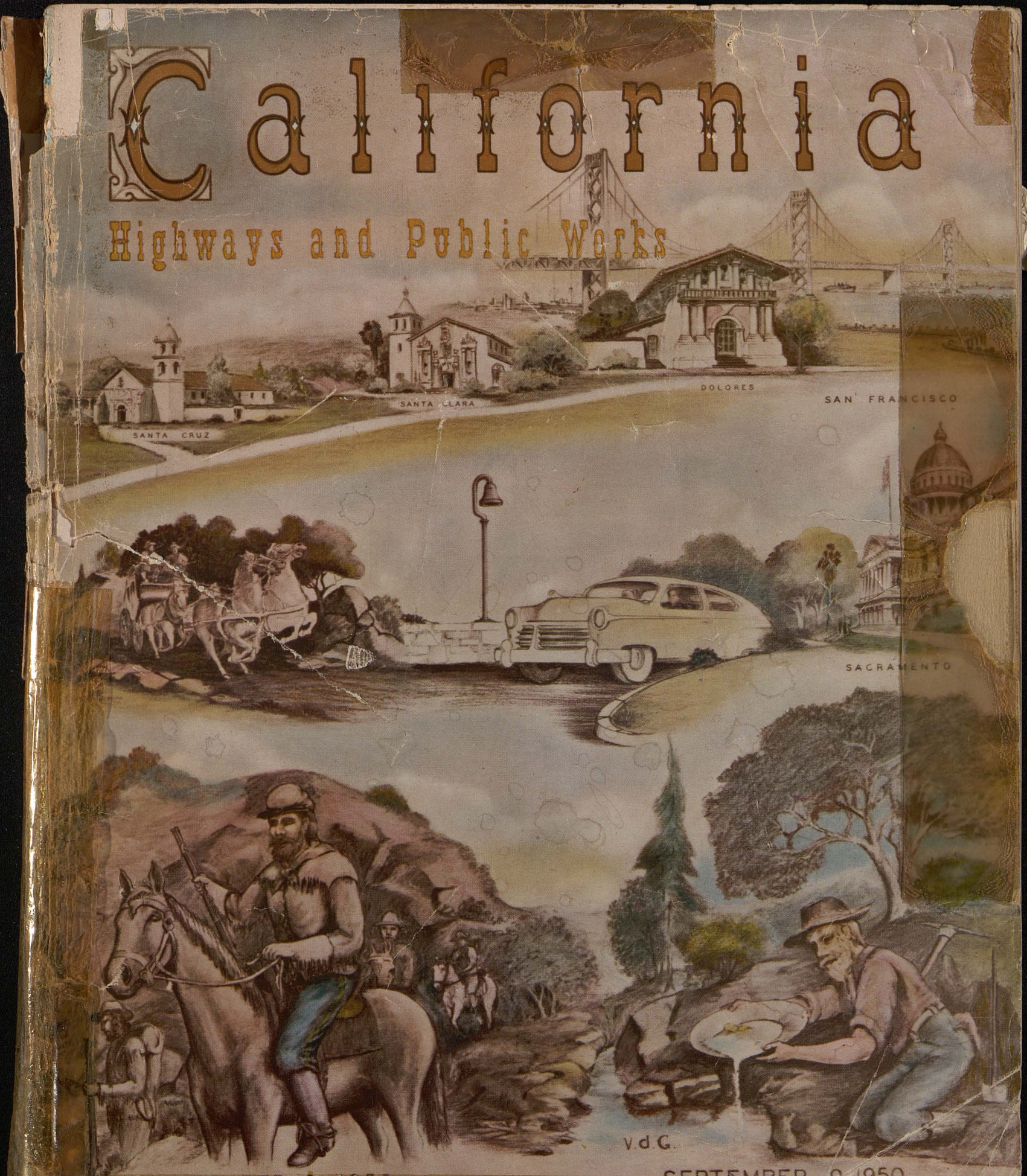
California

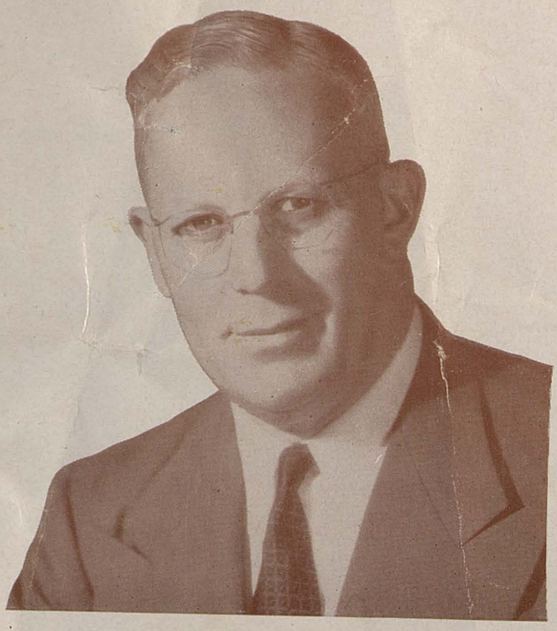
Highways and Public Works



SEPTEMBER . 9 . 1850 — SEPTEMBER . 9 . 1950

Centennial Edition

inches
centimeters
D50 Illuminant, 2 degree observer
Density
Golden Thread
Colors by Munsell Color Services Lab
Don Williams



EARL WARREN
Governor of California

CALIFORNIA'S tremendous progress in the century that has elapsed since its admission to the Union has been due in large part to the steady development of its highway system.

The trails followed by the gold seekers of 1849 soon became stagecoach routes and the necessity for year-around travel brought about the building of roads. With the advent of the automobile came large-scale road construction, and our highways have been steadily improved until we now have one of the finest highway systems in the Nation. We have become literally a state on wheels—a state with more motor vehicles than any other state. We have a million and a half more vehicles than we had 10 years ago.

We have been hard-pressed to keep up with the demands for new and improved highways. To meet these demands we are now spending nearly $100,000,000 per year on our highway program. We must continue to spend this much or more for many years to come, to keep in step with our growing population and our expanding transportation needs.

In view of the importance which highways have assumed in our economy, it is most appropriate that *California Highways and Public Works* should record in this centennial issue the progress that has been made in highway development during the past 100 years. It is a story unequaled in construction history.

Earl Warren

From Trails to Freeways

THIS, BRIEFLY, is the story of 100 years of highway building in California, with prefatory chapters going back to the days of Father Junipero Serra, Don Gaspar de Portola, Don Pedro Fages and Juan Bautista de Anza. These explorers and the pathfinders who came after them hewed trails through the wilderness that, with few deviations, are the major state highway routes of today.

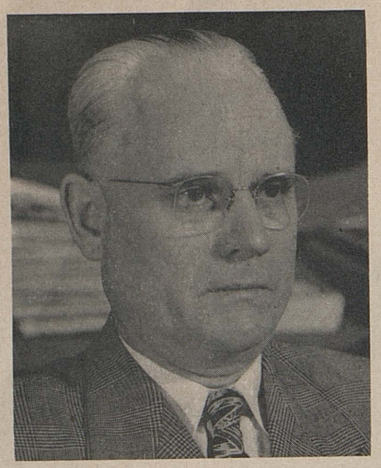
To tell the complete history of the development of California's world-famous system of highways would require volumes. These pages perforce must touch only upon the highlights of that history.

On the one hundredth anniversary of the admission of our State to the Union, this centennial edition of *California Highways and Public Works* is dedicated by Director of Public Works C. H. Purcell, State Highway Engineer George T. McCoy and the California Highway Commission to the people of California, both living and dead, who through their bond issues and their contributions to the Highway Users Fund have made possible, with the aid of their elected representatives in the Legislature, who enacted necessary enabling laws, the far-flung, splendid State Highway System acclaimed by road builders the world over.

California Highways and Public Works is indebted to the authors of the written words which follow, to Van der Goes, Bridge Department, Division of Highways, creator of the cover page and the double-page illustration inside, to Miss Caroline Wenzel, California Section, State Library, to Bancroft Library, to Stanford University Press, to Carroll D. Hall, Curator, Sutter's Fort, and to many others who have helped to compile the story herewith presented.

KENNETH C. ADAMS, *Editor*

Deputy Director



FRANK B. DURKEE

Director Public Works

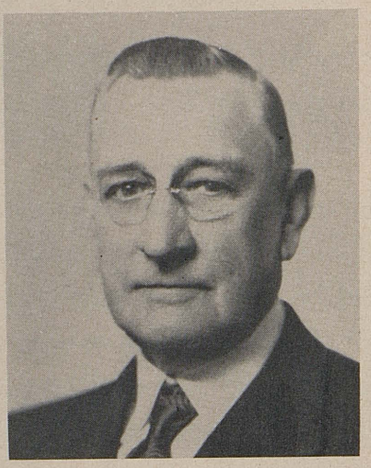
CHARLES H. PURCELL

State Highway Engineer

GEORGE T. McCOY

CALIFORNIA HIGHWAY COMMISSION

HARRISON R. BAKER



HOMER P. BROWN

JAMES A. GUTHRIE

CHARLES T. LEIGH

F. WALTER SANDELIN

CHESTER H. WARLOW

JUNIPERO SERRA
1713-1784
California's first and greatest pioneer; founder of the Mission Chain—California's first highway. (From the original portrait, painted in Mexico in 1773.)
Courtesy, University of California

Foreword

In the chapters written by Alice Fisher Simpson and Stewart Mitchell is unfolded the story of California's first famous Emigrant Trails and the people who blazed them: The trails of the early explorers in the service of His Majesty, the King of Spain; the immortal Padres, intent on planting the cross of Christendom among the heathen children of the wilderness; the fur traders and the mountain men, restless and adventurous; the white-covered wagons of the emigrant trains, answering the call of "Gold!" It is the colorful epic of stagecoach days, when the sturdy Concords, rocking and swaying, rumbled over the narrow, twisting roads of the '60's and '70's; the mule-teams and the cumbersome freighters—whose glory was dimmed by the coming of the "Iron Horse."

Today, many of these famous old trails have become important U. S. and state highways, over which the motorist may travel with ease and comfort—basking in the romance of yesterday, and reliving the dynamic events of California's glorious past.—*Editor*.

Chapter I

Historic Trails of the Padres

By Alice Fisher Simpson

In the year 1769, from Loreto in distant Baja California, that long, narrow peninsula bordered by the Pacific Ocean and the Gulf of California, began the long arduous trail that was ultimately to become California's first highway. In that year came Father Junipero Serra and Governor Don Gaspar de Portola, to plant the Cross of Christendom and the Royal Standard of Spain in the wilderness of Alta California.

On Vizcaino's exploration of the California Coast in 1602, Father Ascension, recorder for the expedition, had sent much valuable data back to Spain, regarding the possibilities for colonizing the region as well as the natural resources to be found there.

The Spanish Government had long contemplated making permanent settlements in the northern region, and was now spurred into action by the encroachments of the English and the Russians. The plan of the Spanish Crown coincided perfectly with that of the zealous Junipero Serra, President of the Lower California Missions, whose cherished ambition had long been the spiritual conquest of Alta California, and the establishment of a vast chain of Franciscan stations.

In 1768, at a conference between Junipero and Jose de Galvez, the visitador-general, the plans of the King were discussed, together with the means of carrying them out. It was agreed that San Diego should be the initial point of the proposed new settlements. Two different expeditions were to be dispatched to that point, one by land and the other by sea. Whichever would arrive at San

Diego first was to wait there for a period of 20 days for the other. In the event that the second did not arrive by that time, the other was to proceed to Monterey.

Three ships were to be employed in the sea expedition, each sailing at a subsequent time. The land expedition was also to be divided into two parts, with each unit marching separately. The vessels sailing from La Paz, were to carry a portion of the troops, the camp equipage, church ornaments, agricultural implements and provisions. The land parties were to be made up of the remainder of the troops, the colonists and Indian servants. From Loreto they would drive before them their herds and flocks, with which the new colonies were to be stocked. Four missionaries were to accompany the sea party, while two, including Father Serra, would travel with the second land expedition, with the Governor, Don Gaspar de Portola, in command.

After making all arrangements for the care of the Lower California Missions, placing them in the hands of his old friend, Francisco Palou, Serra intended leaving with Portola and his men when they marched from Loreto on March 9, 1769, but with the excessive travel and activity, the ulcerated leg from which he had long suffered had become so aggravated and swollen that he was forced to remain behind, joining them later on May 13th at the frontier. Seeing the condition of his leg, Father Palou implored Junipero to remain at ease in Lower California and allow him to go to San Diego instead. But the wiry little priest was determined to carry out the grand conquest he had so long contemplated. "I have placed my faith in God," he answered, "and trust in His goodness to plant the standard of the Holy Cross not only at San Diego, but even as far north as Monterey."

The trip was rough and tedious. On the way the Padre's ulcerated leg became even worse; it was dreadfully inflamed and the pain was intense. He was no longer able to ride his mule, so Portola ordered the construction of a litter, upon which he might be carried in a prone position by the Indian neophytes. But Serra flatly refused, on the grounds that the poor wretches already had enough to bear. Instead, he summoned one of the muleteers and asked him if he knew any remedy for the angry ulcer that had caused him so much suffering.

"Why, Father, I am no surgeon," the bewildered man replied. "I am only a muleteer! * * * I cure only the sores on the backs of the beasts."

To this the determined Serra responded: "Then treat this ulcer the same as though it were a sore on the back of one of your mules."

While the amazed company watched, the muleteer went to work. He took a small lump of tallow, mashed it between stones, mixed it with certain herbs which he found growing nearby, and heated the whole. Then he applied the compound to the ulcerated leg and bound it on. Its soothing effect enabled the Padre to get his first night's sleep in several days. The next morning he was able to pursue his journey in comfort.

From here on travel was slow and difficult. Several of the Indians died from fatigue; some had to be carried on litters, while others deserted. But encouraged by the undying faith of Father Serra, the expedition kept going. After a spirit-killing journey of nearly two months, the wayfarers came in sight of San Diego on July 1, 1769. As they looked down upon the bay, they beheld the two ships of the expedition, the 200-ton *San Carlos* and the *San Antonio* riding at anchor. The third vessel, the *San Jose,* carrying among other items, 10,000 pounds of dried meat and a quantity of dried beans, raisins and dried fish, had as yet not been heard from.

Serra and Portola were overjoyed as they beheld the tents dotting the shore line, proclaiming the arrival of Rivera y Moncada and the first part of the land expedition. As they hastened on to meet their comrades, Portola's soldiers fired volley after volley. Moncada's troops instantly returned the salvos; and then, as if suddenly awakened into life, the ships riding at anchor joined in celebrating the glad reunion.

Although the *San Carlos* had been the first vessel to sail, leaving La Paz on January 9, 1769, she arrived 20 days after the *San Antonio,* which sailed February 15th. The vessel had been driven off her course by storms, and her passengers endured untold suffering. Of her crew all but one sailor and the cook had succumbed to scurvy. Many of the soldiers had died.

It had been planned that those who were to proceed to Monterey would travel by sea aboard the *San Carlos,* as the *San Antonio* was to be sent back to San Blas for provisions. When it came time, there were not enough sailors to man the vessel, so it was agreed that the party would march overland. Accordingly, on July 14th, with transport animals, baggage and provisions, the expedition started in search of the Bay of

Mural by Albert Herter. Reproduced by courtesy of Los Angeles Public Library

BUILDING OF A MISSION

Monterey, so glowingly described by Vizcaino. Personnel consisted of 64 persons: Governor Portola, Fathers Crespi and Gomez, Captain Rivera y Moncada, Lieutenant Fages, Engineer Costanso, Sergeant Jose Ortega and a number of soldiers, muleteers and Indian servants.

No sooner had Portola and his men departed than the enthusiastic Serra turned his attention to the founding of the mission. July 16th was the date decided upon. It was appropriate, since it was on this day in the year 1212 that a great victory had been won by the Christians over the Moors. The spot selected was on the north side of the bay. Here a great cross was erected, and with the celebration of Holy Mass, Junipero Serra had established the first settlement in Alta California—the Mission San Diego de Alcala.

At first, the Indians appeared friendly, and willingly accepted any gifts they were offered; but as time went on, they became most troublesome. On August 15th, armed with bows, arrows, wooden scimitars and war clubs, they broke into the mission in great numbers to pillage and loot.

To complicate matters, the rainy season came on. Supplies were running dangerously low; the entire colony was faced with famine unless the *San Antonio* returned soon from San Blas with provisions. In the midst of the confusion, the exhausted Portola and his weary company returned without fulfilling their mission. For six long grueling months they had roamed the trackless wilderness in search of the elusive Bay of Monterey. In this they had failed; but their efforts had not been in vain, for instead they had discovered the great Bay of San Francisco, which in spite of the many voyages in its vicinity, had remained so long undiscovered.

Portola took little interest in the new discovery, however, declaring that he saw nothing worthy of description in the "labyrinth of bays and channels which inundated the territory." Under the circumstances, any other man in his position would have felt justified in abandoning the colonization of Alta California; starvation and disease had reduced his forces to a minimum. He was certain now that the supply packet *San Jose* had been lost at sea with its precious cargo of food. But as a soldier of the King, Portola remained steadfast to his purpose. He had been ordered to hold the northern territory and he meant to carry out those orders as long as the strength of his forces would permit.

As the anxious days wore on and the *San Antonio* failed to return, the suffering became even more acute. Some of the soldiers had barely enough clothing left to cover their backs; all else having been given over to the Indians in exchange for fish, geese and other food. A small quantity of corn had been planted where the soil was best, and although it grew well, the birds ate most of it before it matured.

