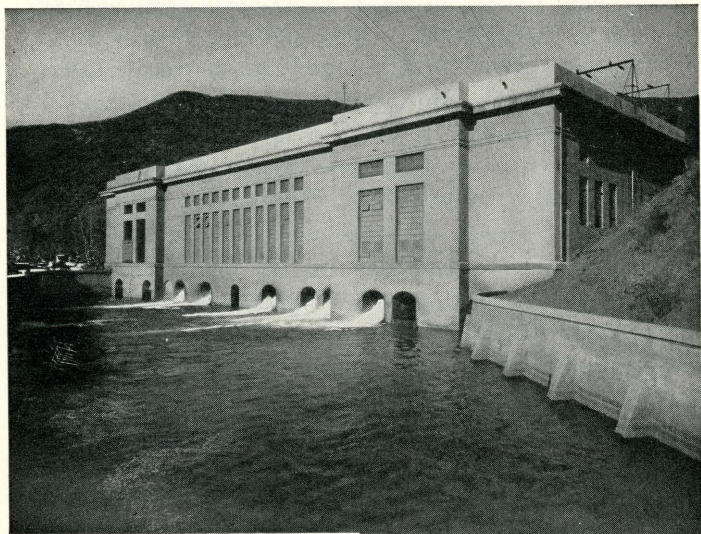
The Los Angeles River, under normal conditions, was capable of supplying the needs of 250,000 people. By 1905 the city's population had reached and passed the 160,000 mark, and was continuing to grow at an amazing rate. Then came a series of dry years; the river barely was able to meet the city's present needs, much less provide for future growth.

Los Angeles could not continue to grow and prosper without additional water. And yet, nowhere within the immediate vicinity of the city did there exist a single undeveloped water source of any consequence.

Seeking a solution of their problem, the people turned to William Mulholland, then chief engineer of the Municipal Water Bureau. Mulholland had heard of the Owens River, far to the north—a stream fed by the pure, sparkling snow waters of the High Sierras.

Hitching a team of mules to an old buckboard and taking with him a few surveying instruments, he quietly set forth on a journey of investigation, which took him 250 miles northward, over the parched sands of the Mojave desert and across rugged mountains into Owens River Valley. Mulholland found the Owens River wasting most of its precious cargo of water into the salt-encrusted basin of Owens Lake. For 40 days he tramped over the mountains and desert. By the time he returned to Los Angeles he had formulated plans for the construction of the longest municipal aqueduct in the world—a gigantic water carrier, piercing mountain barriers, conquering a desert and capable of supplying enough water to meet the needs of 2,000,000 people.

Mulholland had dreamed a mighty dream. He set about at once to transform that dream into an actuality. The result was a masterpiece of engineering daring and achievement, destined to raise Los Angeles from a modest tourist city to the magnificent heights of a great and prosperous metropolis.



*San Francisquito Power Plant No. 1, generating capacity 92,000 horse power. Largest of the Municipal Power System's five hydroelectric plants operated along the Aqueduct.*

## CHAPTER III

### Building the Aqueduct



WITH a population of 160,000 in 1905, Los Angeles suddenly was confronted with a serious water shortage. The Los Angeles River, normally capable of supplying about 250,000 people, had been reduced by a series of dry years. Unless additional water could be brought in

from a new source the city faced certain stagnation and heavy business losses.

William Mulholland, then chief engineer of the Municipal Water Bureau, had investigated the proposal of building an aqueduct from the Owens River, 250 miles to the north. He had reported that the plan was feasible, that it offered the only solution to a desperate situation, and that the construction of such a project would cost \$24,500,000.

The first bond issue of \$1,500,000, needed to purchase rights-of-way and start preliminary work, was submitted to the people in 1905. The vote in favor of the bond issue was in the ratio of 14 to 1. Thus did the citizens of a small city, with high courage and a vision of the future, lay the foundation for the Metropolis of the Pacific Coast.

Following the completion of surveys and a mass of preliminary work, the aqueduct was started in 1908 and completed in 1913, within the cost estimate originally set

by Mulholland. It was, and is, capable of supplying the needs of 2,000,000 people.

Under the leadership of Mulholland, an army of 5,000 men labored through blazing desert summers and freezing mountain winters for five long years to complete the most gigantic and difficult engineering project theretofore ever undertaken by an American city.

Before the aqueduct itself could be constructed, it had been necessary for the builders to conquer and tame a vast and well-nigh inaccessible wilderness. A railroad 120 miles long must be constructed to carry thousands of tons of heavy machinery and supplies. More than 500 miles of highways and trails must be opened to reach the line of the aqueduct with materials and men. To provide the necessity of water in the desert, a complete pipe line system was laid out to carry on construction work and supply workers. There were no established lines of communication and, therefore, hundreds of miles of telegraph and telephone wires were strung to connect the fifty-seven division camps erected to house men and supplies.