Each day the devout Serra prayed earnestly and fervently that the pitiful group might be spared, through the mercy of Divine Providence, to carry out their mission. Toward evening, on March 19th, the festival of St. Joseph, patron saint of the expedition, the little brown-robed friar stood upon a high bluff and scanned the distant horizon. Suddenly, he dropped to his knees and joyfully gave thanks; for far in the distance, he had sighted the appearance of a sail.* * *

The arrival of the *San Antonio* with the badly needed supplies was a boon to the lagging spirits of Portola and his men. The Governor was now assured of the cooperation and the earnest intentions of the visitador-general in colonizing the country. He determined at once to retrace his steps northwestward and renew his search for the Harbor of Monterey.

The expedition consisted of two divisions, one of which was to proceed by sea and the other by land. Sailing April 16th, aboard the *San Antonio,* were Padre Junipero, Engineer Costanso, Surgeon Pedro Prat and Captain Juan Perez. The land party, consisting of Governor Portola, Father Crespi, Lieutenant Pedro Fages, 19 soldiers, five Lower California Indians and two muleteers, set out a day later, on April 17th.

Shortly after leaving port, the *San Antonio* encountered northwesterly gales, which drove the little vessel several degrees to the south, and delayed it in reaching Monterey for a month and a half.

On land, Portola and his party were experiencing the same difficulty in recognizing Monterey as on their first march. The latitude and landmarks, however, told them they had reached their destination. They explored further and found that between Point Pinos on the south, and a distant headland on the north, lay an immense circuit of smooth water, "alive with sea lions and deep enough for whales." Seven days later, when the *San Antonio* dropped anchor in this harbor, they concluded that it was the long-sought Bay of Monterey, decidedly overrated by Vizcaino.

Upon disembarking Father Junipero looked about and pronounced the port the same as that described by Father Ascension. There were the springs of fresh water; and nearby, the spreading oak on the shore line, where mass had been celebrated in 1602.

June 3, 1770, was the date selected for the ceremonies which would found California's second mission—San Carlos Borromeo de Monterey. Following the elaborate religious service, came the civil and military ceremonies. While the Spaniards, according to custom, uprooted grass and flung stones into the water, symbolizing the seizing of the territory, Governor Portola planted the royal standard—formerly taking possession of the country in the name of His Majesty, Carlos III of Spain. Thus was founded the settlement which immediately became, and for many years remained, the Capital of Alta California.

By 1783, the Franciscan Missions dotted the King's Highway like the beads of a rosary. There were now nine: San Diego de Alcala, San Carlos Borromeo de Carmelo, San Antonio de Padua, San Gabriel Archangel, San Luis Obispo de Tolosa, San Francisco de Asis, San Juan

Mural by Albert Herter. Reproduced by courtesy of Los Angeles Public Library

Capistrano, Santa Clara de Asis and San Buenaventura.

During the long, difficult 14 years, the ingenious Serra had worked hard and relentlessly. With his own hands he transformed the raw, physical products of the wilds into building materials; he hewed trees, sawed up the lumber, and made bricks of mud and straw; he was architect, contractor and master mason all in one. He used no means other than tact and kindness to subdue the superstitious Indians about him, and to teach them to aid in the work. He taught them to plow the fields and plant the crops, that they might be better fed; to spin and weave, that they might clothe their nakedness.

At 70, the Father-President was still active, although slightly stooped, and a little lame from the persistent pain of his ulcerated leg. Through summer's dust and winter's mud, his sandaled feet patiently trod the rough, narrow trail from mission to mission. No matter how arduous the journey, the pious Franciscan adhered steadfastly to the tradition of his order—to walk whenever possible.

Between September of 1783 and January of 1784, he visited each of the missions south of Monterey, administering the rite of confirmation. In the spring he journeyed by way of Santa Clara and paid a last visit to Mission San Francisco de Asis. Then he returned to Monterey and retired to his headquarters at Mission San Carlos, confirming all the neophytes there.

In the illness and pain that attended his last days, he was uncomplaining; and on August 28, 1784, the zealous Servant of God passed quietly away, confident that he had saved more than 10,000 heathen souls.

* * * Today, the name of Junipero Serra is perhaps the most beloved name in California history; revered by men of all classes and creeds. As the founder of the California missions he not only accomplished the spiritual conquest of Alta California, but made possible the physical as well; for without the sustenance provided by mission fields and herds, the Spanish Presidios would soon have withered and died.

While it was the heroic Portola who actually blazed the wilderness trail from San Diego to San Francisco, it was the indomitable Serra who stayed on for 15 long years, to bring into being the settlements of civilization along that trail. The missions which he founded, destined to become important cities, he dedicated to the Glory of God; while the chain that joined them together—California's first highway—he named in honor of the King: "*El Camino Real*, * * * *The Royal Road*."

As sources of information the author acknowledges:

Theodore H. Hittell: "History of California, Vol. I, San Francisco, 1885.

The Very Reverend Francis Palou: "Junipero Serra." Translated by the Very Reverend J. Adam, P. E. Dougherty Company, San Francisco, 1884.

George Wharton James: "In and Out of the Old Missions of California." Little, Brown and Company, Boston.

Father Zephyrin Engelhardt, O.F.M.: "Missions and Missionaries of California," Vol. II. Joseph H. Barry Company, San Francisco, 1912.

A. F. S.

Chapter II

Rediscovering San Francisco Bay

IN ONE of the most remarkable expeditions in history, Don Gaspar de Portola and a company of 63 half-starved, scurvy-ridden adventurers hacked their way through nearly 500 miles of trackless wilderness to accidentally discover the great Bay of San Francisco, and what would one day become one of the world's greatest ports.

Leaving Father Serra to found the mission settlement of San Diego, Portola and his company set out on July 14, 1769, in search of the Bay of Monterey, which Vizcaino had described as an unusually "fine harbor."

In advance of the expedition rode Sergeant Jose Ortega with a scouting guard, locating the best trails and the easiest routes. For miles at a time, the scouting party was forced to cut its way through the dense underbrush to blaze a trail for the cumbersome caravan and its lagging, overladened mules. In a quiet valley, on the banks of a peaceful little stream, or in the seclusion of a wooded canyon, they sought out camp sites for their weary followers.

Traveling northwestward along the coast, the explorers entered what is now Orange County on July 22d. They made camp in a canyon north of San Onofre, near an Indian village, where the Padres baptized two little Indian children whom they found seriously ill. Upon the site was bestowed the name it still bears—Los Cristianitos ("The Little Christians").

The next stopping place is described by Father Crespi, diarist of the expedition, as a very pleasant, green valley, full of willows, alders, live oak and other

and Public Works

trees, with a good stream of pure, fresh water. "We called it the Valley of Santa Maria Magdálena," he recorded. The actual spot selected for the camp was a few miles above the site which Father Serra later selected for Mission San Juan Capistrano.

On the night of July 24th, the expedition made camp on Alisos Creek, near the present site of El Toro. Here they rested for two days before moving on to the Santiago Hills east of Tustin, which they reached on the 26th. Two days later they arrived at the Santa Ana River and set up camp on the left bank, near the present town of Olive, east of Anaheim. Great difficulty was encountered in crossing the swiftly flowing river. Once across, the travelers pursued a northwest course, making camp on a hill near a small pool of water. (The site is now known as La Brea Canyon, north of Fullerton.)

On July 30th, the company crossed the La Puente Hills by way of La Habra Pass, into the broad, fertile valley of the San Gabriel. On August 2d, on the jubilee of Our Lady of the Angels, the pathfinders reached a spot by the river, which they named in her honor: "Rio de Neustra Señora La Reina de Los Angeles de Porciúncula" ("River of Our Lady, the Queen of the Angels of Porciúncula"), present site of the City of Los Angeles.

For several days in advance and during their stay here, Portola and his men encountered a succession of severe earth shocks. They concluded that volcanoes existed in the vicinity, and in searching came upon the La Brae asphalt beds, which Father Crespi referred to as "Rivers of Pitch."

On August 5th, the expedition entered what is undoubtedly Sepulveda Canyon and passed over the mountains into the San Fernando Valley, where they camped near the present site of Encino. On the 7th, they made camp northwest of what was later to become the site of Mission San Fernando. Resuming their march on the 8th, they traveled over San Fernando Pass to the present site of Newhall, camping at an Indian village on the banks of the Santa Clara River, near what is now Castaic.

On August 10, 1769, the expedition left Castiac, in what is now Los Angeles County, proceeding northward through the verdant valley which Father Crespi named the Santa Clara. Close to what is now the county line, the expedition spent the night on the banks of an arroyo in the vicinity of what later became Rancho Camulos. For three successive days, Portola and his men camped near the Indian villages in the neighborhood of what is now Piru, Fillmore and Santa Paula, refreshing themselves on the gifts of food brought to them by the friendly natives.

On the 14th, a campsite was selected near a large Indian rancheria on the coast. Father Crespi named the place La Asunción de Nuestra Señora —predicting, "that such a fine site, where nothing is lacking, will become a good mission." Thirteen years later on this spot, Serra founded the Mission San Buenaventura.

The next night, while camping at another Indian village, the travelers found little rest. Father Crespi recorded in his diary, that the natives "disturbed us and kept us awake, playing all night on some doleful pipes or whistles."—thus accounting for the name bestowed upon the place by the soldiers: Pitas ("whistles") Point.

On August 16th, the wayfarers camped at an Indian village near what is now known as Rincon Point. On the 17th, they reached another village where the natives were engaged in building a canoe. The Spaniards promptly named the place "La Carpinteria" (a name still retained by the town situated near the site).

All along the coast the Indians were numerous. They were friendly, and on the whole appeared intelligent. In the warm August sunshine, the squaws were busy drying fish for the winter, while the men hunted game in the surrounding hills; and in their sturdy canoes, plied back and forth between the Channel Islands and the mainland. On the 18th, Portola and his men reached an extremely large native settlement, on a beautifully situated spot, with oak-studded hills running back from the shore line. (Today on this site stands the City of Santa Barbara.)

Proceeding up the coast along the Santa Barbara Channel, the trailblazers camped at a site which they named "Gaviota," because of having shot a seagull there. A little farther up the coast they passed Point Arguello, the rocky headland, joining with Point Concepcion to form the corners of California; here the coast line shifts from an approximate north and south angle, to a line running east and west.

On August 30th, they reached the Santa Inez River, and on September 1st, they arrived at Guadalupe Lake, beyond which lay the boundaries of what is now San Luis Obispo County.

During the first part of September, camp was set up in a broad valley where the ground was literally plowed up by the many wild bears that came from miles around to feed on the native roots. Portola's soldiers found sport in hunting down a couple of the ferocious beasts, thereby gaining the profound admiration and respect of the numerous Indians inhabiting the region. They named the site, "La Canada de Los Osos" ("Canyon of the Bears"). Here, three years later, on September 1, 1772, Father Serra founded the Mission San Luis Obispo de Tolosa.

On September 8th, the trailmakers wended their way back to the coast, where they set up camp at the mouth of Morro Creek, on a hill overlooking what is now called Morro Bay and majestic Morro Rock. On the 10th, they stopped at Santa Rosa Creek near the present site of Cambria. The next day they proceeded as far as Little Pico Creek, east of San Simeon Point, where traveling became extremely difficult.

By now, Portola had come to realize that following the coast line presented anything but easy transit. On the 13th, further progress up the coast became impossible, due to the steep mountain precipices. The 14th and 15th, the explorers spent preparing a path over a most difficult pass, and on the 17th, they laboriously made their way over the rough terrain to what is now the boundary of Monterey County.

Pushing inland, the weary party finally reached the San Antonio River, near the present site of Jolon, where they camped on the night of September 24th. Two days later, they descended what is now Kent Canyon, striking the Salinas River near the present site of King City.

The commander and his men followed the stream to its mouth, where they made camp, to rest and make further exploration. On October 1st, they beheld what they believed to be the Point of Pines described by Vizcaino. They failed, however, to recognize the Port of Monterey as that which the navigator had so glowingly described. They were likewise little impressed by the surrounding country, wild and ungracious, with little to greet the eye save rocks, brush and rugged mountains, which Vizcaino called the Sierra de Santa Lucia.

Portola had expected to find the supply ship San Jose awaiting him at Monterey. Since there was no sign of the vessel, he was certain that they had not yet reached the bay in question, and reluctantly ordered the expedition to proceed farther north.

From here the advance was slow and difficult, as many of the men were suffering from scurvy; some had to be carried on litters. On October 8th, the weary pioneers reached the stream which they called the Rio del Pajaro or "Bird River," because of having found upon its banks a huge eagle stuffed with straw—undoubtedly used by the Indians in a ceremonial.

Just before reaching Soquel on October 10th, the Spaniards first saw the famous "big trees" (*Sequoia sempervirens*), which Portola named the "Palo Colorado" because of the reddish color of the wood. On October 17th, the party camped on the west bank of a large river which Father Crespi named the San Lorenzo, a name which it still bears. (On the campsite, covered with redwoods and wild roses, now stands the City of Santa Cruz.) From here the explorers passed up the coast, halting occasionally to rest their animals and care for the sick.

With early rains slowing their progress, the party, footsore and disheartened, camped on Pilarcitos Creek (site of Spanish Town or Half Moon Bay). Every man in the command was ill; medicines were nearly exhausted.

Monday, October 30th, found them on the march again, battling the rugged terrain. With their meager equipment, they were forced to construct improvised bridges in order to cross several deep arroyos. Further up the shore they were confronted by a formidable barrier of rock. Here the company set up camp, while Ortega and his scouts attempted to find a pass over the Montara Mountains.

By noon of the next day, October 31st, they reached a pleasant spot near the beach, where there was an abundance of large, choice mussels. Father Crespi named the place, "Angel Custodio," while the soldiers dubbed it "Punta de los Almejas," or "Mussel Point." (Today the site is known as Point San Pedro.)

The next day, upon resuming his march, the commander ascended a promontory, and sighted a distant bay, formed by a point running far out into the ocean. He believed it to be the Punta de Los Reyes, which Vizcaino had named in honor of the Three Wise Men of the East; further to the southwest of it, were six or seven small, rocky islands, clearly the Farallons. Portola was certain that this was Drake's Bay, called the Port of San Francisco by Cabrera Bueno, Vizcaino's map-making pilot, whose book he carried with him. He took little comfort in the discovery, however, for it meant that he had passed the Port of Monterey—his real objective.

The men were of divided opinions as to whether or not this was really the Port of San Francisco, as recorded by Vizcaino. While deliberating, the company made camp in what is now the San Pedro Valley, at the foot of the Montara Mountains. It was a peaceful region, traversed by two small streams, which united and flowed into the sea; it was overgrown with reeds, brambles and roses like those of old Castile. There were no trees in the immediate vicinity, other than small willows; only on the distant mountains could any be seen.

When the command had disposed itself for a stay of several days, Sergeant Ortega with a small company of soldiers was ordered to explore the surrounding

On left is Gaviota Pass in Santa Barbara County as it must have looked to Portola and his men who gave it its name because they killed a seagull there. On right is Gaviota Pass as it looks today. Gaviota Pass illustration is from the Vischer painting, courtesy, California State Library

country. On Thursday, November 2, 1769, Father Crespi relates in his diary, that some of the soldiers remaining in camp, saw a number of deer. Obtaining Portola's permission to hunt the animals, the men spent the entire day roaming over the hills to the east. Upon returning in the evening, they enthusiastically related, how from the hilltops, they had seen toward the north, an immense arm of the sea running inland, extending in a southeasterly direction as far as the eye could see.

The next evening Ortega and his scouts returned, heralding their approach by firing off their muskets. They too had seen the great bay. Eagerly, the Governor and his party heard from Ortega, that the Indians had reported there was a port and a ship but two days' journey from their camp site. From this information, Portola immediately supposed that Monterey was close at hand; whereupon, early the next morning, the expedition broke up camp and headed in the direction indicated by the Indians. They traveled northward along the beach for some distance, and then turned off northeast. Mounting the hills, Don Gaspar de Portola and his entire company looked upon the dancing waters of the great bay, apparently four or five leagues across, stretching out below them to the northwest and the southeast. They failed, however, to find the slightest trace of a ship, which led Ortega to believe that he had misunderstood the Indians.

For nearly two weeks, the commander and his men explored the region. They marched down the bay shore and saw the great plains of the Santa Clara Valley, where the Missions of San Jose and Santa Clara were later established.

Although they were undoubtedly the first Europeans ever to look upon the precipitous, rocky portals of the Golden Gate, and the smooth, deep waters of the magnificent bay locked away among the hills, they were little inspired. Hungry and exhausted, they turned around and retraced their steps back to their old camp at the mouth of the Salinas River. It was a grueling march!

Through this pass marched Portola and his expedition in August, 1769

Like virtual living skeletons, the men staggered along day after day, clinging to the hope that the supply packet San Jose might still be sighted.

By December 20th, the food supply was practically exhausted, and the expedition was not even half way to San Diego. "What little still remained could have been eaten by one man in two days," says Father Crespi. In spite of Portola's vigilance, the starving soldiers began stealing from the few remaining sacks of flour; so in order to be fair to all, the commander divided what was left equally

Portola and his men get their first view of San Francisco Bay. From the drawing by Walter Francis, courtesy Bancroft Library

among the men so that each man might guard his own. Each person received eight small cupfuls, and only five very thin tortillas could be made from each cup. In a narrative written some years later, Portola himself described the ordeal of hunger.

"In order that we might not die meanwhile," wrote the commander, "I ordered that at the end of each day's march, one of the week-old mules should be killed. The flesh was roasted or half fried in a fire made in a hole in the ground. The mule being thus prepared, without a grain of salt or other seasoning—for we had none—we shut our eyes and fell to on that scaly mule like hungry lions. We ate 12 in as many days, obtaining from them perforce all our sustenance, all our appetite, and all our delectation."

On November 27th, Portola recommenced an examination of the country in the vicinity of the Point of Pines. Although he camped on the very spot where Monterey was later founded, he failed to recognize in the waters before him, the "sheltered harbor" as described by Vizcaino. After some deliberation as to whether the company should be divided, with one-half returning to San Diego and the others remaining at the Point of Pines, it was finally decided that all would return together. Before starting, the commander set up two great crosses, one on the beach and another on a hill in the Carmel Valley, in full view of the ocean. On the former was inscribed a notice that the expedition had returned to San Diego on December 9, 1769. On the latter were inscribed the words, "Escarba al pié y hallarás un escrito." ("Dig at the foot and you will find a writing.") Beneath the cross a glass bottle was buried, containing a document with a brief account of the expedition. It closed with a prayer to God, the All Powerful, to guide the expedition on its way, and to conduct the navigator who might find the paper, to the port of salvation.

Thus, through the exhaustive sweat and the relentless efforts of California's first pioneers, was carved from the virgin wilderness, the trail which was to become one of the most historic in all California. Although the route missed the sites of several of the missions, for the most part, it became the pathway of the Padres, along which they forged the Mission Chain from San Diego to San Francisco.

One hundred and eighty-one years later, with few deviations, Portola's route is traversed by two of the finest and most scenic highways in the Nation: The beautiful, modern Coast Highway, U. S. 101; and from Santa Cruz north into San Francisco by way of Pescadero and Half Moon Bay, it is followed by State Sign Route 1.

As sources of information, the author acknowledges:

Theodore H. Hittell: "History of California," Vol. I, San Francisco, 1885.

Charles Edward Chapman, Ph.D.: "A History of California, The Spanish Period." The Macmillan Company, New York, 1921.

Herbert Eugene Bolton: Father Crespi's Diary—in the book "Fray Juan Crespi," University of California Press, Berkeley, California, 1927.

Hero Eugene Rensch and Ethel Grace Rensch: "Historic Spots in California (The Southern Counties)." Stanford University Press, 1932.

Charles Caldwell Dobie: "San Francisco, A Pageant." D. Appleton-Century Company, New York, 1933.

John A. Berger: "The Franciscan Missions of California." Doubleday and Company, Inc., Garden City, N. Y., 1948.

A. F. S.

Chapter III

Spain Consolidates Her Holdings

FOLLOWING THE FOUNDING of Mission San Carlos de Borromeo, and the occupation of Monterey, Portola had been instructed by Galves, the visitador-general, to turn over his command to Don Pedro Fages, and return to Lower California. On July 9, 1770, barely eight months after his discovery of San Francisco Bay, he complied with these orders. Leaving about 20 soldiers and a few sailors, too ill to make the return voyage, he departed aboard the *San Antonio* for San Blas, never to return to Alta California.

The intrepid trail blazer had never been overly enthusiastic about the San Francisco Bay region, which he described generally, as a territory indented by a large number of bays and inlets. In the two weeks that his men had scouted the region, he had learned but little. How large the body of water actually was, and how far it extended, no one really knew.

Fages, on the other hand, was eager to explore the newly discovered area; for if the Spanish Crown was to make settlements north of Monterey, he reasoned, it was urgent that the country surrounding what Father Crespi called, "the great arm of the sea," should be thoroughly known. Accordingly, with six soldiers and a muleteer, he left Monterey in November, 1770. Following up the Salinas River, then called the Santa Delfina, he traveled inland. Crossing the barren Gabilan Mountains, he passed north through the Santa Clara Valley, instead of following Portola's original route up the coast by way of Half Moon Bay.

At the southern end of the great bay, Fages and his party traversed the same ground over which Sergeant Ortega had passed in scouting the region the year before. But he proceeded much further north than Portola's scouts, passing over the present sites of the Cities of Oakland and Berkeley. Deeming it unsafe to remain away from Monterey too long, since he was acting without official orders, Fages made no further explorations in the north at that time.

In March of 1772, shortly after his return to Monterey from the founding of Mission San Gabriel, Fages undertook a second expedition to the San Francisco Bay region, at the instigation of Father Serra. The Father-President was desirous that the country be examined for the purpose of ascertaining the most suitable place for a mission settlement. It was still generally believed that the Port of San Francisco lay under Point Reyes, and that the great inland bay, sighted by Portola's expedition, communicated directly with it. The object of the new survey, was to resume the search made by the expedition of 1769, and to continue it around the eastern shore of the bay to Point Reyes and the supposed port.

On March 20, 1772, Fages started from Monterey, with the faithful Crespi, whom Serra had assigned to accompany the expedition. There were 12 soldiers, a muleteer and a Lower California Indian to attend to the pack train. Crossing the Salinas River, the expedition passed through the Salinas Valley, climbed the Gabilan Mountains and dropped down into the valley on the other side, where Mission San Juan Bautista was later established. Continuing north, it passed through the Santa Clara Valley, and on the 22d, set up camp a little north of what is now the City of Gilroy.

On March 24th, Fages and his men reached the head of the bay, camping on a little creek a few miles north of what is now Milpitas. Thence, the expedition proceeded along the eastern shore of the bay, where the explorers saw vast herds of deer and elk; many bears were also encountered.

By the 26th, Fages and his party had advanced as far as the present site of Fruitvale and made camp near the spot where Mills College stands today. On March 27th, camp was made in a marshy region, near what is now Lake Merritt, where the company was much annoyed by the swarms of mosquitoes. It was from an observation point presumably near the present site of the Technical High School, that Father Crespi made his observations of the "Boca del Puerto" (the Golden Gate).

In its march on the 28th, the expedition passed the present sites of Berkeley and Albany, to what is now eastern Richmond, in Contra Costa County. Proceeding to and around the shore of San Pablo Bay, the Spaniards expected to be able to reach the mountains seen to the north of it. But at this point Fages and his men were prevented from advancing further in that direction by the Straits of Carquinez. They turned eastward and made their way along the southern shore of Suisun Bay, to a point on the hills north of Monte Diablo. From here, to their great surprise, they beheld the great interior valley, as level as the palm of one's hand, spread out before them, to the north and the south, as far as the eye could reach. They also observed two great rivers (the Sacramento and the San Joaquin), emptying into the head of Suisun Bay, and "communicating with each other near their mouths by numerous channels."

Realizing that without boats, or being forced to make a most extensive detour, they could go no further in their search for Point Reyes and the port believed to lie under it, Fages now decided to return to Monterey.

On the way back, instead of following the bay shore, the expedition crossed over around the western base of Monte Diablo, through Amador and Suñol Valleys, down Alameda Creek, and on to Monterey by the same route it had come, arriving there on April 5th.

As time went on, and the mission settlements grew, friction arose between

Through these rolling foothills in Contra Costa County marched Don Pedro Fages following a route that is the present day U. S. 40. This section of the highway north of Oleum doubtless was traveled by Fages

Father Serra, President of the Missions, and Fages, Commander of the Presidios. The latter contended that, since the presidios were established to give full protection to the missions, he should have some control over them. Serra, on the other hand, resented Fages' interference. In writing to his old friend Palou, he stated that the hot-tempered Fages had caused "nothing but pain, disgust and discouragement for the religious work, without any benefit to the missionaries." Finally, differences between the two men became so serious, that Serra made the long journey to Mexico City to lay the matter before the new viceroy, Antonio Maria Bucareli. On October 19, 1772, the unhappy Junipero left San Diego aboard the *San Carlos,* reaching the Spanish capital on February 16, 1773.

In compliance with the viceroy's request, Serra submitted a lengthy report on the status of the California missions, in which he discussed some 32 topics. Fearless and candid in his recommendations, the Father-President mapped out a complete program relative to what he thought should be done if Spain was to hold her dominions in remote Alta California.

But first of all, Serra petitioned the viceroy to recall Fages—maintaining that he represented a great hindrance to the mission system. Next he took up the matter of providing more and better vessels for shipping supplies from San Blas to San Diego and Monterey. He related in detail, how for months at a time, the mission settlements were practically without food, as most of the corn and dried meat that arrived from San Blas was unfit for use, being either moldy or full of worms. Nowhere, he argued, were cattle more plentiful than the country around San Blas; yet for nearly two years, the missions had been without meat, depending entirely upon wild game, hunted by the soldiers or the Indians.

He pleaded eloquently for the establishment of a mission in the newly discovered San Francisco Bay region; and urged that an overland route be opened from Mexico into California, whereby, in case of famine, food products could be obtained from the Indians who tilled the rich valleys of the Colorado River. He cited additional advantages from such a land route: In case of encroachment by a foreign power, soldiers could be easily marched overland. Colonists too, he told the attentive Bucareli, could be brought into the country, once such a route was fully established.

All through the conference, the viceroy was unmistakably swayed by the eloquence and the earnestness of Serra's plea. He readily agreed to increase the annual support for each mission. He had given much concern to the lack of order and business procedure which obviously retarded the progress of the Alta California colonies. It now became clear to Bucareli that the distant province must be placed on a more permanent basis, with the result that he drew up the first civil code for California.

There were other matters too, in which the viceroy followed Serra's recommendations: He recalled Pedro Fages as Commander of the Spanish Presidios in California. Although the latter may have failed to perform the duties of this important office to the satisfaction of Father Serra, he nevertheless ranks among the greatest of California's pathfinders. He was the first white man to travel inland from Monterey to the Bay of San Francisco —thereby, virtually charting a portion of the route of the present Coast Highway, U. S. 101. He made the first accurate charting and mapping of the major part of the great bay region, which today is traversed by a vast network of both U. S. and state highways.

From San Jose north, to what is now Warm Springs, the explorer's trail is followed by State Sign Route 17. From Warm Springs to the City of Oakland, it is paralleled by the present Foothill Boulevard.

From the City of Oakland, to the Straits of Carquinez, it might be said that the explorations of Fages and Crespi practically opened the way for the present highway U. S. 40, Northern California's principal artery with the East.

As sources of information, the author acknowledges:

Theodore H. Hittell: History of California, Vol. I., San Francisco, 1885.

Herbert E. Bolton: Fray Juan Crespi, Missionary Explorer on the Pacific Coast, 1769-1774. University of California Press, Berkeley, California, 1927.

Mildred Brooke Hoover, and H. E. and E. G. Rensch: Historic Spots in California. Stanford University Press, Stanford, California, 1948.

—A. F. S.

Chapter IV

Anza Opens First Overland Route

Serra was not the only one who insisted that a direct land route to California from Mexico was essential. Many had written to the viceroy and the king concerning such a project. "With such a route," they predicted, "Spain can hold the country indefinitely; without it, she will ultimately fail."

But the government itself gave the matter little serious thought, until a certain letter came to the viceroy's attention. It was written by a young Spaniard by the name of Juan Bautista de Anza, a comparatively obscure figure, captain of the small presidio of Tubac in Sonora (a small settlement on the United States side of the Mexican border, about 50 miles south of Tucson). Anza had been born and raised on the frontier of northern Mexico, and had learned the tactics of Indian fighting from his father, a seasoned army man. In his childhood he learned how to travel through the treacherous desert country, where his father was slain by the Indians.

For several years he had made a thorough study of the explorations of Father Eusebio Kino, a Jesuit priest, who as early as 1700, had blazed a trail from Mexico to the junction of the Colorado and the Gila rivers, in an attempt to find an overland route from Sonora to the missions of Baja (Lower) California.

Soon after the founding of the Monterey Mission, Anza had been anxious to lead an expedition from southern Arizona to the new colony. In writing to the viceroy, and offering to conduct such an exploration, he promised that the project would not be too costly and could be accomplished with little difficulty. "My aim is to serve His Majesty and enlarge the Royal Domain," wrote the conscientious soldier.

Anza's letter reached Viceroy Bucareli at a most opportune time; in fact, just about the time Comandante Fages had gone on a bear hunt to keep Monterey from being starved out of existence. Needless to say, the letter received the official's most serious consideration. He immediately conferred with advisors on the northern frontier, among whom was Governor Sastre of Sonora. Entirely convinced of the feasibility of the plan, he called a junta, or conference, with several high-ranking officials, who were responsible in cases where funds had to be provided by the royal treasury.

Then followed further correspondence between Anza and Bucareli, to make definitely certain that the young captain was the man best suited to lead such an important expedition. Anza's cause was furthered materially by the intercession of Father Francisco Garces, the famous priest-explorer. A loyal friend of the Indians, Garces was the first white man to enter the great Colorado Desert, when in 1771, he crossed the Colorado River, mistaking it for the Gila. In his explorations he skirted the Cocopah Range to its terminus at Signal Mountain, near what is now Calexico. He sighted two gaps in the Sierra, through which he believed it would not be difficult to reach the New California.

After more than a year of waiting, Anza received the news that on September 9, 1773, the junta had passed a resolution authorizing him to lead an expedition from Sonora, Mexico, to Monterey, California. The soldier had proved himself the man for the undertaking; he was patient, generous, well liked by the Indians, honorable in the service and of upright life.

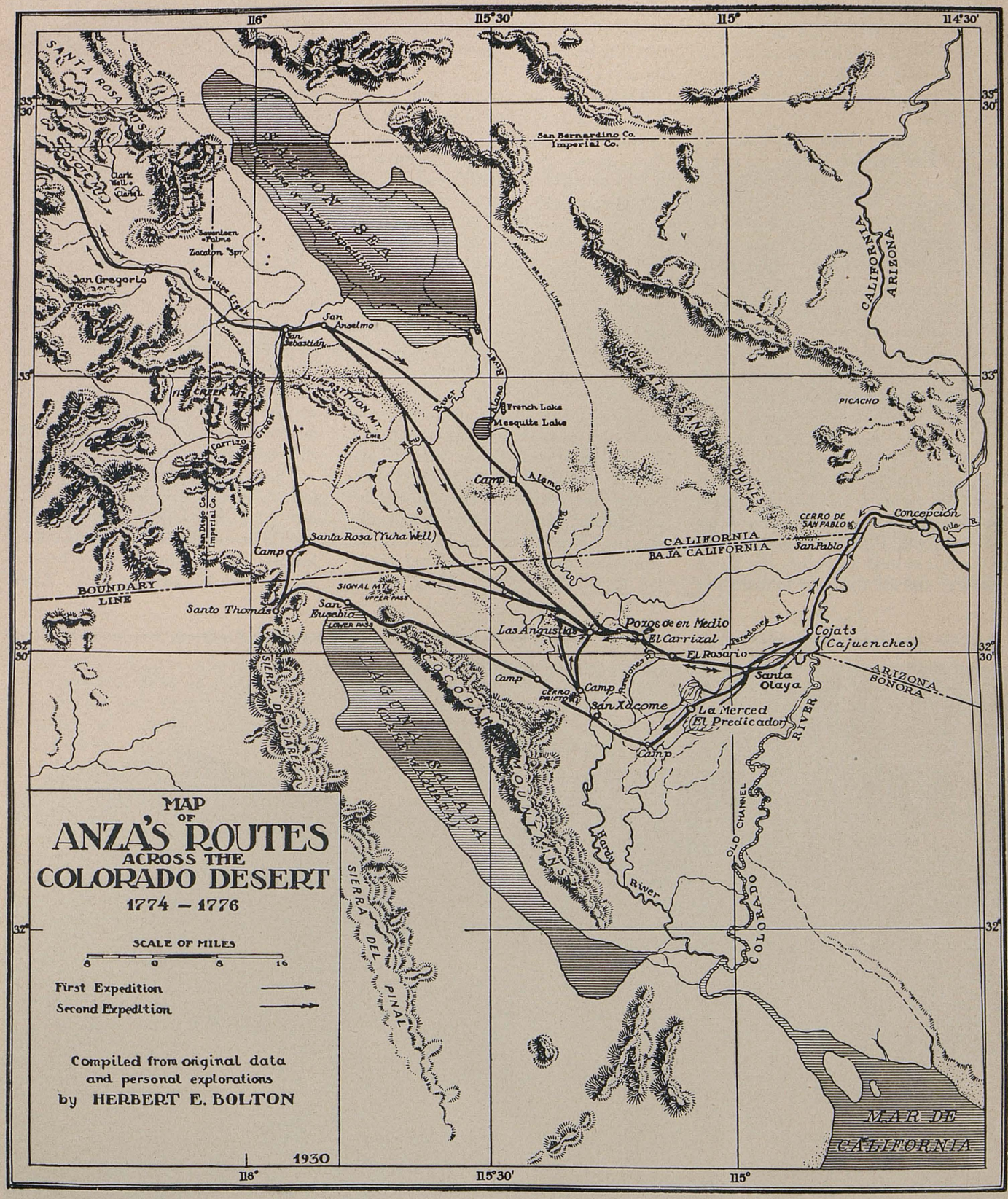
At his own request, the volunteer pathfinder was to be accompanied by Father Garces, Father Juan Diaz and 20 soldiers from his own presidio of Tubac. He was to make no settlements, and was to be held personally responsible for the success or failure of the project. He at once set himself to the task of procuring uniforms, gathering horses, mules and supplies. Pack saddles were repaired and old muskets were cleaned. Father Garces took a lively interest in the work, making himself useful wherever his services were most needed.

Organizing a party and providing provisions for such a trek over miles of unknown desert country was no small undertaking. But in spite of innumerable difficulties, the determined captain was prepared to start in the short space of three months—only to be held back by a daring act of his old enemies, the Apaches. From a safe vantage point, the thieving savages watched Anza assemble mounts and cattle. Horse meat was their favorite food. Under cover of night, they suddenly swooped down from the hills upon his headquarters at the presidio and made off with more than 130 horses, including many choice animals especially marked for the California expedition.