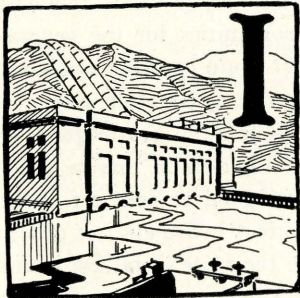
Construction of the aqueduct itself presented hundreds of engineering difficulties, apparently insurmountable, but ultimately and invariably solved. From its intake in Owens Valley, the aqueduct pushed its way southward through the rough foothills of the High Sierras, tunneled through mountain barriers, crossed scores of wide and precipitous canyons and burrowed under the blistering sands of the Mojave Desert.

When completed, the aqueduct included 142 separate tunnels aggregating 53 miles in length, 12 miles of inverted steel siphons varying in diameter from 7 to 11 feet, 24 miles of open unlined conduit, 39 miles of open cement

lined conduit, and 97 miles of covered conduit. Additional miles were taken up by three large reservoirs, the largest of these, the Haiwee Reservoir, being capable of storing more than twenty billion gallons of water.

Built primarily as a water system, the aqueduct also provided, along its course, the opportunity for the development of hydro-electric energy. Thus it has blessed Los Angeles with two priceless and vitally necessary resources—water and electric power. Its water invited and supplied a rapidly growing population. Its electric energy, developed by the power and light system, established a foundation upon which has been builded, thus far, this city's amazing industrial expansion and prosperity.

## CHAPTER IV White Gold



**I**T WAS the lure of Yellow Gold that started, from the four corners of the world, the first march of settlers toward California. Since the days of '49 the sailing vessel and the prairie schooner have been replaced by giant ocean liners, transcontinental trains and motor cars — but the steady influx of settlers never has ceased.

Yellow Gold opened the eyes of the world to the beauty and opportunities of a glorious commonwealth; White Gold, in the form of hydro-electric energy, has made it possible, in these later years, for this increasing population to find gainful employment and permanent prosperity.

Twenty-five years ago Los Angeles was approaching the limit of its local water supply; it faced the future with little hope of ever rising above the level of a small and modest tourist city. Then came the proposal of constructing a giant aqueduct to bring large additional quantities of water to this city from the snow-capped peaks of the High Sierras, 250 miles distant. This project was destined to provide Los Angeles not only with life-giving water, but also with the precious treasure of hydro-electric energy.

The floor of Owens Valley, at the point where water from Owens River is diverted into the aqueduct intake, stands at an elevation of 3,800 feet above sea level. From this considerable height the aqueduct, in its course to Los Angeles, gradually drops to an elevation of about 800 feet, making a total fall of 3,000 feet. In surveying the route of the aqueduct it immediately became apparent that a number of excellent opportunities for the generation of electricity by water power could be made available.

With the view to developing this hydro-electricity, the City in 1909 retained the services of E. F. Scattergood, at that time a consulting electrical engineer in private practice in Los Angeles. Mr. Scattergood at once set about the planning and building of a great hydro-electric generating system that was to capture the force of falling water along the aqueduct and transform this energy, as if by magic, into electric power and light to serve the homes, stores and factories of Los Angeles.

Today the enterprise which he set in motion in 1909, is the largest municipally-owned electrical generating and distributing system in the world, and became known as the Municipal Bureau of Power and Light. It was officially established as a separate municipal bureau in 1913 and

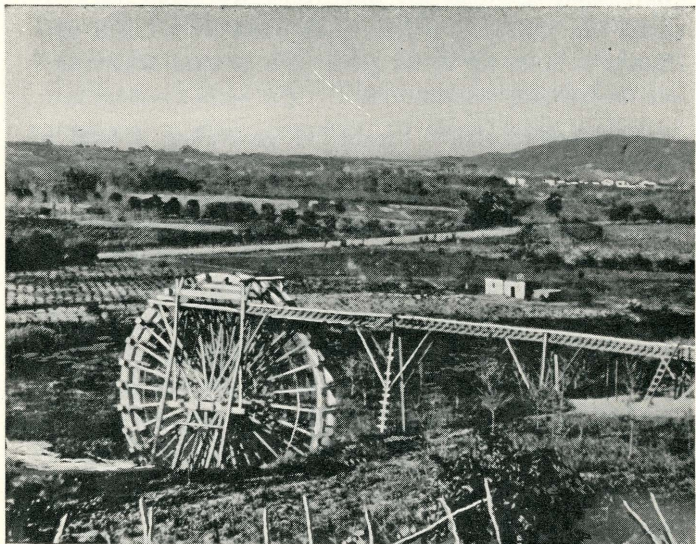


Mr. Scattergood at the same time was made its chief electrical engineer. Prior to that time the preliminary work of hydro-electric development was carried on as a part of the aqueduct project.

Five power plants, capable of generating a total of 149,650 horsepower of hydro-electric energy, are now operated by the Department along the aqueduct. These plants, together with their individual generating capacities, are: San Francisquito No. 1, 92,000 horsepower; San Francisquito No. 2, 41,800 horsepower; San Fernando, 9,000 horsepower; Franklin Canyon, 2,850 horsepower, and the River Plant, 4,000 horsepower.