When the stock had been replenished, Anza started from Tubac on January 8, 1774, with a party of 32 people: The two Padres, two servants, five muleteers, two Indians, a guide slightly familiar with the desert country, and the 20 soldiers from his presidio.

At first he planned to travel north, but to outwit the Apaches, who hated the very sight of a white man, he changed his route and headed southwest to Altar. Here he added additional mules and horses, bringing the number of pack train animals to 35 mules and 140 horses; 65 head of cattle were taken along to supply meat for the expedition. A Christianized Indian was also picked up by the party at Altar. Some time before, the neophyte, Sebastian Tarabal, had run away from the Mission San Gabriel with his wife and brother, both of whom had died in attempting to cross the desert. The fugitive had arrived at Altar just as Anza was making his last minute preparations to march; since he had just traversed much of the country over which the expedition was to pass, he was taken along as a guide.

By January 26th with plenty of food and ammunition, Anza now felt himself



Reproduced by courtesy of the University of California Press

well equipped for the task ahead. He left Caborca, a small town a few miles southwest of Altar and with assurance, faced the vast, awesome desert, silent and mysterious, without maps or instruments of any kind.

Upon reaching Agua Escondida, in the shadow of the Gila Range, the Commander met a Sonoita Indian who had just come from the Yuma junction, La Junta de los Rios. He had hastened to warn Anza to approach the Yumas with caution, stating that part of the tribe, those living farthest from the junction, were planning to waylay the expedition, kill the entire party, steal the horses and loot the packtrain.

While the Indian's report caused Anza no great anxiety, it did put him on his guard. He realized that the Yumas controlled any trail that might lead through the territory from Sonora to Monterey. They were a powerful tribe, and he well knew that he must exercise the utmost discretion in dealing with them. After conferring with Fathers Garces and Diaz, he decided to send for Palma, the Yuma chieftain, and ask the latter to meet him on the trail. Promising the Indian messenger a generous reward, he forthwith sent him back to the Yuma camp to bring the great Palma.

Meanwhile, the expedition kept up its march. The next day, the messenger returned, but instead of Palma, came a Yuma headman and eight braves. The headman made a speech, which an interpreter repeated to Anza, to the effect that Palma was absent from the village; at the same time, he made it clear to the commander that the great chief and all his people meant the Spaniards no harm. He insisted that they must come at once—promising them a friendly welcome.

At the Yuma camp, Anza and his men were objects of curiosity for the simple-minded natives, many of whom had never seen a white man before. At five in the afternoon, Palma himself appeared and received Anza most hospitably. The commander returned the compliment by distributing among the Indians tobacco, beads and toys. In an impressive ceremony, he placed about the neck of the chief a piece of red ribbon from which hung a likeness of the King of Spain.

The next morning the caravan crossed the Gila. Palma generously offered to have the cargoes carried across on the heads of his tallest and strongest braves. They also carried the venerable Garces across, as the padre could not swim, and would rather trust his Indian friends than a horse. By three o'clock in the afternoon the crossing had been made with entire success.

The next day, February 9th, came the crossing of the Colorado. Here the packs were carried over by the mules instead of on the backs of the Indians. In celebration of the feat of crossing the mighty Colorado, which Anza claimed had never been done before by the arms of the king, the commander ordered the firing of a salute of musketry.

That night, the expedition set up its first camp on California soil. The next day the Spaniards resumed their march traveling a distance of four leagues along the river where it turned south, passing Pilot Knob,

The giant sand dunes of Imperial County blocked the way of Anza and his men in their overland march into California from Mexico in 1774

In 1926, engineers finally conquered the forces of nature, when they constructed the elevated highway, comparable with all other modern highways, over the formidable sand hill area which almost defeated Anza

which Anza named the Cerro de San Pablo.

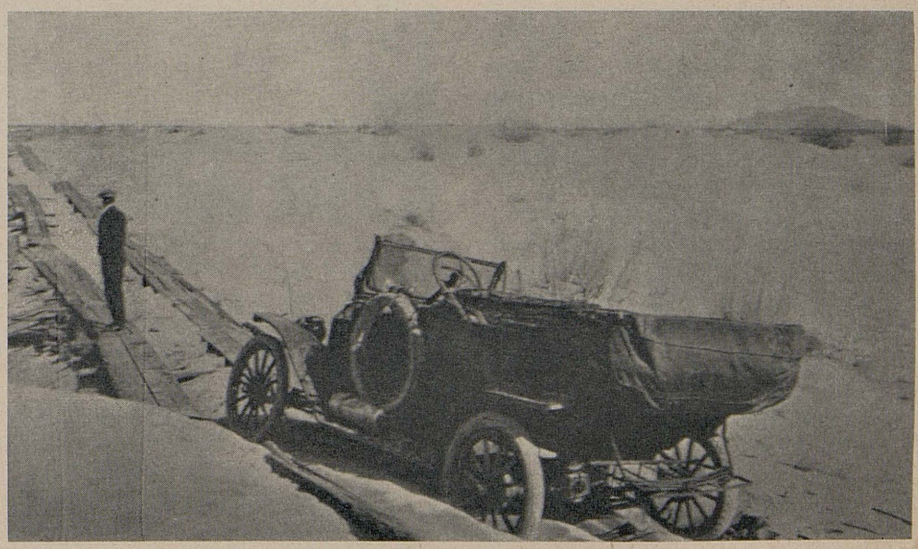
The explorers were now just above the boundary line. They continued in a southwesterly direction until they reached a lake, named by Anza Laguna de Santa Olaya, situated about 12 miles south of the present boundary line and eight miles west of the Colorado.

This was the end of the known land. Beyond lurked hostile Indians; and barring their way into what is now Imperial County lay endless leagues of giant sand dunes, as treacherous as the shifting sands of the Sahara. The desolation and loneliness of the region was enough to try the soul of even the most venturesome.

For days the disheartened pathfinders wandered over the unfriendly desert country, fighting their way through the whirlwinds of choking sand and suffering unbearably from thirst. The animals were sorry to behold. Weak and wobbly, with their bones protruding through their hides, they had become miserably ill from foraging on a particular herb in the absence of grass. It was now 10 days since Anza had left Santa Olaya. By one long, difficult league after another he had pushed his way into the desert, with its brackish pools of water, its blinding alkali wastes and poisonous reptiles. After spirit-killing effort, the overpowering dunes proved utterly impassable; and the exhausted company was forced to crawl back to its Colorado base at Santa Olaya, where the water was fresh and the meadows green.

At the Colorado, Anza came to the decision that the only way he could ever reach his destination was to travel light. He placed in Palma's charge the greater

This is the old plank road across the sand dunes before highway engineers found a solution of the problem of drifting sand

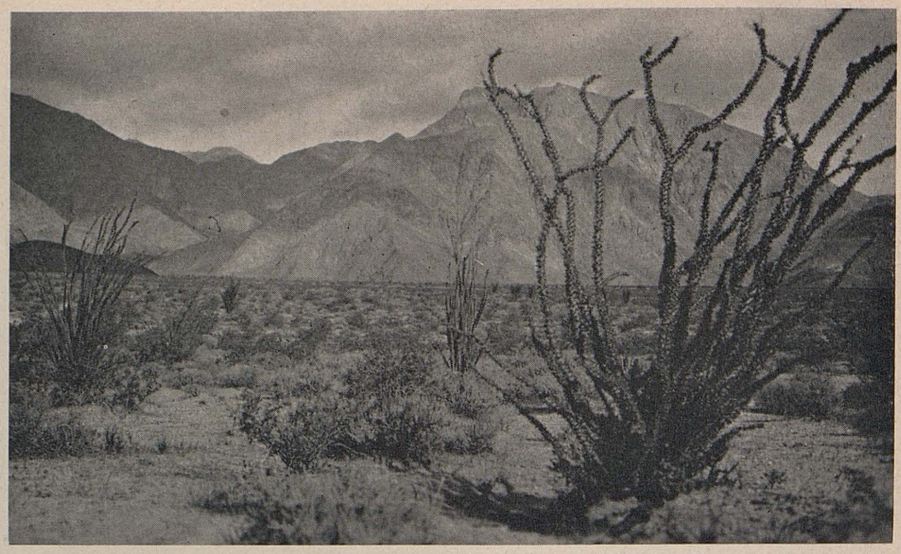


part of the cargoes, with mules enough to transport it to his village. He left also the disabled cattle and saddle horses. To care for his property, he detailed three trustworthy soldiers, three muleteers, one of his own servants and two Pima Indians.

At the oasis, among the friendly Indians, Anza and his weary company rested for several days. They resumed their journey on March 2d, finally reentering California five days later. They set up camp about three or four miles southwest of what is now the Yuha Well (Imperial County), and about two miles north of the present international boundary line.

The next morning they discovered a little group of wells, typical desert pozos dug into the sand, which when opened, "poured forth an abundance of the finest water." The entire Yuha basin (six miles southwest of Dixieland), where the life-giving springs were located, was literally covered with myriads of fish fossils, beds of decaying oyster shells and the most amazing rock concretions of various forms and sizes, resembling petrified fruits, flowers and vegetables. Because of the unusual rock formations, Anza named the wells, Pozas de Santa Rosa de las Lajas (the Wells of Saint Rose of the Flat Rocks).

In their trek over the dry, level plain the Spaniards suffered another grueling day without water. But the Indian Sebastian kept assuring Anza that water was not far distant. Looking north from the wells of Santa Rosa, the neophyte had recognized the gap through which he had emerged from the mountains. At the moment, however, traveling was even more difficult. Between Fish Creek Mountain on the left, and Superstition Mountain on the right, the expedition encountered more sand dunes. To lighten the burden for the horses, the men dismounted and proceeded on foot. After traveling seven long, hard leagues, more than 20 miles, skirting Carrizo Creek the last half of the way, Sebastian's promise came true. In his honor, the commander named the watering place San Sebastian. The spot, which is now known as Harper's Well, is situated at the base of the San Jacinto Mountains (approximately four miles west of Kane Springs, on U. S. Highway 99, between Indio and Brawley).



The Borrego Valley, traversed by Anza's expedition in 1774, is now a part of the Anza Desert State Park, in San Diego and Imperial Counties. The park area is reached via State Sign Route 78. (Courtesy California State Division of Beaches and Parks)

On March 12th and 13th, the expedition camped at San Gregorio, at the entrance to Borrego Valley, where the famished animals gorged themselves on the welcome forage. Leaving San Gregorio on the 14th, Anza swung northwestward, ascended Borrego Valley to its head and entered Coyote Canyon. Having traveled six leagues, he camped next at the refreshing springs of Santa Catharina. (Reeds Springs or Lower Willows.) Jubilantly, Anza recorded it as "a spring or fountain of the finest water, which runs for about two leagues, having willows most of the way. Here was found much grass and other green plants, as well as wild vines and trees, which announce to us an improvement in the country from here forward."

On March 15th, after another long, hard pull, the party reached the summit of the San Jacinto Range, passing through the Royal Pass of San Carlos, the first inland gateway to the coast of California, located near what is now the southern boundary of Riverside County, some 20 miles west of the junction of the present Riverside, Imperial and San Diego Counties.

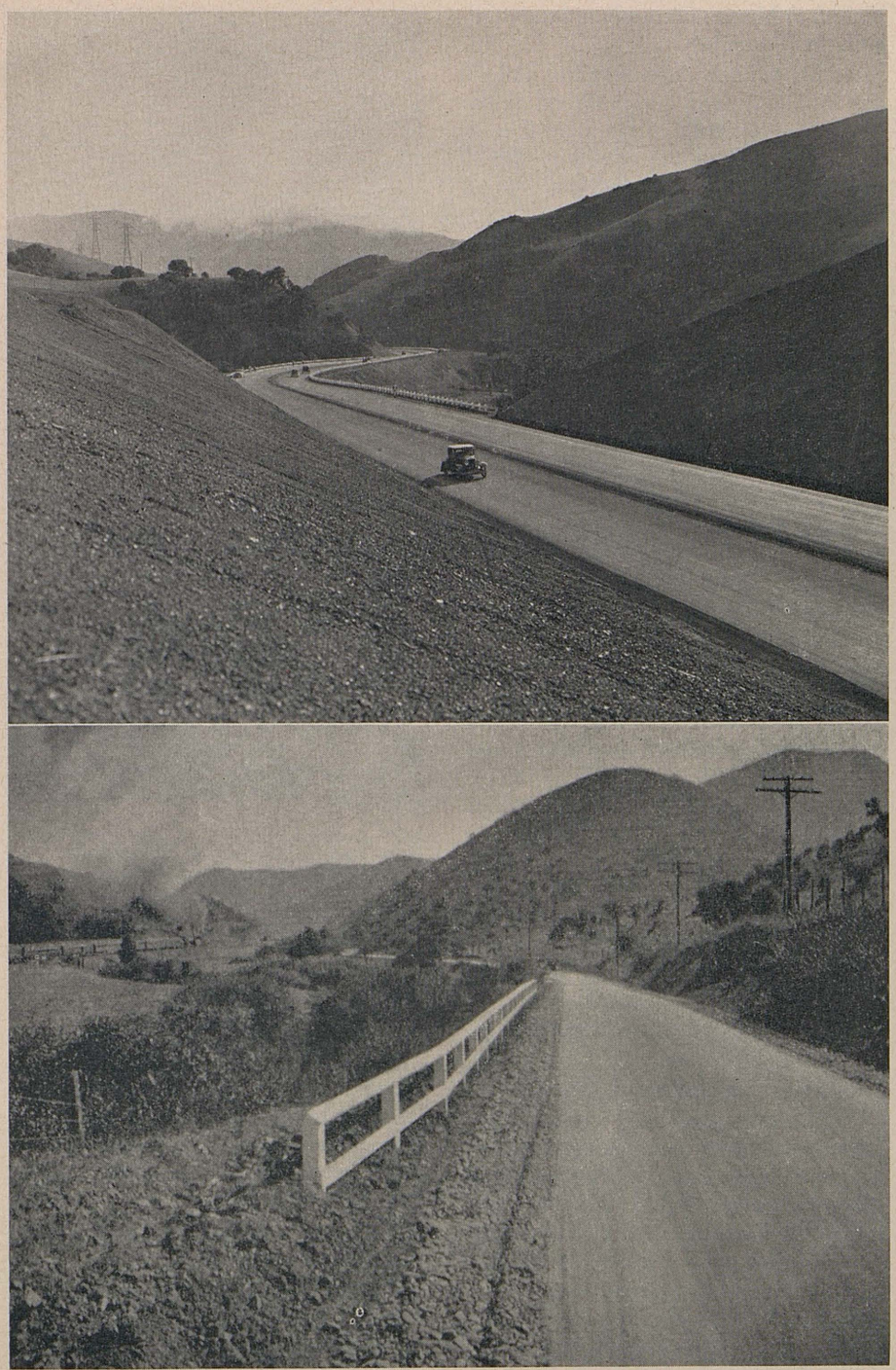
On March 16th, the caravan passed through the Cahuilla Valley to Laguna Principe (now known as Dry Lake). Following the Bautista Canyon, it descended the mountain to what is now the San Jacinto River. About three miles above the present site of San Jacinto, the travel-weary trailbrazers made camp in a shady grove of cottonwoods.

The indomitable captain from Tubac and his loyal band of followers were nearing their goal. On March 19th, they camped at the western end of San Jacinto Lake (now dry). Turning west the next day, they passed the present site of Moreno, on their way through what is now the Allessandro Valley. Undoubtedly, they descended from the ridge by way of the present Sycamore Canyon.

Traversing the present site of Riverside, the wayfarers halted near an Indian village on the banks of the Santa Ana River (about three miles south of Mt. Rubidoux). Here they constructed a bridge of logs across the swiftly-flowing river and entered the last lap of their long, wearisome trek.

On the 21st, they entered what is now San Bernardino County, passing close to the present site of the City of Ontario. On March 24th, at sundown, they arrived at Mission San Gabriel (at its original location, about five miles south of the present site).

At the Franciscan settlement the wildest excitement prevailed. "Even though the friars and soldiers saw us," Anza states in his diary, "they could hardly believe that people could have come from Sonora; and kept repeatedly asking me if it were true. Tears



The new (upper) and old (lower) Cuesta Pass highway. It was through Cuesta Pass that Anza found his way in 1774

sprang to their eyes caused by the joy and pleasure at seeing an expedition accomplished, and at knowing how close at hand Sonora was and how easy the transit from it."

When the burst of sentimentality and play of emotions began to subside, everyone was faced with the stark realization that the mission's supplies were dangerously low, due to the failure of the supply ship to arrive. Since Anza had been forced to leave most of his supplies in care of Palma at the Colorado base, starvation faced the settlement. The generous Father Paterna, superior of the mission, willingly offered Anza a portion of his meager store, but even at that, there was not enough to support the expedition on its journey to Monterey.

But just when things seemed their worst, news came that the *Nueva Galicia* had arrived at San Diego, bringing supplies and likewise Father Serra, en route home from Mexico. Immediately Anza and Father Paterna organized a pack train to go to San Diego for provisions. Fresh mounts were also to be brought back, as Anza's animals were in a pitiful condition.

At first it had been decided that Anza and Father Garces should accompany the pack train to San Diego; but as the rivers were rising at an alarming rate, they deemed it best to remain; instead, they sent four soldiers with 15 pack mules to bring back the supplies.

Two days later, the rivers subsided, and Father Garces set out belatedly behind the train. At San Diego, the priest-explorer had his first meeting with Father Serra, who was preparing to travel to Monterey by land.