In 1916 the Department began the construction of an electric distributing system by which it was to serve, at a remarkably low rate, the electricity from its generating plants. From this small beginning in 1916, when its consumers numbered only a few hundred, the Department has expanded its power system and service until, in 1932, it was distributing power and light through more than 260,000 separate service connections.

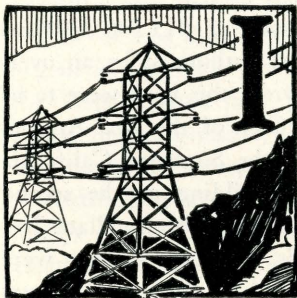
Power to operate factories and mills in Los Angeles must be supplied by hydro-electric energy; there are not available here the cheap coal supplies of the Eastern and Middle Western industrial centers. Thirteen years ago the City's electric system began to generate along the aqueduct the energy so urgently needed, and from that day forward the rapid industrial expansion and prosperity of Los Angeles has amazed the world. Thirteen years ago the annual value of this city's manufactured products amounted to \$160,000,000; last year the value of products in this area had increased to \$1,300,000,000.



*One of the early Los Angeles  
River water wheels which  
was used to lift irrigation  
water.*

## CHAPTER V

# Averting a Power Shortage



**I**N MARCH of 1917, the Department of Water and Power completed its first hydro-electric generating plant along the Owens River aqueduct. The plant was called San Francisquito No. 1, being named after the canyon in which it was situated. Power from this source, distributed to consumers at exceedingly low rates, opened for this city the gateway to industrial expansion and prosperity.

The word went out that cheap power for factories and mills was available in Los Angeles. Almost overnight the amazing industrial development of this area was under way. Factory wheels began to whirl and multiply. New jobs were created for an ever-increasing population; the value of manufactured products rapidly increased. Los Angeles—the Wonder City—was in the making.

Cheap power from the City's first plant created a demand for still larger quantities of electrical energy from a rapidly growing number of industrial and domestic consumers. To meet this increasing demand, Chief Electrical Engineer Scattergood urged immediate construction by the Department of Water and Power of a second large power plant in the San Francisquito Canyon. Accordingly a bond issue of \$2,000,000 was submitted to the voters in June, 1917, to finance the build-

ing of the plant. This bond issue was opposed by interests which did not favor the expansion of the City's electrical system, and failed by a few votes of securing the necessary two-thirds majority.

In June of 1919, a bond issue of \$13,500,000 was submitted to the voters and was authorized by an overwhelming majority. Proceeds from this issue were to be used for the purchase by the City of the Los Angeles electrical distributing system of the Southern California Edison Company, and for the building of the second power plant, to be known as San Francisquito Plant No. 2. After the voting of the bonds, a number of suits were filed seeking to hold up the sale of the securities. It was not until February, 1922, that these suits were wiped out by the City and the Edison purchase completed.

In the meantime the new industrial expansion of Los Angeles was bringing about an ever-increasing demand for more and more hydro-electric power. The need for electrical energy rapidly was overtaking the supply. Mr. Scattergood pointed out that Power Plant No. 2 must be built at once or the City's industrial development and prosperity would be cut short.

Bond funds, urgently needed to finance this construction work, were tied up in litigation. Fortunately, however, the Department's operation of its system, with the first plant as a source of energy, had proved highly successful, and a plan whereby the second plant could be financed from the System's own revenues was outlined by Mr. Scattergood. The plan was approved and work on the plant was set under way immediately.

The building of Power Plant No. 2 was started in August of 1919. In the Spring of 1920, because of low rainfall conditions, all California faced a crippling power

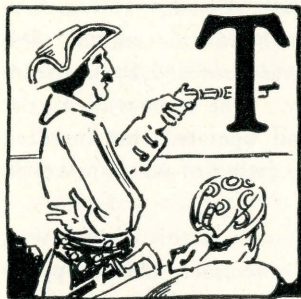
shortage. Work on the new plant was rushed forward at top speed. It was completed and in operation, with a generating capacity of 41,800 horsepower, in July, 1920, exactly eleven months after being started.

Just as Los Angeles was slipping within the grip of a general statewide power shortage the giant turbines of the Department's new generating unit began to move. Along the transmission lines this energy came flashing to the rescue of factories, stores and homes.

Fortified by a new block of energy from the Department's second large generating plant, Los Angeles alone escaped the losses of a power shortage throughout the West. Instead of diminishing, its industrial activity pushed forward with renewed vigor. Seeking the one center where power at low rates was available in sufficient quantities, new manufacturers and investors came here in increasing numbers. The commercial expansion and general prosperity which followed put Los Angeles on the Nation's business map as "the White Spot of America."

## CHAPTER VI

### The Smokeless City



Los Angeles has depended

THROUGH the skill and ingenuity of a Yankee engineer, who landed on the California Coast from the deck of a pirate ship more than one hundred years ago, the people of this territory first came to reap the benefits of water power. From that distant day forward almost exclusively upon the

energy derived from the force of falling water to operate its machinery in shops and mills.

Historical records indicate that the first water wheel successfully operated in Southern California was designed and constructed by Joseph Chapman. Born in Massachusetts, Chapman was one of the first Yankees to settle in Southern California. The story of his appearance upon this western coast is one of colorful romance and adventure.

Leaving his home in New England at an early age, Chapman sailed around the Horn and went ashore in a South American port. There, either by choice or through force, he joined the crew of a pirate ship preparing to head northward to harry and pillage the California settlements from San Diego to Monterey. At Monterey, Chapman and a few of his gentle companions were captured by the Spanish settlers, and the young Yankee was saved from instant execution only by the intervention of the beautiful Senorita Guadalupe Ortega.

The sequel of this dramatic incident was the marriage of Chapman and Senorita Ortega. The two, shortly thereafter, came to Southern California and established their home near the San Gabriel Mission. It was here that Chapman set to work to build this region's first water wheel. Water power was provided by a stream from a nearby canyon, now dry. The stone-walled grist mill which Chapman built and operated one hundred years ago stands to this day, the father of water power in Southern California.

The introduction of water power in this district was, indeed, an epochal event. It furnished the energy to grind the grain of the early ranchers and to operate the first crude lumber mills. Following the erection of the

San Gabriel mill, the citizens of Los Angeles built their first water wheels and began to harness and use for power the water of the Los Angeles River.

Other sections of the country, in later years, came to depend upon the burning of coal under boilers as a source of industrial energy. The people of the coal centers looked upon Los Angeles and said it could never develop as an industrial area because it lacked these vast deposits of black fuel. In the meantime, however, man had perfected the hydro-electric turbine, a modern development of the old water wheel.

Construction of the Owens River Aqueduct gave this city its opportunity to reap the priceless benefits of hydro-electric energy made available along this 250-mile water course from the High Sierras to Los Angeles. Developed and distributed by the Department of Water and Power, this electric power has been served to the people at rates so low as to compete successfully with the cheap fuel districts of the East and Middle West.

It has, in fact, formed the foundation upon which Los Angeles has created its ever-expanding structure of industrial prosperity. Today, this city numbers its electrically operated factories and mills by the thousands and these producing centers are giving employment and profits, directly and indirectly, to hundreds of thousands of our citizens.

For those who have been accustomed to associate industry with tall chimneys and black clouds of smoke, it is difficult to realize the extent of this city's industrial growth.

Los Angeles—the smokeless city—has revealed to the world that industry may thrive and bring prosperity to all concerned under clear and unsullied skies.



*Mulholland Dam and Reservoir  
in the Hollywood Hills. One of  
the Municipal Water System's  
domestic water storage basins  
in Los Angeles.*



## CHAPTER VII

### A Gigantic System



SHORT, shallow ditch at one time carried all the water Los Angeles required. With the Los Angeles River as their only source of supply for domestic and irrigation purposes, the early Spanish settlers used this simple method of securing from the stream, all the water they

needed for their homes and crops.

Today, Los Angeles possesses the second largest water distributing system in the United States. More than 3,700 miles of mains varying in diameter from 4 to 60 inches are now required to carry water to homes, stores, office buildings and factories.

Where once the total length of this City's water distributing system was only a little greater than five city blocks, the great network of pipe lines now used to supply Los Angeles' water needs, if extended in a straight line, would reach across the American continent.

This colossal water distributing system no longer depends entirely upon the limited resources of the Los Angeles River. Since 1913 the people of this city have received the major portion of their water from the snow-capped peaks of the High Sierras by way of the Owens River Aqueduct, a gigantic artificial water course 250 miles long.

Since 1902, when the City purchased the properties of the City Water Company, Los Angeles' water supply

and distributing systems have been under municipal ownership and control. The organization which operates these systems for the people is known as the Department of Water and Power.

Geographically, Los Angeles is the largest city within the United States. Its municipal boundaries encircle 450 square miles of territory. The necessity of delivering water to residents, scattered over such a far-flung area, has required the building of a water distributing system which, in other more densely populated cities, would be extensive enough to serve a population three times greater than our own municipality's. In addition to providing service for the largest city area in the nation, the Department must deliver water to consumers residing on land elevation varying all the way from sea level to 1400 feet above sea level. This necessitates heavy pumping operations in many sections of the city, and in several instances it is necessary to lift the water as high as 900 feet.

Despite the long distance Los Angeles must go to secure its water supplies, the wide territory over which this water must be distributed and the high elevations to which it must be lifted, the maximum domestic water rate charged by the Department is 13 cents per 100 cubic feet, as compared to an average of 18 cents charged in 183 of the largest cities in the United States.