By April 1st, the pack train was ready to start back to San Gabriel, followed five days later by Serra and Garces. Upon his return to San Gabriel on April 11th, several days after the arrival of the pack train, Father Garces was sadly disappointed to find that Anza had already left for Monterey.

The commander had completely changed his plans when he learned that no mounts could be spared from San Diego. Also, the provisions were woefully inadequate, with much of the food unfit to eat. He decided that the only solution was for some of the men to go back to the Colorado River. He took with him to Monterey four of his own men and two from San Gabriel to show him the way, leaving word that the rest, accompanied by Fathers Diaz and Garces, should return to the Colorado to wait for him there.

Anza's trip to Monterey was made with little difficulty. The route was well charted by those who had passed over it in the five preceding years: Portola's expedition had traversed it twice; Fages had traveled it numerous times; and Serra had already been over it once.

Leaving San Gabriel on April 10th, the commander followed the Rio de la

Porciúncula (Los Angeles River) into the San Fernando Valley, turning west around the point of the mountain, west of the present site of Glendale. On the night of the 11th, he camped near the present site of San Buenaventura, on the river by that name, in what is now Ventura County. The 13th found him at the mouth of the Santa Inez River, in what is now Santa Barbara County. On the 15th, he made the long ride from the Santa Inez River to Mission San Luis Obispo, a distance of nearly 50 miles.

From San Luis Obispo, Anza traveled inland, crossing the Santa Lucia Range through Cuesta Pass. Descending into the Santa Margarita Valley, he turned northwest, passing over the present site of Paso Robles (Pass of the Oaks) to San Marcos Creek. From there he traveled almost due north to the Nacimiento River and on to the first crossing of the San Antonio River, to about King Well, in what is now Monterey County.

Within three days from the time he left San Luis Obispo, the hard-riding captain was in Monterey, having completed a journey of four hundred miles in nine days. At Monterey he was hailed as the hero of the hour. Comandante Fages and Father Palou were on hand to welcome him. Special mass was celebrated in his honor. * * *

But Anza was a soldier, a man of action, little given to pomp or social life. After three days' stay, he was again in the saddle on his way back to Mexico. At San Gabriel he remained only one day, crossing the inhospitable desert and camping at San Sebastian on the night of May 7th. From that point, he made a short cut directly across the desert to Yuma, arriving there May 10th.

From Yuma, Anza chose a different route to return home. Striking north, he followed up the Gila River where he found the Indians peacefully cultivating their fields. The closer he came to Tubac, the faster he rode, arriving there May 26th, a day ahead of the rest of his party.

The commander was given a royal welcome; but while he was being showered with honors, he also received the disappointment of his life. At the presidio he found Antonio Bonilla, adjutant inspector, who needlessly detained the impatient pathfinder for several months. When he was finally released, he hurried on to Mexico City, where he arrived early in November.

At the capital, Anza was the idol of the city. He had accomplished what others had dreamed of for more than a century. With all the ceremony due a royal personage, he was received by the government officials, and was elevated by the grateful viceroy to the rank of Lieutenant-Colonel of Cavalry.

But with all the praise and honors that were heaped upon him, the former Captain of Tubac modestly rode back to his little presidio, content that he had faithfully served his country and his king.

The achievement of Don Bautista de Anza, in opening an overland road into California, stands out as one of the most dynamic steps in the development of the great empire of the West. His desert trail across what is now Imperial Valley was later followed by a long line of traders, trappers, argonauts and homesteaders. At various times it was known as the Sonora Road, the Colorado Road, the Emigrant Trail and the Butterfield Stage Route.

Today, a major portion of Anza's original route is traversed by modern U. S. and state highways. From Yuma to Dixieland in Imperial County, a portion of his trail is traversed by U. S. Highway 80. Engineers have now subjugated the famous sand hills of Imperial County, which presented so formidable a barrier to Anza's expedition.

In 1916, the first attempt was made to bridge the area with pine planks. Eight years later another experiment was made when redwood timbers were used. In 1926, after engineers had made a careful study of the movement of the dunes over a period of several years, the present road was constructed through the dune area, comparable with all other modern highways. By elevating the new road to the height of the tops of the surrounding dunes, with steep embankments to prevent the sand from drifting over the road, man finally conquered the forces of nature.

In San Diego and Imperial Counties, Anza's trail, through what is now Anza Desert State Park, runs close to the Julian-Kane Springs Highway, State Sign Route 78.

Juan Bautista de Anza, founder of San Francisco. From a painting by Herter. Courtesy Los Angeles Public Library

Just south of Hemet Valley, in Riverside County, the historic route is paralleled by State Sign Route 79. Near Riverside, it is traversed by U. S. 60.

In San Bernardino County, following the present route of U. S. 60, Anza's trail crossed what is now Euclid Avenue, that long, tree-lined drive, extending north and south through the modern towns of Ontario and Upland.

From Mission San Gabriel in what is now Los Angeles County, to Monterey, the illustrious trailblazer triumphantly completed his stupendous project of opening an overland route into California from Sonora to Monterey, by following the Mission Trail, El Camino Real, which in turn laid the pattern for the present Coast Highway, U. S. 101.

As sources of information, the author acknowledges:

Herbert Eugene Bolton: Anza's California Expeditions (in five volumes). University of California Press, Berkeley, California, 1930.

Mildred Brooke Hoover and H. E. and E. G. Rensch: Historic Spots in California. Stanford University Press, Stanford, California, 1948.

—A. F. S.

Chapter V

The Founders of San Francisco

PART I

In November, 1774, the Spanish Capital at Mexico City was seething with excitement over the news that Captain Don Juan Bautista de Anza had opened an overland route into California. A thorough study of the trailmaker's diary and report by government officials strengthened the viceroy's decision to commission Anza to lead a party of colonists overland, to form the nucleus of a settlement to be established on the Bay of San Francisco.

Previously, in May of 1774, Viceroy Bucareli had ordered further surveys of the bay area before attempting the founding of a settlement in that region. His orders reached Monterey in July of that year. On November 23d, Captain Rivera y Moncada, who was to replace Fages as Comandante of the Presidios, accompanied by Father Palou and 16 soldiers, left Monterey for the north. They traveled the same route taken by Fages in 1772, passing what is now Gilroy, and on through the Santa Clara Valley. On their way through what is now San Mateo County, they traveled northwestward along the bayshore; and on account of swampy places, ascended the hills and followed Portola's route. On November 30th, the festival of St. Andrew, they came to the peaceful little valley, which they named San Andreas in honor of the saint (a name which it still retains).

Proceeding almost due north, passing by Lake Merced, and crossing the sand dunes, they arrived at Point Lobos on December 4th. Here on the summit of the hill (close to where the Cliff House now stands), looking down upon the jagged points of the Seal Rocks on one side, and upon the deep rocky cliffs guarding the entrance to the bay on the other, Father Palou erected a cross. Then, due to the almost incessant rains, the expedition made no further surveys, but returned to Monterey.

Heartened by the success of Anza's expedition, in the latter part of 1774, Bucareli ordered the establishment of a presidio at San Francisco and the founding of two missions, one at San Francisco and another at Santa Clara. The ship that brought the joyful news to Father Serra at Monterey was none other than the *San Carlos,* the historic vessel that had carried the first seaborne division of pioneers to San Diego in 1769.

Reaching Monterey on June 27, 1775, the *San Carlos* was under the command of Juan de Ayala, a lieutenant of the Royal Navy. The lieutenant had been instructed by Bucareli that after delivering his dispatches and unloading part of his cargo he was to proceed to and make a survey of what Vizcaino had called the "Port of San Francisco," believed to lie under Point Reyes. He was further to ascertain particularly whether the canal or arm of the sea, that had been discovered by Portola's expedition in 1769, and again surveyed by Fages and Crespi in 1772, communicated directly with the port in question.

Ayala set sail from Monterey on July 27, 1775, and cautiously crept up the coast. In nine days he arrived off the heads. For exploring operations he was equipped with a sturdy launch, which he had ordered his carpenters to construct from a large redwood tree before leaving Monterey.

Just off the heads, Ayala sent the launch ahead to explore the narrow passageway, now famous the world over as the Golden Gate. Seeing that his men had no difficulty in entering the inlet, Ayala followed on the *San Carlos*. Although darkness came on, he continued his course, since the water was deep and the way clear. On the memorable night of August 5, 1775, the *San Carlos* sailed through the pillared gateway, the first ship, as far as is known, ever to enter the Bay of San Francisco.

For nearly 40 days, Ayala explored the great landlocked bay. In his launch, he surveyed almost the entire coastline, going up as far as the junction of the Sacramento and the San Joaquin Rivers. Besides proving that the bay had but one inlet, he completely disproved the belief that it was connected by water with Drake's Bay. In his report to Viceroy Bucareli, Ayala asserted that the new port, which was beginning to be known as the Port of San Francisco, was one of the finest in the possession of Spain.

Meanwhile in distant Mexico, preparations were under way for the organization of Anza's colonial expedition. In organizing and managing the second expedition, the Lieutenant-Colonel was given full power to act. He was privileged to choose his own leaders and soldiers, as well as the number and caliber of the people who would make up the expedition. Intrusted to his judgment, was the kind and amount of provisions and supplies that would be needed on the trip. In short, he was to be personally responsible for the entire colony, until it reached its destination.

As the best material for colonists, Anza selected people from the districts of Culiacan, Sinaloa and Fuerte, in the province of Sonora. "Most of these inhabitants," the Colonel told Bucareli, "I have seen submerged in the direst poverty and misery, and so I have no doubt they would most willingly embrace the advantage which Your Excellency may deign to afford them."

Much thought was given to the method of payment, whether the recruits were to be paid in cash or in commodities. Anza favored the latter method, as he well knew the weakness of these people for prodigality and gambling.

Since most of the soldiers were taking their families with them, and would therefore be weighed down with responsibility, Anza requested that he be allowed to take 10 of the soldiers from

In 1775-76, Anza led the first settlers overland from Mexico to California. The party numbered some two hundred and forty persons, most of whom were women and children. From the drawing by Walter Francis, courtesy Bancroft Library

his own presidio of Tubac, who had accompanied him on his first expedition. Then there must be a sufficient number of good mounts, for between Culiacan and San Francisco Bay lay a distance of more than 1,500 miles.

There must also be presents, with which to win the favor of the Indians along the way: Tobacco and a quantity of brilliantly-colored glass beads. Something extra special must be taken along for Palma—a suit, perhaps, with jacket and buckskin breeches; a blue cloth cloak, trimmed in gold; and a cap with cockade, like that of the dragoons.

All through the spring and summer of 1775, Anza and Bucareli worked ceaselessly. Tailors, gunsmiths and saddlers were prodded for rush orders. Then from Mexico City to distant Culiacan the equipment was hurried by pack mule.

Anza had hoped to be at Tubac in time to make the final start by the end of September. But before he could get there with his colony, the Apaches repeated their villainous act of the year before by swooping down on the presidio and running off the entire herd of horses.

Thus, the commander had suffered an almost irreparable loss, since horses and mules were comparatively scarce in that district. To make matters worse, a stampede at Horcasitas, capital of Sonora, where the caravan was assembling, caused the loss of additional horses and mules.

With the greatest effort, Anza gathered as many new animals as possible, many of which were of inferior stock. On the morning of starting from Horcasitas, September 29th, mass was celebrated with all the solemnity possible by Father Pedro Font, Chaplain for the expedition. Since the caravan was such a long one, it had not been possible to start before afternoon. At half past four, the bugle sounded and amid parting tears the march began.

Officers of the San Francisco Colony were Don Jose Joaquin Moraga, lieutenant, and Pablo Grijalva, sergeant. In advance of the train rode several soldiers, to mark the best places for the caravan to follow. Anza, leading his party, was followed by Sergeant Grijalva and Father Font, while Lieutenant Moraga followed behind the train to pick up lost articles and to prevent an Indian attack from the rear. Following the leaders came a company of soldiers, equipped with shields, lances and carbines, wearing sleeveless coats made of several thicknesses of deer skin, to ward off the poisoned arrows of the Indians. Following, came their families and those of the civilian settlers, riding horses and mules. In the rear rode the servants, Indian guides and the muleteers with their heavily-ladened pack train, consisting of around 140 mules. It was a motley procession of some 177 souls: Women approaching motherhood; others with babes-in-arms; children of various ages, all part of the historic train that was to people His Majesty's dominions on the distant Bay of San Francisco.

The first major stage of the long journey was from Horcasitas to Anza's presidio of Tubac, a distance of about 200 miles. It was a trip fraught with difficulty; one which would have disheartened a less courageous soul than the heroic Anza. Every day it took several hours to break camp and load up. The mules were unbroken and many of the muleteers were inexperienced. The unseasoned animals, unaccustomed to the heavy packs, soon became exhausted; many of them ran away. Packs were continually falling off and baggage was lost.

It was the fifteenth of October, 1775, that the expedition reached Tubac, where it was held up for several days while Sergeant Grijalva brought his family from the presidio of Terrenate. Father Garces and Father Tomas Eixarch joined the party, to go as far as the Colorado River, where they were to work among the Yumas at the Gila-Colorado junction.

With everything in readiness by October 23d, the mammoth train, now numbering 240 people, began its 100-mile journey to the Gila River. The first night in camp, tragedy struck. At La Canoa, on the River of Tubac, Señora Feliz, the wife of a soldier, died in childbirth, leaving a bouncing baby boy and seven other children to be cared for by the other women in the party.

Day by day, the colonists plodded along, eating the scanty diet, thirsting between the dribbling desert pozos, which were sometimes miles apart. By late November, they reached the Gila River where Palma came to meet them. On the 28th, the caravan moved down the Gila, made the crossing and set up camp near the junction of the two streams. Then came the commander's first major problem: The crossing of the mighty Colorado. On his first expedition, with hardy soldiers, all seasoned frontiersmen, it had been a comparatively easy matter. But with 30 women and 136 children, so much baggage and stock, it was a far different story!

Matters were further complicated when Anza learned that the ford used the year before was no longer passable. He next considered crossing the river on rafts; but the Indians objected, complaining that the water was too cold for the swimmers who would have to guide the rafts. Moreover, they contended that it would take a day's labor to get each raft load across, necessitating a delay of several days. So the ingenious Colonel mounted his horse and with one of his most trusted soldiers rode out to look for a favorable ford. All morning the pair struggled through brush and morass, until they finally found a place where the river divided into three channels, forming two islands. Upon returning to camp, Anza sent men out with axes to clear a trail to the ford.

The next morning, November 30th, camp was shifted a quarter of a mile upstream to the ford, so that packs could be moved across in half loads. The women and children were taken across on the backs of the largest and tallest horses. As before, the good Father Garces was carried across feet first, on the trusty shoulders of the Yumas. It took three hours to make the crossing, but by 1 o'clock, people, pack animals, stock herd and most of the baggage were safely on the other side of the broad stream.

On December 3d, camp was made at Palma's village, where the native chieftain gleefully modeled the new outfit sent him by the appreciative viceroy. The next morning the party started out again, swinging west along the brush-covered bottom lands, making camp that night about a league beyond Cerro de San Pablo (Pilot Knob).

Anza was cheered by the news brought back by his scouts that they had found the water holes the same as the year before, and that they had found a way through the sand dunes, where the first expedition had been turned back. But there was much to disturb the com-

mander's peace of mind nevertheless. Mesquite, tornillo and cachanilla delayed pack mules and cattle; some of the animals were lost. It was now growing bitterly cold, and with each passing day the sick list grew longer. The animals were falling with exhaustion; on the night of the 5th, a mule and a horse died.

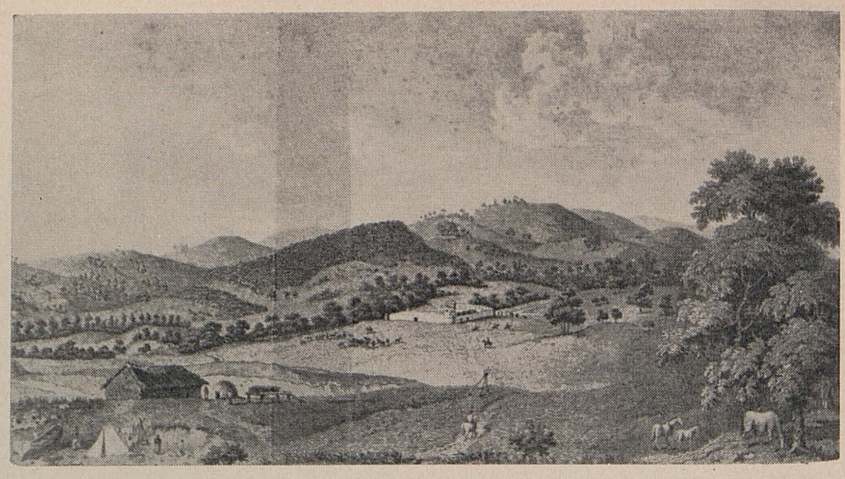
But weary spirits were soon revived when the caravan reached Santa Olaya on December 6th. As before, the spot was a virtual land of plenty for both man and beast. Anza recorded that the friendly Indians brought all sorts of food: Vegetables, and "more than 2,000 watermelons of enormous size," held over from the fall crop by being buried in the sand.

For three days, while the people and the animals rested and recuperated, the commander calculated and planned for the journey ahead. He came to the decision that in order to conquer the desert, the expedition would have to be divided into three divisions, with each starting a day apart. It was a dangerous plan, but the only way, if the scanty watering places were to hold out. He and Father Font would accompany the first division; Sergeant Grijalva the second, and Lieutenant Moraga, the third. The vaqueros and the rest of the soldiers were to leave on the 10th, and were instructed to go directly from El Carrizal to San Sebastian, to relieve still further, the drain on the water holes. For their own use, the men would carry water in skin bags, but the cattle would have to go without.

On the 9th, Anza's division started out with the Wells of Santa Rosa as its destination. Before leaving, every person filled his water bag, and as an extra precaution, was required to carry a supply of maize and a bundle of grass for the animals.

On the way, the colonists, accustomed to the warm climate of the Mexican interior, suffered unbearably from the cold, bitter winds and the violent snowstorm that held the entire plain, from the Colorado River to the California mountains, in its icy grip. But in spite of hardships, they managed to travel a distance of seven leagues over the old trail to El Carrizal.

The second day, they suffered even worse. As far as Los Augustias, the route still followed Anza's old trail; but from that point westward, it was virtually unknown, save for a brief exploration by the scouts. With each step of the way, the sand grew deeper and more difficult



The Presidio of Monterey, much as it looked when Anza led the San Francisco colonists there in 1776, on their way north. Cut courtesy California Highway Patrolman Magazine

for the tired horses. After stumbling along for seven long, hard leagues, the half-frozen wayfarers and their gaunt, weak animals halted at a dry barranca (undoubtedly the channel of the New River). There was no water, nor pasture for the animals; but fortunately, Anza's forethought had provided the poor beasts with a bit of sustenance at least.

It was a pitiful group that made camp that night! While tents were being set up, mothers numb with cold, gathered their shivering, hungry broods about them, and huddled before the feeble fire of dried mesquite twigs. All the while, the tender-hearted commander and Father Font, himself ill, bent every human effort to alleviate the misery of their wretched followers.

December 11th was "blue Monday" indeed for the poor colonists; it was the most grueling day of the whole march thus far. The anxious commander was up at 3 o'clock, feeding grain to the animals. Packs were stripped of all extra clothing to bundle up the women and children. Men were sent ahead to open the wells at Santa Rosa. Then for 11 long tedious hours the division laboriously threaded its way through the monotonous dunes. There were times when many were forced to dismount and literally push their lagging animals through the deep sand. But by 6 o'clock, well after nightfall, they reached Santa Rosa, having traveled a distance of 35 weary miles.

To Anza's great disappointment, the wells were running slowly. He and his men at once set out to deepen them, working from 6 that evening until 10 o'clock the next day, before all the animals had been watered. Man and beast alike were suffering from fatigue, but time was precious. They must push on immediately if enough water and forage was to be saved for the two divisions just behind them.

On the 13th, the first division reached San Sebastian over the original trail past Superstition Mountain. Here Anza decided to await the rest of the party, as there was water and grass, carrizo and mesquite for the cattle. There was also brush for firewood, an important item, since the weather was bleak and bitterly cold. Roundabout, the Sierras were white with snow. It was a winter such as the oldest living Indians had never experienced before.

On the 14th, Anza was cheered by the arrival of the cattle herd. The next day, Grijalva's division arrived, with most of the people "half dead from the cold." Because of the snow, Moraga's division was forced to spend three days on the road between El Carrizal and Santa Rosa, arriving on the 17th, with many of its members severely frozen. Although numerous horses and mules fell by the wayside, "by the grace of God," Father Font recorded, "the people escaped with their lives."

From San Sebastian, the expedition followed the same trail Anza had charted the year before. Christmas Eve, December 24th, found the commander and his people at the upper end of rain-swept Coyote Canyon (at Upper Willows, or

Fig Tree Spring). Here, appropriately for the season of the Nativity, a baby boy, Salvador Ignacio, was born shortly before midnight to the wife of one of the soldiers.

Resuming its journey on the 26th, the train, now considerably shortened by the loss of so many animals, continued on over the old route with one variation. Having passed through the Paso Real de San Carlos, the summit of the sierra, the party reached Lake Antonio Bucareli (Lake San Jacinto) on December 29th. Anza now traveled past the present site of Lakeview, through Bernasconi Pass and across the present Allessandro Valley, by way of what is now March Field. He halted at his old camp on the Santa Ana River, where the colonists watched the old year out.

Once again, Anza had conquered the desert! He had surmounted the Sierra, and was now within three days' march of Mission San Gabriel, where scouts had already been sent to announce the coming of the caravan.

PART II

Since Anza's former visit, the Mission had been moved about a league north of its original site, where it would be safe from inundation by rampaging flood waters. It was anything but an imposing establishment, built of logs and tule. But shortly before noon, on the morning of January 4, 1776, it was a welcome sight to the eyes of the weary wayfarers; the first Spanish settlement they had seen since leaving San Xavier, 600 miles away in distant Mexico. They were warmly received by the kindly padres, who graciously offered the colonists the humble hospitality of the mission.

Waiting for Anza at San Gabriel was Captain Don Fernando Rivera y Moncada, Commandante of the Presidios of California, who had replaced Don Pedro Fages. At the Santa Ana River, Anza had received word of the Indian uprising at San Diego Mission. Rivera now confirmed the report, stating that the mission had been fired, and that a priest, the mission carpenter and blacksmith had been killed. He felt that since he had only 10 soldiers with him, all that could be spared from the presidios, Anza should accompany him to San Diego, to help him put down the uprising. Besides, he argued that the roads were so bad it would be impossible for Anza to get his colonists to Monterey immediately.

Obligingly, Anza and Father Font, with 17 soldiers left with Rivera to round up the Indian murderers. Traveling south, they followed precisely the route opened by Portola six years before, which had now became a well-traveled trail, known as El Camino Real (The King's Highway).

It was not long before Anza learned that the real purpose of Rivera's plan was to delay the founding of San Francisco. By the middle of February, the three men were still at San Diego, wrangling over the question of proceeding north. Undoubtedly prompted by jealousy, the Comandante insisted that the port of San Francisco had been greatly overrated: "There is nothing there to warrant a settlement of any kind," he flatly asserted, and even went so far as to propose that Anza and Father Font turn the expedition over to him and return to Tubac; whereupon the grim-visaged Padre replied stubbornly: "No, Señor, we must comply with our instructions and do our duty—which is to go to Monterey, and from there, to proceed to explore the Port of San Francisco." Anza, now well aware of Rivera's motives, was also adamant.

Momentarily, however, the commander's difficulties with Rivera were overshadowed by a disturbing message from Moraga, who had been left in charge of the expedition at San Gabriel. Provisions at the mission were nearly exhausted, forcing Father Paterna to put the colonists on half rations. Discontent was rife, Moraga stated, and the colonists were complaining bitterly of the long delay.

Anza was gravely concerned, and hurriedly made arrangements to send a pack train to San Gabriel with supplies. Since Rivera was now openly showing himself

The Presidial Pueblo of San Francisco, with the Fort and the "Boca del Puerto," (Golden Gate) 1830

adverse to the establishment of a presidio at San Francisco, refusing to accompany Anza and Font north to select a suitable site, the pair left for San Gabriel without him.

At the mission there was more bad news. The night before five men had deserted. A soldier of the mission guard, a servant and three muleteers rifled the packs and made off with a variety of goods, including two muskets, a saddle and 30 or more horses and mules, some belonging to the mission, and the rest to the individual members of Anza's expedition. A few hours before the arrival of Anza and Font, Lieutenant Moraga had set out after the culprits. It resulted in a long, hard chase of more than 200 miles, but the horses were badly needed; moreover, discipline was at stake.

Meanwhile at San Gabriel, the commander was growing restless and the people were grumbling over the delay. Believing that action was the best remedy for all concerned, Father Font insisted that the caravan start at once for Monterey. Accordingly, on February 21st, Anza set out, with all but 12 families, which he left at San Gabriel to follow later, accompanied by Moraga.

The Mission Trail was now well known to the commander, since he had traveled it twice the year before. The first night, camp was made at the Portezuelo, near the present site of Glendale. The next night, they reached Agua Escondida, in the mountains west of Calabasas. The third day's march was a distance of nearly 40 miles, to the Santa Clara River, east of the present site of Ventura. The Santa Barbara Channel came next, and Point Concepcion, where Anza turned north, following his old trail across the Santa Rosa River and on to Mission San Luis Obispo, which the party reached after an 11 days' ride from San Gabriel.

On March 4th, the journey continued over the steep Cuesta and down the Santa Margarita River, along the Salinas, by the Paso de los Robles (Pass of the Oaks), across the Nacimiento River and the oak-lined San Antonio River, to Mission San Antonio de Padua. Here Anza was surprised by the arrival of the dashing Moraga, who had left the 12 families in charge of Sergeant Grijalva, to follow later.

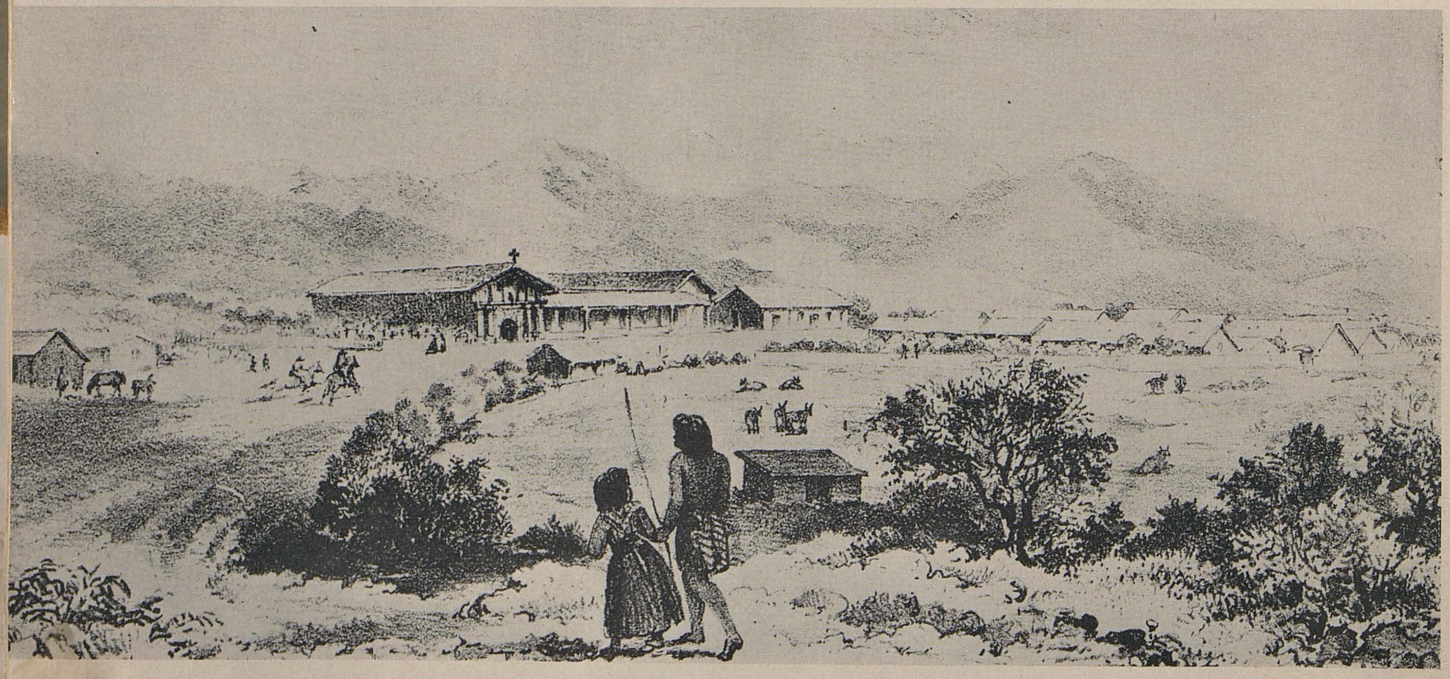
From San Antonio, the trail led over the ridge and down the present Kent Canyon, traversing Portola's trail to the Salinas River. Passing down that river, the colonists passed the present site of Spreckels, reaching the Presidio of Monterey over a route which is now traversed by the modern highway, State Route 117.

The last lap of the journey on Sunday, March 10th, was made in the pouring rain. Those coming from Culiacan had traveled nearly 1,500 miles. There was cause for rejoicing, even if everyone did arrive at Monterey wet to the skin. The volleys of artillery, the firing of muskets and the special mass, presided over by five padres, was only the beginning of a gala celebration that was to last for several days.

While the colonists danced the fandango, Anza was engaged in more serious business. Father Palou and two other padres had been waiting two years at Mission Carmelo to take over their duties at the proposed new mission on the Bay of San Francisco. Palou had made a survey of the area with Rivera in 1774 and at the time was much impressed. His influence and the impatience of the colonists to become settled in their permanent home had much to do with Anza's decision to leave for the north immediately.

On the 13th of March, while writing Rivera a letter informing the latter of his intentions, the commander suffered a spell of illness. It was March 22d before

Mission of Dolores of San Francisco, A. D. 1830. The sites for both the presidio and mission were mapped by Anza in his survey of the San Francisco Bay area in 1776. Photos on this page courtesy California State Library



he was able to ride again. On the 23d, he set out with a party of 20 men: Father Font, Lieutenant Moraga, and eight soldiers from Tubac; two others who had been to the bay with Fages and Rivera went along as guides. Serra had declined to assign a friar to the expedition, fearing that by so doing, he might incur the wrath of Rivera and further hinder the establishment of the new mission.

With minor variations, the expedition followed close to the former trail blazed by Fages, Rivera and Palou. It crossed the Salinas Valley, the Gabilan Range, the San Benito Valley and the Pajaro River. Skirting the west side of the Gilroy Valley, to the pass at Coyote, Anza swung westward. He camped on San Francisco Creek (now called San Francisquito), near the lone, tall redwood tree (Palo Alto), first seen by Portola's expedition. He passed the present sites of San Mateo, Millbrae, San Bruno, Colma and Lake Merced. On March 27th, the expedition camped "on the banks of a fine lake or spring of very fine water near the mouth of the port of San Francisco."

From this campsite, on what is now the southern edge of the Presidio Reservation, Anza and Font directed the explorations that were to establish the positive positions of the Presidio and Mission of San Francisco. With each passing day, as the work of exploration continued, Anza became more enthusiastic about the future possibilities of the area. Padre Font was equally impressed. "The Port of San Francisco," he recorded, "is a marvel of nature and might well be called the harbor of harbors."

At Point Lobos, they found the remnants of the cross erected by Father Palou. Font made some sketches of Point Reyes, the Farallones and the Boca del Puerto (the Golden Gate). To the north they explored what Font called, "the white cliff which forms the end of the mouth of the port and where begins the great estuary." Here Anza set up a large cross, while Father Font ascended the green table land near by. In his diary, he made the following entry: "This beautiful country has all the conveniences desired, by land as well as by sea, with a harbor so remarkable and so spacious that in it may be established shipyards, docks and anything that may be wished. This mesa," he added, "the commander designated as the site for the new settlement and fort which were to be established on this harbor."

With further explorations, on "the Friday of Sorrows," a beautiful arroyo, with manzanita-lined banks, was selected as the site for the new mission, San Francisco de Asis.

Yet to be explored, was the "Rio de San Francisco," as the Straits of Carquinez were then called. Traveling partly over Fages' old trail as far as what is now Antioch, Anza and Font came to the conclusion that "what was called a river is not a river, but a great sea of fresh water without current, extending through that plain."

His task accomplished, Anza now decided to return to Monterey. On the return trip, the commander was a pathfinder once more. Attempting to take a short cut, he and his men spent three long difficult days making their way through the rugged mountainous country, climbing to the top of Crane Ridge near Eagle Mountain, passing towering Mount Hamilton, and eventually dropping down into Gilroy Valley.

On April 8th, they were back at Monterey. Anza had now fully resolved to return to Sonora within a few days, intrusting the actual founding of the presidio to Lieutenant Moraga.

Thus, while the Founding Fathers were laying the foundation for American independence on the Atlantic Coast, history was also being written in primitive California. On that memorable morning of June 17, 1776, 191 colonists made their way over the King's Highway from Monterey to the "white cliff" overlooking the Bay of San Francisco, to establish the Royal Presidio, by order of His Excellency, the Viceroy. Among the settlers were families destined to play an important part in the future history of California: Castro, Valencia, Bernal, Alviso, Pacheco, Sanchez, Peralta and others, whose names would one day be given to great ranchos, and later to towns, a mountain pass, and the thoroughfares of the great cities that were to rise from the shores of San Francisco Bay.

As sources of information, the author acknowledges:

Theodore H. Hittell: History of California, Vol. I., San Francisco, 1885.

Herbert Eugene Bolton: Anza's California Expeditions, in five volumes. University of California Press, Berkeley, California, 1930.

Charles Caldwell Dobie: San Francisco, a Pageant. D. Appleton-Century Company, New York, 1933.

Mildred Brooke Hoover and H. E. and E. G. Rensch: Historic Spots in California. Stanford University Press, Stanford, California, 1948.

—A. F. S.

Chapter VI

El Camino Real... Yesterday and Today

WHILE STAGECOACHES rumbled over Boston's crooked streets, and white-covered Conestoga Wagons wound their way through the Pennsylvania-Dutch countryside, California listlessly existed under a civilization little removed from that of the stone age.

On the Pacific slope the average state of aboriginal culture was lowest; Indian tribes were extremely backward. They neither tilled the soil, nor possessed domestic animals. Roads were unknown, for there existed no wheeled vehicle of any kind—all transportation being done on foot, with burdens borne on human backs.