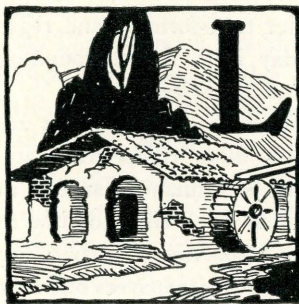
Sixteen storage reservoirs have been constructed within the city by the Department to conserve aqueduct water for use throughout the year. These basins are capable of holding seventeen billion gallons of water. Along the line of the aqueduct there are four more large reservoirs with a total storage capacity of thirty billion gallons. Enough water can be stored in these twenty

reservoirs to supply Los Angeles' domestic water needs for more than one year.

The necessity of these enormous storage basins becomes apparent when it is pointed out that Los Angeles is now consuming, for domestic purposes, as much as 156,000,000 gallons of water a day. Few persons, perhaps, realize that the per capita consumption of water in this city amounts, on an average, to 120 gallons a day.

This city's first water system was its *Zanja Madre*, or Mother Ditch, a few hundred yards long, constructed by the community efforts of the pueblo's eleven original families. Its one employee was an Indian woman who carried water from the ditch to the various households. Today, the Municipal Water System possesses assets totaling \$120,000,000 and 2,000 employees are required to operate its vast supply and distribution facilities.

## CHAPTER VIII Power and Prosperity



LOS ANGELES today possesses the largest municipally-owned electrical generating and distributing system in the world. Keeping in mind the fact that this city's industrial and commercial development always has rested upon a foundation of water power, it is interesting to trace briefly the growth of the Municipal power and light system.

Actual construction of the Department's electrical distributing system in Los Angeles was started on March

30, 1916. On that day the first pole for its overhead distributing lines was set at the corner of Pasadena Avenue and Piedmont Street, in the northeast section of the city.

When the Department began operations as a distributor of electric power and light in 1916, it served only a few thousand consumers. In 16 years this electric utility has expanded its system until it is now serving power and light through 260,000 separate service connections.

Today the Power System represents assets totaling more than \$80,000,000. Its gross revenues have increased in the course of 16 years from less than \$1,000,000 annually to more than \$15,000,000 annually.

It required only a few miles of wire to extend service to the Department's consumers in 1916; in 1931, 11,000 miles of overhead lines and underground cables were used to carry energy to its consumers. In addition to its distributing lines, the Department operates 42 district and 98 industrial distributing stations in as many sections of Los Angeles. These stations are used to receive electric energy at high voltage, and, after transforming and regulating the flow of current, relay it to the surrounding homes, stores, office buildings and factories.

While selling its service to consumers at rates that are lower than those in effect in any other competitive city, the Power System has proved to be a financial success in every respect. Power bonds voted from time to time to provide for the extension of the Department's generating and distributing system, do not cost the taxpayers one cent for the reason that all interest and annual principal charges of these bonds are paid from earnings derived by the Department through the sale of electric service.

In this same connection, also, it should be noted that the Department is each year retaining large surplus earn-

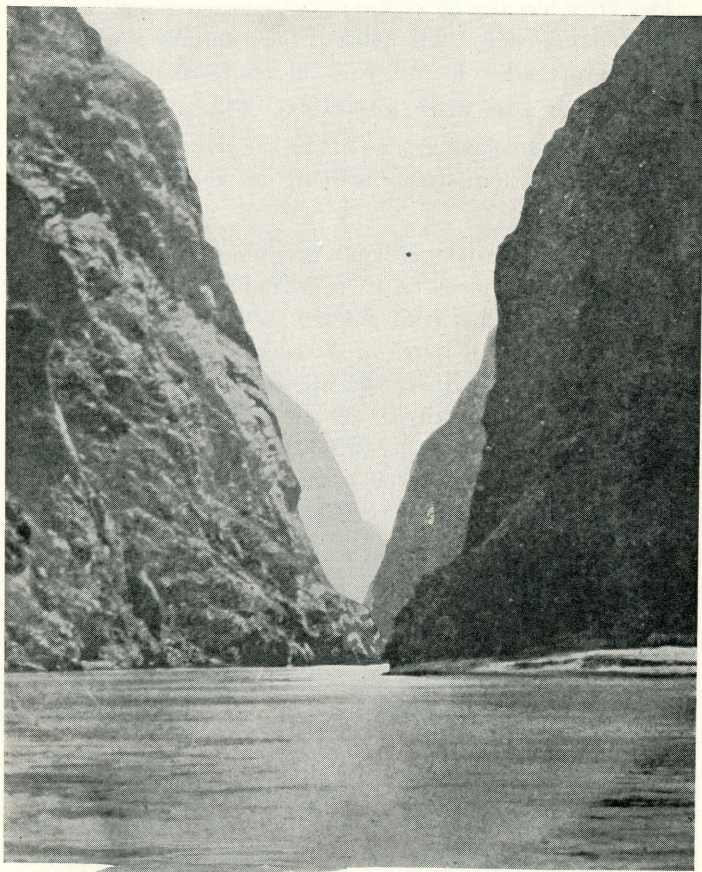
ings after meeting all expenses and interest charges on its outstanding bonds. The total of these surplus power system earnings for the 16 years it has been in operation amounts to more than \$32,000,000. This money is reinvested in permanent extensions to the power system and has helped materially in building up the assets of the entire system.