In 1769, came the California Renaissance, when Governor Don Gaspar de Portola and Father Junipero Serra reached San Diego to establish a mission settlement. For the first time in history, the horse, the mule and the ox were to stamp their indelible hoof-marks upon the soil of Alta California, marking the beginning of a new era in Western transportation.

It was the intrepid Portola himself, in his overland march in search of the Bay of Monterey, who blazed a trail through 500 miles of trackless wilderness, from San Diego to San Francisco, which with few deviations, was to become the pathway of the Padres.

During his 15 years in California, Father Serra had established nine missions: San Diego de Alcala; San Carlos Borromeo de Carmelo; San Antonio de Padua; San Gabriel Archangel; San Luis Obispo de Tolosa; San Francisco de Asis; San Juan Capistrano; Santa Clara de Asis and San Buenaventura.

With the founding of Mission Santa Inez on September 17, 1804, the nineteenth link had been forged in the mission chain. The gaps between the older establishments had now been filled in, and the spiritual occupation of the country between the Coast Range and the ocean had been accomplished. From San Diego to the Bay of San Francisco, the rough, narrow Mission Trail, known as El Camino Real, "The King's Highway," zig-zagged from the coastline inland and back again—wherever fertile valleys and abundant water prompted the Padres to select a new mission site.

No longer was the traveler forced to sleep by the roadside at night. Governors, comandantes, missionaries, soldiers and citizens could now travel conveniently from one end of El Camino Real to the other—a distance of 700 miles, enjoying the hospitality of a mission every night; for rarely did the distance between stations exceed 30 miles. At each mission station, domestic animals soon became abundant; fresh mounts could be procured without trouble or expense.

In the real sense of the word, however, "The King's Highway" could scarcely be called a road. It was a mere trail, running along the ocean shore in some places, winding through mountain passes in others, descending into canyons and traversing sun-baked valleys. For nearly all but the devout Padres, horseback was the general means of travel. Notwithstanding the fact that the animals were unshod, they were swift and hardy, making for comparatively easy and frequent transportation.

As the Mission settlements grew and the colonial population increased, great Ranchos were established over the length and breadth of Spanish Arcadia. The carreta or ox-cart, now came into use as a general means of transportation. They were primitive affairs, with their heavy wheels of solid blocks of wood, cut transversely from the butt ends of trees, and bored through the center for the huge wooden axles. In some respects the carreta might be classed as a forerunner of the covered wagon of overland fame, with its deep body arched with hoop-poles and covered with hides or cotton fabric. The crude contraption was void of springs of any kind. As it rumbled along over the unworked roads, the squeaking of its unoiled axles turning in the holes, could be heard for a mile away. The primitive vehicle was drawn by oxen, yoked by the horns. Indian drivers ran along-side, poking the awkward ani-

In the early days of travel over El Camino Real prior to 1842 this carreta was only known vehicle to travel the King's Highway. Courtesy State Library. From a drawing by Frederick Remington

mals in the sides with poles to keep them moving. On long journeys, a mattress and a few pillows added a note of comfort; but even at that, traveling was an exhaustive experience. There are recorded instances where it took as long as three months to make the trip over El Camino Real from San Francisco to San Diego by ox-cart. In the summer months, the covering over the top of the cart would frequently gather so much dust that it would sag to the point where the driver was obliged to scoop it out with a dipper.

It was now 43 years that "The Royal Road" had been in use as California's main "highway." The Spanish colonies had flourished and many of the mission establishments had become important centers of agriculture and industry. With the year 1812, came an ominous threat to Spanish security. In that year, the Russians had established themselves at Bodega, ostensibly to hunt for otter, seal and beaver. But gradually they extended their operations—buying cattle, establishing farms and fortifying a military post at Fort Ross, on the coast only 65 miles from San Francisco. Here the Russian Governor Kuskof had taken up his residence.

In the face of such bold encroachment by a foreign power, the Spanish Government and the missionaries became alarmed. Heretofore, no attempt had been made to cross the Golden Gate, or to claim the vast rich region to the north, since the Bay of San Francisco imposed an almost insuperable obstacle.

It was Father Mariano Payeras, President of the Missions, who first sounded the note of alarm, when he addressed a report upon the subject to the King of Spain in May, 1817.

Before the end of the year he began the founding of a new mission between San Francisco and the Russian settlements, to be dedicated to the Archangel San Rafael. The site was one of the most picturesque and healthful spots in all California. It was ideally situated at the foot of a high hill in a narrow, fertile valley, traversed by a small stream, emptying into the bay. To the south of Mission San Rafael, one perceived less than a mile distant, at the other side of the valley, a long steep ridge of moderate height densely covered with evergreen trees. High in the background, some five miles away, rose the purplish-blue peak of Mount Tamalpias. To the left, tule marshes spread toward the bay, and clearly discernable 30 miles distant, were the outlines of the Contra Costa Mountains, and the double-humped summit of Mount Diablo.

Although the new mission was but 12 miles in a direct line, a little west of north from the Presidio of San Francisco, it was nevertheless remote and isolated; for with such crude launches as the Californians were capable of building, it was a difficult feat to cross the channel entrance to the bay.

Moreover, Mission San Rafael was considerably smaller than any of her predecessors and offered a weak, practically defenseless barrier to the Russians. Although the latter had thus far confined their settlements solely to the Bodega Region, Padre Payeras believed they would gradually be extended. He renewed his plea for more and greater protection, only to be drowned out by the more vibrant alarm, occasioned by the progress of the revolution for independence in Mexico and South America, which ultimately brought to an end Spanish domination on the American continent.

In 1823, under Mexican sovereignty, the defenses against the Russians again became the subject of paramount consideration. It was decided that at least one and perhaps two more missions would be established east of the Russian settlement. Accordingly, it was ordered that a careful and complete reconnoissance and examination of the country to the north and northeastward of San Rafael was to be made.

To head the exploring expedition, Don Ignacio Martinez, commander of the Presidio of San Francisco, appointed Ensign Jose Sanchez, accompanied by Padre Jose Altimira, who had come to California in 1820. The latter was to be the missionary founder of the new establishment.

On June 25th, 1823, the caravan left the Presidio of San Francisco, crossed the bay to San Rafael, and marched by way of a large Indian Village called Olompali, to the neighborhood of what is now Petaluma. Several days later, the company entered a beautiful oak-studded valley, with innumerable springs and streams. With the surrounding hills abounding in game, its marshes teeming with wild fowl, the sheltered valley had long been a paradise for the Indians. They called it "Sonoma," ("Valley of the Moon.")

Two of the reasons cited for the bestowing of this romantic appellation upon the valley of Sonoma, is that owing to the peculiar distribution of the surrounding hills, the moon may be seen to rise from behind them seven successive times in one evening. The actual shape of the valley itself may have also suggested the name. (Rider's "California.")

There was every good reason that Sonoma should have been chosen as the location for the new mission, San Francisco Solano de Sonoma, for it was conveniently located between the valleys of Petaluma and Napa. A building site was

Early day travel on U. S. 101 was rugged. This old painting shows stage coach detouring through surf at Santa Barbara. Courtesy Security Trust and Savings Bank, Los Angeles

This painting by Frederick Remington, the famous artist of the West, pictures the "Governor's Carriage," the first vehicle with spoke wheels, for description of which see text below. Courtesy University of California

selected on the easterly side of the valley, about the middle of its length north and south, with three or four miles of navigable tide water in Sonoma Creek. It was situated north of the center of San Pablo Bay and in a direct line about 23 miles a little east of north from San Rafael.

With the completion of the ceremonies for the founding of the new mission on July 4, 1823, the leaders of the expedition, Jose Sanchez and Francisco Castro, resumed their march and returned to San Francisco by way of Petaluma and San Rafael. Thus, with the establishment of the last of the 21 Franciscan stations, the Mission Trail had been extended to the shore beyond the Golden Gate.

During the next 10 years, came disturbing times of political intrigue, difficulty with the Russians and quarrels between the Mexican Government and the clergy over secularization of the missions. The fate of the Mexican colonies in the north hung in the balance. In 1834, Governor Figueroa of Monterey, acting under orders from Mexico, chose the young, diplomatic Mariano Vallejo to deal with the Russians, and to lay out a presidio and pueblo at Sonoma. With colonization of the region north of the bay, El Camino Real became the main avenue of travel between the northern settlement and Monterey, and between the latter Capital and the great ranchos of the South.

With the lifting of trade barriers formerly imposed by the Spanish authorities, American clippers had been sailing into California ports in ever-increasing numbers. Hides and tallow had now become the chief enterprise of the Californians. After the spring and fall roundups, heavily ladened ox-carts, groaning under the weight of ponderous bundles of hides, lumbered along El Camino Real, carrying their produce to the harbors of San Pedro, Monterey and San Francisco, for shipment to eastern markets.

Along the same route rode the dashing, gayly dressed caballero, astride his handsome mount; the smiling, dark-eyed señorita, who preferred the back of a fine horse to the hard-riding carreta. There was an occasional wedding procession, on its way from the rancho to the mission. There were times of fiesta, when relatives gathered from near and far, and gaudily decorated carretas loaded with happy children and a buxom señora, traveled over the narrow, dusty trail, laughing merrily and giving little heed to the roughness of the trip.

It was a happy, carefree era for all but the self-sacrificing Padres. With 1834, under the corrupt Mexican regime, secularization of the missions began in earnest. The Mission Fathers were dispossessed and one by one, the missions fell into the hands of private individuals. Most of the establishments situated off of the direct route were abandoned and soon fell into decay; vandals carried away what had been spared by the elements. In some sections, the old Mission Trail became overgrown; in other places rampaging flood waters covered it with layers of silt and debris, until only the main part of the route remained in use.

With the 1840's, California was to experience great changes. In 1842 the first vehicle with spoked wheels rambled over the rutted surface of El Camino Real, when Governor Micheltorena brought the startling innovation into the Country from Mexico. As all horses were broken only for the saddle, the Governor was compelled to attach saddle horses to the shafts, each with a rider. About 1843, a few of the wealthy rancheros began introducing calesas (carriages), and

carts with spoked wheels from the United States. Aside from these rare instances, horseback and the ox-drawn carreta were still the two common means of travel over California's principal highway.

But the romantic, leisurely days of the Dons were nearing their end. On the fourteenth of June, 1846, the sleepy little Pueblo of Sonoma was roused from her slumbers by the daring act of a band of rough frontiersmen from the Sacramento Valley. The Mexican banner flying over the plaza was torn down and replaced with a crude, muslin flag bearing the emblem of a bear and star. The Republic of California was thus proclaimed! . . . Over El Camino Real, from pueblo to pueblo, galloping riders spread the word: "The Gringos have taken Sonoma!" . . .

Events moved swiftly. On July 7, 1846, Commodore Sloat hoisted the Stars and Stripes over the Custom House at Monterey . . . The Californians and the United States were at war!

In the South, Pico and Castro rallied their forces . . . El Camino Real resounded with the beat of cavalry: . . . American forces under Fremont, it was reported, were marching on Los Angeles! . . .

Barely had the conflict ended officially, than James Marshall caught the gleam of tiny, yellow flakes in the tailrace of Sutter's sawmill at Coloma. Thus, the stage was set for one of the most thrilling chapters in California's cavalcade of transportation.

As the gold fever spread to the Southland, a motley procession began moving over El Camino Real. Within a one-week period in June, more than 1,000 men left Monterey for the mines. The coastal towns of Santa Barbara, Los Angeles and San Diego were all but depopulated. By every available means they came: Some traveled on horseback; others on foot; and a few patient souls made use of the ox-drawn carreta.

For many, however, the "King's Highway" did not lead to the proverbial Pot of Gold. Gradually the stragglers wandered back to their ranchos, to begin a new way of life under American occupation and eventual statehood.

Today, from Sonoma in the north to San Diego in the south, along the beautiful, modern Coast Highway, U. S. 101, bronze mission bells trace the route of the old "King's Highway." Though the present route may deviate from the original old Mission Trail in some places, motorists may still feel that they are traveling over ground hallowed by the sandaled feet of the immortal Padres.

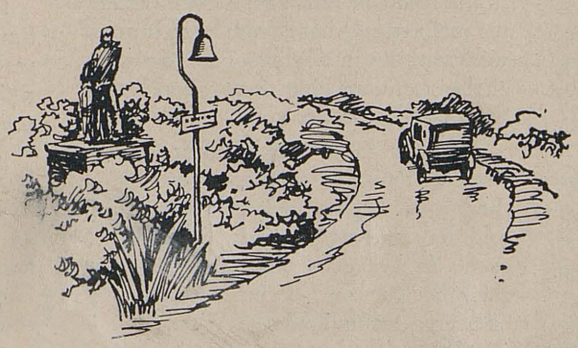
As sources of information, the author acknowledges:

Charles Edward Chapman, Ph.D.: "A History of California, The Spanish Period." The Macmillan Company, New York, 1921.

Theodore H. Hittell, "History of California," Vol. I. San Francisco, 1885.

Nellie Van de Grift Sanchez: "Spanish Arcadia." Powell Publishing Company, Los Angeles.

Rockwell Dennis Hunt and Wm. S. Ament: "Ox-cart to Airplane." Powell Publishing Company, Los Angeles, 1929. *A. F. S.*



Chapter VII

The Coming of the Fur Traders

PART I

DURING the uneventful days of the Spanish regime (1769 to 1822), California was virtually a world apart from the bustling young states of the Union, beyond the Missouri River. Separated by the great American deserts, the Spanish felt reasonably safe from American encroachment. To safeguard their position still further, the Spanish Government prohibited foreign ships (American and others) from entering California harbors to trade with the colonists. (There were times, however, when the practice was engaged in secretly.)

With 1822, Mexico won her independence from the Spanish Crown, and likewise laid claim to the Spanish colonies in Alta California. Under the laxity of Mexican rule, many restrictions were lifted, including the ban on foreign trade. All the way around treacherous Cape Horn, the Yankee captains now came to barter cloth from New England's mills and rum from her distilleries for hides and tallow. There were also other attractions: The coveted otter skins and the luxurious pelts of the fur seal, which had lured the Russians to establish a settlement on the northern coast of California as early as 1812.

The eyes of the young Republic were now focused on the rich, virgin land bordering the Pacific. It was obvious that a vast territory, so rich in undeveloped natural resources, so inviting to other nations, would not long remain under the control of a country so weak in military power and politically unstable as Mexico. Thus, by 1825, the United States was beginning to manifest a definite interest in California, and a vital concern for her destiny.

Between the American frontier and the Pacific, lay a wilderness of desert and mountainous terrain greater than the average Old World empire—the habitat of wild beasts and savage Indian tribes. There was no approach to California except by way of the sea. Even the first overland trail blazed by the intrepid Juan Bautista de Anza, from Sonora to San Gabriel, was no longer used by colonists from Mexico, because of the hazardous and desolate country which it traversed, and the hostility of the Yuma Indians.

For at least another generation, California might well have remained isolated and untouched by American emigration, had it not been for those daring adventurers of the outermost frontier—the rugged Rocky Mountain fur traders. Lured beyond every new horizon to hunt for the valuable fur-bearing animals, these hardy explorers, as early as 1820, had already made their way far into Texas, and up the Arkansas River into Colorado. They had penetrated into New Mexico and the upper reaches of the Colorado River.

Several large companies were formed during this period. From St. Louis, the trading caravans would assemble at the frontier post of Santa Fe, which became the main supply base; from here, hunters were sent out in all directions, regardless of the strenuous objections raised by the Spanish Government.

The fur most sought after by the Rocky Mountain trappers was that of the beaver. In the mountains, these skins sold for an average price of $5 or $6 each. So universal was their use, that they became an accepted medium of exchange throughout the West.

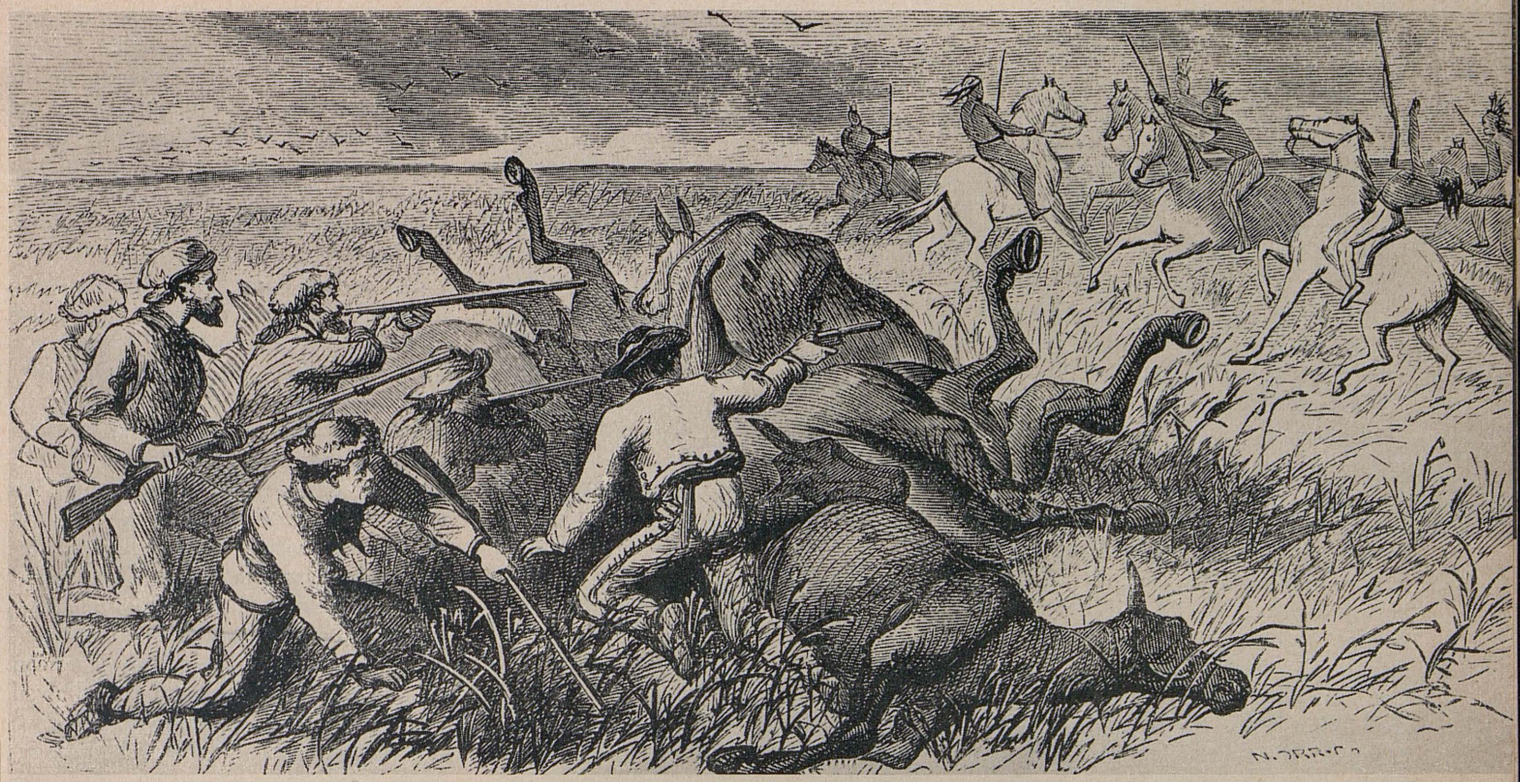
One of the most active of the early fur companies was the firm of Smith, Jackson and Sublette, who had recently taken over the interests of General William Ashley, one of the most famous fur traders of the West. In 1826, the company decided to enlarge its operations and the energetic young Jedidiah Strong Smith was selected to head an expedition to explore the country as far as California.