Since the Department began operations as a distributor of cheap electric power in 1916, the industrial development of Los Angeles has been nothing short of amazing. Its growth has been reflected in the enormous increase in the demand for electric energy during the past decade. Records reveal that the quantity of energy distributed by the Department increased from 88,000,000 kilowatt hours in 1917 to 537,000,000 kilowatt hours in 1927—the latter volume being more than six times greater than the former.

So great has been the demand for power and light in Los Angeles during these past few years that it has absorbed completely the amount that can be generated in the Department's five large power plants along the aqueduct. It is imperative that this growing demand for cheap hydro-electric power be met by the development of additional supplies.

Fortunately, the Colorado River affords Los Angeles, in common with the whole Southwest, an opportunity to develop the cheap hydro-electric energy so vitally needed. Construction of a 550-foot dam at Boulder Canyon, Government engineers have shown, will create a site for the generation of a million horsepower of electricity.

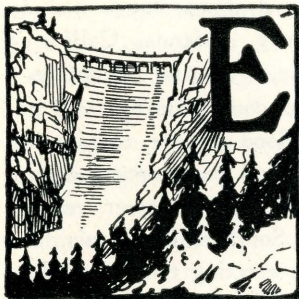
With a fair share of this energy made available for this city, a golden future of growth and prosperity for Los Angeles will be assured.



*Boulder Canyon on the Colorado River, where Federal Government is erecting the world's largest concrete dam.*

## CHAPTER IX

# The Colorado River



**E**XPERIENCE has taught Los Angeles that its growth in population, its industrial expansion and the prosperity of its citizens can be measured definitely and exactly in terms of water and hydro-electric power. Failure to provide ample and reliable supplies of water and water power automatically halts development, while the assurance of these basic necessities, in generous quantities, will encourage and support almost unlimited growth.

Twenty-six years ago, when Los Angeles rapidly was approaching the limits of its domestic water supply, it constructed the Owens River aqueduct, capable of meeting the needs of 2,000,000 people. Along this water course the city developed large quantities of hydro-electricity—and thus supplied a second basic necessity.

So rapid has been the expansion of Los Angeles during the past ten years, that it now finds itself, once more, reaching the limits of its water and power resources. To meet this situation, Los Angeles, in common with the entire Southwest, has turned to the Colorado River.

Ranking as the third largest river in the United States, the Colorado is now recognized to be one of the richest natural resources in America. Its potential wealth exists in the form of water for irrigation and domestic use and vast quantities of hydro-electric power.

From its head waters in the Rocky Mountains, 14,000 feet above sea level, the Colorado travels 1,700 miles to its outlet in the Gulf of California. It extends through two nations—the United States and the Republic of Mexico—and within this country its drainage basin includes portions of seven states; namely, Arizona, California, Nevada, New Mexico, Colorado, Utah and Wyoming.

As the Colorado now runs its course, unregulated and uncontrolled, it is a terrifying flood menace, threatening, each year, to overtop its banks and permanently destroy the rich agricultural valleys along its lower reaches. Ranchers in Imperial Valley, in Southern California, have expended millions of dollars in erecting temporary flood protection works, in their annual battle to hold back the raging waters of the Colorado.

Should the Colorado ever break through these levees, the entire valley would be transformed into a great inland sea. Imperial Valley is far below sea level; therefore, the flood water could never be drained off, but would permanently destroy 600,000 acres of highly developed land, a dozen towns and the homes of 60,000 people.

Several years ago the Federal Government, through its Reclamation Service, made an exhaustive survey of the problems of the Colorado River. In 1922 the Reclamation Service submitted its report and recommendations to the Secretary of the Interior. This report, in turn, was approved by the Interior Department, and presented to Congress for consideration and action.

Careful surveys made by the Government had revealed that, through proper control and conservation of Colorado River water, 1,000,000 horsepower of hydroelectric energy could be developed from this stream, and enough water stored in reservoirs to irrigate 6,000,000



acres of land, potentially fertile, but now arid and useless.

Initial development, the Government's report declared, should be set under way at Boulder Canyon. A dam 550 feet high at Boulder Canyon, it was shown, will permanently eliminate the present flood menace; will create a reservoir capable of holding 26,000,000 acre feet of water, enough to bring under irrigation 1,250,000 additional acres of land in Arizona and California; will provide a site for the generation of 1,000,000 horsepower of hydro-electricity.

Thus, it was disclosed, by the construction of Boulder dam, the Government, in one stroke, will transform the Colorado River from a black flood menace into a source of inexhaustible wealth, benefiting the entire Southwest.

## CHAPTER X The Government Acts



WHEN the U. S. Reclamation Service submitted its report to the Department of the Interior on the problems of the Colorado River, in 1922, it recommended the construction by the Federal Government of two major projects. Its first recommendation was that the Federal Government construct a main irrigation canal from the Colorado River to Imperial and Coachella Valleys. This canal was to be entirely within the United States and was to replace Imperial Valley's present main canal, which passes for a distance of 60 miles through Mexican territory before reaching California.

Its second recommendation was that the Federal Government construct a dam 550 feet high across the Colorado River in Boulder Canyon.

Erection of a high dam at Boulder Canyon, Government engineers pointed out, would: (1) Permanently eliminate the Colorado River flood menace. (2) Create a reservoir capable of irrigating 1,250,000 acres of desert land. (3) Provide an opportunity to generate 1,000,000 horsepower of hydro-electric energy.

These recommendations were approved by the Secretary of the Interior, and the report forwarded to Congress for action. Shortly thereafter a bill, based upon the recommendations of the Interior Department, was introduced in both Houses of Congress.

When Congress convened in December of 1925, the pending legislation was submitted to Secretary of the Interior Hubert Work, for consideration and approval. Secretary Work, in a report to the Senate Committee, expressed his approval of the general plan. He suggested, however, certain additions and changes in the bill.

The most important of Secretary Work's suggestions was the recommendation that the bill provide, not only for a dam at Boulder Canyon, but also for the construction and operation by the Federal Government of a hydro-electric generating plant at the dam site. The original bill had contemplated that the Government would lease, to various municipal and private agencies, the right to develop power available at Boulder Dam, but had not contemplated the erection of the plant, itself, by the Government.

Where the original bill had provided for an appropriation of \$70,000,000, Secretary Work recommended that the measure authorize the establishment of a fund of \$125,000,000. This money, he stated, should be used to

cover the cost of constructing Boulder Dam, the hydroelectric generating plant and also the All-American canal. With these three projects financed, he stated, there would remain \$21,000,000 available to meet interest payments on the money invested during the time the various structures were being built. In accordance with Secretary Work's recommendations, the bill was amended to include the plans outlined by him.

The amended bill retained that provision of the original bill, which specified: (1) That all money invested by the Government in the construction of Boulder Dam must be repaid with interest, from the sale of power developed at the dam site. (2) That the cost of the All-American canal must be repaid by assessments on the lands benefited.

Following a long series of hearings and investigations, the Boulder Dam bill was brought to a vote in the House of Representatives in May of 1928, and was adopted by an overwhelming majority. In the Senate the bill failed to come to a vote because of a filibuster conducted by three Senators.

During the Summer of 1928 the project was further investigated by an engineering commission headed by General William L. Sibert. This Commission approved the project but estimated that the works provided for in the bill would cost \$165,000,000.

When Congress convened in December, 1928, the Boulder Dam bill came up as the first order of business in the Senate. Amended to authorize a total expenditure of \$165,000,000, the bill was adopted by the Senate on December 21. Within a few days the measure was signed by President Coolidge.

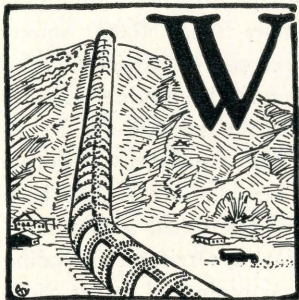
The long fight had been won. Congress, at last, had authorized the great Boulder Canyon Dam project.



*(Upper) Photograph taken twenty-two years ago, when Owens River Aqueduct was under construction, reveals the size of a section of Aqueduct siphon pipe. (Lower) Completed section of Aqueduct. The Colorado River Aqueduct will be almost four times larger in capacity.*

## CHAPTER XI

# The Colorado Aqueduct



WHEN Los Angeles, in 1913 completed its Owens River aqueduct, the people of this city confidently believed they had solved their domestic water problem for generations to come. This great artificial waterway is capable of supplying the needs of 2,000,000 people.

Since the Owens River aqueduct began to pour its precious cargo of water into Los Angeles, however, the rapid growth of this community has amazed the entire world. Nineteen years after the completion of the aqueduct we find Los Angeles supporting a population of 1,300,000, and climbing toward the second million mark at the rate of 100,000 new residents a year.

Los Angeles' astounding development has confronted its Municipal Water System with the same problem it faced prior to the construction of the Owens River aqueduct. It is a problem of finding and developing a new and large source of domestic water.

Realizing that this city must begin to prepare for that day, in the very near future, when it will reach the limit of its present water supply, William Mulholland, as Chief Engineer of the Municipal Water System, in 1923, began to survey a route for an aqueduct to bring water to this city from the Colorado River. At the same time a large number of other cities in Southern California indi-

cated their necessity of developing additional domestic water supplies.

In carrying forward his study of the Colorado River aqueduct project, Mr. Mulholland directed a thorough survey covering an area of more than 50,000 square miles. For four years some sixteen survey parties traveled up and down the vast region bounded by Boulder Canyon on the north, the Colorado River on the east, the Mexican border on the south and the Southern California coastal plain on the west. When the survey had been completed, Mr. Mulholland's engineers had accumulated detailed data on every acre of this territory, including 18,000 square miles of rugged mountain and desert country never before crossed by a surveying instrument.

For the benefit of engineers and laymen interested in securing exact information as to the nature of the region that must be traversed by a Colorado River aqueduct for Southern California cities, the Los Angeles Department of Water and Power made a huge topographical map of the entire area. The map reproduces in miniature every feature of the terrain, including the Boulder Canyon dam and reservoir site on the Colorado River. It is on permanent display at the headquarters of the Metropolitan Water District of Southern California.

Mr. Mulholland's surveys and detailed studies revealed that it was feasible and practicable to build a gigantic aqueduct that will divert sufficient water from the Colorado River to supply, not only the needs of Los Angeles, but also the requirements of a score or more of other municipalities in Southern California. His studies further disclosed that the Colorado River is the only source capable of meeting Los Angeles' water requirements.

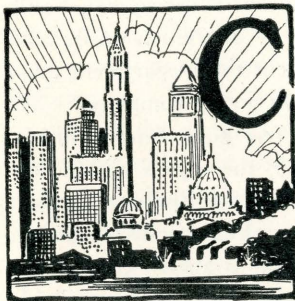
As now planned, the Colorado River aqueduct will be 260 miles long—only a few miles longer than Los Angeles' present aqueduct, but its capacity will be almost four times greater.

With a capacity of 400 second feet, the Owens River aqueduct is capable of meeting the water needs of 2,000,000 people; the Colorado River carrier will have a capacity of 1,500 second feet and will be able to supply 7,500,000 people with domestic water.

Construction of the Colorado River aqueduct will be a herculean task; it will necessitate the investment of millions of dollars; it will require, probably eight years to complete. And it will build Southern California into one of the most populous and prosperous areas in America.

## CHAPTER XII

### Boulder Canyon Power



CONSTRUCTION of Boulder Canyon Dam on the Colorado River, United States Government engineers have revealed, may be financed entirely through the sale of the tremendous volume of hydro-electric energy that will be made available

for development at the site of this towering structure.

The water held in storage behind a dam 550 feet high, Government surveys disclose, will be capable of generating a peak load of 1,000,000 horsepower of hydro-electricity or a continuous flow of energy amounting to

600,000 horsepower. In accordance with the recommendations of former Secretary of the Interior Hubert Work, Boulder Canyon dam legislation was made to provide that the electricity may be generated in a plant to be constructed and operated by the Federal Government, and sold to the various municipalities and agencies in the Southwest in need of electric power.

Careful surveys of the electric power needs of Southern California and the Southwest, generally have shown that there is an urgent demand in this region for all the electricity available at Boulder Canyon dam.

The citizens of Los Angeles, by a vote of four to one, already have instructed their municipal officials to contract with the Federal Government for a fair share of the electricity that will be available when Boulder Dam is constructed. So rapid has been the increase in the use of power and light in this city, during the past few years, that the Department of Water and Power is now able to generate in its plants along the Owens River aqueduct only about 60 per cent of the energy it distributes to its consumers. The remaining 40 per cent the Department must purchase wholesale from a private power company.

A study of the growing electric power needs in the Southwest, discloses that by 1935, the region within economic power transmission distance of Boulder Canyon will require 1,750,000 horsepower of electricity more than it is now consuming. This amount is almost three times greater than the 600,000 continuous horsepower available from Boulder Dam. Thus, it is manifest, the growing need for hydro-electric energy in the Southwest will provide a ready market for all the energy available from Boulder Dam.

Use of Boulder Canyon power in industrial, commer-



cial and agricultural expansion throughout the Southwest will create new national wealth of huge proportions, engineers and economists point out. Taking as a basis for computation the present wealth of Southern California co-ordinate with the quantity of electric power now in use, it is found that no less than \$15,000,000,000 of additional wealth will be brought about by putting Boulder Canyon power to work in Arizona, Nevada and California. Through the use of a share of this power in Southern California, profitable employment will be created for the ever-growing army of men and women that is pouring into this favored region each year.

It is, therefore, apparent that Boulder Canyon power will not only provide the means of financing the great dam, but will enrich, also, the entire nation through its use in moving new wheels of industry and commerce. Furthermore, power from Boulder Dam will be a vitally essential phase of the Colorado River aqueduct project. In order to bring domestic water from the river into Southern California through this great artificial waterway, it will be necessary to raise it over several intervening barriers. Power from Boulder Dam will be required to operate the pumps used in lifting the aqueduct water over these mountain obstacles.

Los Angeles, together with neighboring cities, already has launched the Colorado River Aqueduct project. It also hopes to share in the benefits of Boulder Dam power. The aqueduct will bring in enough water to supply 7,500,000 more people. The power will build permanent prosperity for these millions. Thus Los Angeles today stands ready to write upon the records of time the greatest and most brilliant chapter of its marvelous romance of water and power.

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