Among his contemporaries, the rough, uncouth men of the frontier, young Smith with his devout Christian principles, was an outstanding character, hailing from pioneer New England stock. In his boyhood he had come in contact with the fur traders of Canada and the Northwest, while employed as a clerk on one of the freight boats on the Great Lakes. At the age of 20, he went to St. Louis, then the center of the western fur trade, and engaged in trading and trapping.

As yet, no white man had ever crossed the Rockies to the Pacific by way of the Southwest. Smith believed that the vast unexplored region might be teeming with beaver, and that a great river might be found which flowed into the Pacific. It is possible that he might also have been motivated by an ambition to establish a fur-trading post on the western coast, from which furs could be shipped to China—an enterprise in which John Jacob Astor had attempted and failed in 14 years before.

During the summer of 1826, Jedidiah Smith prepared for the expedition that was to play so important a part in the ultimate development of the West. The trail which he was to blaze was virtually to shape not only the destiny of California, but of the American Nation as well. On August 22, 1826, accompanied by 15 seasoned frontiersmen, and 50 horses, Smith left the rendezvous at Great Salt Lake. He took a southwesterly course to Utah Lake, or Little Uta, as it was called by the mountain men. The expedition then followed up the Sevier River, later crossing a range of mountains to a river which Smith recorded having named the Adams, "in compliment to our President." For 12 days the party traveled down the latter stream (undoubtedly the Virgin River), finally arriving at the Colorado.

Crossing the Colorado, the trappers followed its course until they reached



In their lonely trek across the great American deserts, the fur traders were constantly harassed by savage Indian attacks. Courtesy, California State Library

the Mojave Indian Villages, presumably near the present site of Needles. Smith and his men were nearly destitute of horses and on the verge of starvation. Here was a fertile valley about five to fifteen miles in width, where the "Ammuchabas" (Mojaves), raised corn, beans, pumpkins and watermelons in abundance, also a little wheat and cotton. For 15 days the Americans remained among the Mojaves, recuperating from their grueling march across the desert. They managed to obtain several horses from the Indians, and also secured two guides for the last stage of their journey into California.

From here on, Smith's course is not definitely clear. We do know, however, that after a spirit-killing trek across the desert, he finally crossed the Sierra Madre range, either through the Cajon Pass, or over the Old Mojave Indian Trail—a route followed by the famous priest-explorer, Father Francisco Garces, in 1776. Father Garces was the first white man to cross the San Bernardino Mountains into the San Bernardino Valley; while Smith was the first American to enter California overland.

In their contention that Smith traveled over the Old Mojave Indian Trail, some historians point out that recent studies of the diaries of both Garces and Smith show that the route taken by both of these explorers did not lead directly through Cajon Pass as had previously been supposed. Since Mojave Indians from the Colorado served as guides, they logically would have used the ancient Indian trail of their forefathers—leading across the desert, and up the Mojave River to its western headwaters in the San Bernardino Mountains. Approximately eight miles east of the present Cajon Pass, the Old Indian Trail descended into the San Bernardino Valley on the ridge between Devil and Cable Canyons, crossing Cajon Creek between what is now Devore and Verdemont. From this point, the trail skirted the base of the foothills to Cucamonga, passing Mission San Gabriel on its way to the sea.

In spite of the fact that Americans were forbidden in California by Mexican law, Smith and his men were hospitably received by the padres of Mission San Gabriel. The pious Fathers no doubt appreciated the fact that Smith and his chief lieutenant and diarist, Harrison G. Rogers, were men of devout Christian faith—a quality which set them apart from the general run of mountain men.

For 10 days, the leader and his party remained at San Gabriel, waiting to hear from the Mexican Governor at San Diego, to whom Smith had written upon his arrival. At length the impatient young trapper set out for San Diego to see the Governor in person, leaving his men at San Gabriel under the command of Rogers.

For nearly a month, Smith negotiated with Governor Echeandia at San Diego. Mexican law very definitely forbade foreigners from residing in California, and the Governor declined to issue passports on his own initiative. However, the present of eight choice beaver skins and the intervention of an American shipmaster, in command of a hide and tallow vessel lying at anchor in San Diego Bay, finally prompted the Governor to act in Smith's behalf.

But the suspicious Echeandia had not been as generous as it first appeared. Smith had requested permission to lead his party northward from San Gabriel, through the settled portions of Califor-

nia between the Coast Range and the ocean, to the Russian colony at Bodega. But the best he could do, was to secure the Governor's promise to allow the Americans to return unmolested over the route by which they had entered California.

Realizing that further argument was futile, Smith returned to San Gabriel on January 10, 1827. He spent several days scouting for horses at the different ranchos around Los Angeles, repaired saddles and provided supplies and equipment for the trip ahead.

On January 18th, the expedition was ready to leave, camping the first night near an Indian farmhouse four miles northeast of the mission, where they had camped before on the night of November 27th. From here they made their way eastward along the edge of the Sierra Madre Mountains until they reached Rancho San Bernardino (owned by Mission San Gabriel), near the entrance to the Cajon Pass. Smith and his men camped a short distance from the ranch, where they spent several days breaking the unruly horses and preparing for the trek through the unknown interior country—for the young leader had no intention of quitting California so soon. Mexican law might shut him out of the route along the coast, he reasoned, but in the wild region east of the mountains, there was neither Mexican law nor soldier to dispute his right of way.

Accordingly, when the expedition reached the desert entrance of Cajon Pass, it followed the Sierra Madre to the junction of the Coast Range and the Sierra Nevada—entering the southern end of the great San Joaquin Valley, either by way of Tejon Pass ("Badger"), or the Tehachapi.

On their leisurely journey down the broad, level valley, the party encountered numerous Indians, too indolent to be anything but peaceful. Finally, Smith and his men came to one of the many rivers flowing into the valley from their headwaters in the Sierra Nevada. Whether the stream which the trappers named the "Wimilche," was either the Stanislaus or the Merced River, has never been definitely determined. Smith trapped for a time, finding "a few beaver, and elk, deer and antelope in abundance." He decided to leave most of his men at the "Wimilche," and with two companions, seven horses and two mules, set out to cross the Sierra and return to the rendezvous at Great Salt Lake.

Just how and where the young explorer actually crossed the Sierra Nevada, is a matter of conjecture. In his diary he states briefly: "I found the snow so deep on Mount Joseph that I could not cross my horses, five of which starved to death. * * *" (The best authority on Smith's expeditions, Mr. Harrison C. Dale, identifies "Mount Joseph" with Mt. Stanislaus, and sets Smith's course along the middle fork of the Stanislaus River to the divide.)

Once across the formidable Sierra, the three trail-weary trappers followed the course of what was later named the Walker River, to the vicinity of Walker Lake, thence northeastwardly to Great Salt Lake, where they arrived like virtual living skeletons, with but one horse and one mule left.

In spite of the hardships endured, Smith's first trip into California had only whetted his enthusiasm to make further explorations. At the rendezvous he met his partners, Jackson and Sublette, with whom he remained for about a month. Then, with a new party of 19 men, the young trapper started out again to rejoin the hunters he had left in the mountain camp.

Following his old trail, Smith reached the Mojave Villages without incident; but here he was to meet with disaster. During the first three days, the Mojaves traded with the trappers and appeared as friendly as the year before. Then, at an opportune moment, when the company had become separted in crossing the Colorado, the savages suddenly attacked. Ten of Smith's men were killed and the remainder were forced to abandon most of their belongings and flee across the desert.

Nine and a half days later, after enduring the most terrible sufferings and hardship, the emaciated party staggered into San Gabriel. Smith obtained such supplies as he could from the kindly Father Sanchez, and leaving two of his injured men behind, hurried on to rejoin his company left at the "Wimilche" the preceding May.

Here the young explorer's problems were multiplied. The food supply was just about exhausted. Without fresh supplies, a return to Salt Lake was impossible. * * * If they applied to the Californians for aid, they would be subject to arrest. With no other recourse, Smith took two Indian guides and set out for the Mission of San Jose, west of the Coast Range. Probably crossing the mountains by way of what is now the Pacheco Pass, he succeeded in reaching the mission in three days.

But at San Jose, young Jedidiah was to find the head of the institution, Father Duran, of sterner clay than the generous Sanchez of San Gabriel. Having already accused Smith of enticing away certain neophytes, he promptly arrested the astonished American and locked him up for three days without food. When the trapper finally obtained his release, and called on Governor Echeandia at Monterey, the latter flew into a rage and threatened to send the habitual trespasser to Mexico as a prisoner. Finally, at the intercession of several American shipmasters, the Americans were allowed to secure the necessary supplies and leave the country. To satisfy the dubious Governor, Smith gave a bond for $30,000 to insure his actual departure.

Meanwhile, the men left behind at the San Joaquin camp were starved out. Traveling northward, they finally made their way to San Francisco, with their clothing in rags and badly in need of food. Here Smith joined them, and through the aid of a German merchant, who had recently dared to establish himself on the California coast, were provided with supplies for their trek out of California.

In the journey northward, the company passed along the "Bonadventure," now the Sacramento River. About the middle of April, 1828, Smith took a northwest course across the Coast Range, through what is now Trinity and Humboldt Counties, to the coast. From here, under the most painful conditions, the trapping party made its way through the wild, mountainous country into Oregon, where all but the leader and two of his men were annihilated by the Umpquas.

It had been Smith's express intention of making a third expedition to California, to make an accurate geographical charting of the great interior valleys and the Sierra region. His ambition, however, to present the world with an atlas and history of the western country, was never realized. While on a hunting expe-

dition in the sandy wastes between the Arkansas and the Cimarron Rivers, the young explorer was ambushed and killed by the Indians, at the age of 33.

In all the annals of western trail-breaking, the expeditions of Jedidiah Strong Smith are among the most important. Historians point out that his contribution to the development of California was comparable to what the Lewis and Clark expedition accomplished for the Pacific Northwest. Not only was the modest, God-fearing Smith the first white man to cross the mighty Sierra Nevada, and to traverse the Pacific Slope from the Mojave Desert to Puget Sound, but his explorations opened up the great transcontinental routes to California; making known to American trappers, and in turn to American homesteaders, the great inland valleys of the San Joaquin and the Sacramento.

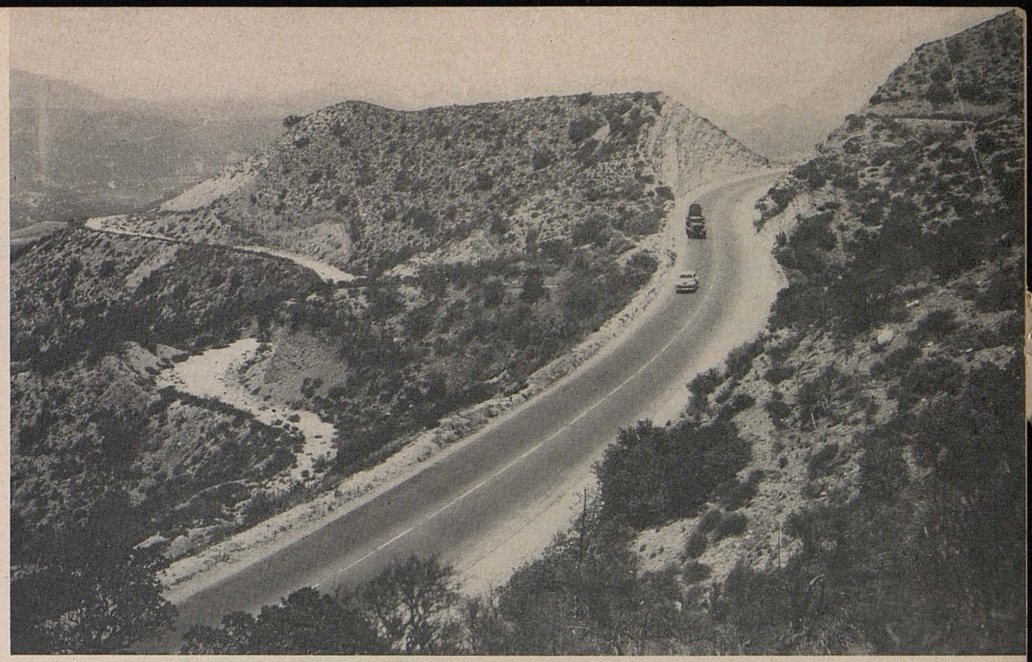
Probably no more fitting monument could ever be dedicated to the memory of Jedidiah Strong Smith, than the smooth, well-graded highways of today that pass over much of the vast territory which he was the first to explore.

PART II

Between the time of Jedidiah Smith's arrival in California on his first expedition, and the massacre of his men by the Umpquas, another party of American trappers was laboriously making its way overland to the Pacific. Leading the company was Sylvester Pattie and his son, James Ohio Pattie.

In the journal written by the younger Pattie, posterity has been bequeathed a graphic picture of their perilous western trek—one of the most thrilling episodes in frontier history. The Patties too, made their contribution to the development of the Pacific: They opened up a new overland route to the coast, and added much to the knowledge of the great Southwest.

Following down the Gila and the Colorado River, as far as the tidewater of the Gulf of California, the party crossed the desert to the Spanish settlements on the northern coast of Baja California. At Mission Santa Catalina, they were harshly received and taken to San Diego under heavy guard, arriving there March 27, 1828.



The modern highway, U. S. 66 through the Cajon Pass—once the route of the early trappers and the Santa Fe caravans. Old road on left, new highway on right

Here they appeared before the self-same Governor Echeandia, who was nothing short of exasperated at the sight of more American trespassers. He thrust the men into a vile prison for several months, where the elder Pattie succumbed to a fatal illness. Gradually, James Ohio managed to gain a concession from the Governor, by using his knowledge of vaccination to save the population from extermination by a violent smallpox epidemic. In 1830 he was given a passport to Mexico City and from there made his way back to his home in Kentucky.

During the years 1830 and '31, three more pioneer pack trains, composed mostly of trappers and traders from New Mexico, crossed the San Bernardino Mountains into the valley beyond. The first, a forerunner of the Santa Fe caravans, was led by Antonio Armijo, a New Mexican trader, who in 1830, entered the San Bernardino Valley by what he called the "San Bernardino Canyon"—(undoubtedly the present Cajon Pass). A little later that same year, came the Tennessean, Ewing Young, and his band of trappers; but unfortunately, they left no record of the trail by which they crossed the mountains. It is believed, however, that they followed Smith's route into Southern California.

On his return from the Pacific Coast, Young reached Taos, New Mexico, in the summer of 1830, where he joined forces with Wm. Wolfskill, a Kentucky trapper, with several years experience in the Missouri-Santa Fe-Chihuahua trade. The purpose of the expedition was to trap the interior streams of California from which Young had just returned. From Taos, Wolfskill and his party reached the Colorado by way of the San Juan, Grand and Green Rivers. They traveled south until the Grand Canyon presented an insurmountable barrier. Then a westerly course brought them to the Sevier River, from where they proceeded southwesterly to the Mojave Villages, and in February, 1831, traveled by way of Cajon Pass into the San Bernardino Valley and on to Los Angeles.

Wolfskill's trip was a noteworthy one, since his course over the mountains is clearly defined. From Santa Fe to California, his route approximated more closely the trail later followed by the New Mexican caravans, than did that of either Armijo or Young. It might therefore be said that it was William Wolfskill who established the famous pack-train route known as the "Old Spanish Trail," used by the Santa Fe-Los Angeles caravans for nearly two decades.

Once each year, pack trains accompanied by a heavy armed guard, made the round trip over the trail. California bound, the caravans carried blankets, Mexican woolen goods, silver and all sorts of American-made wares from St. Louis. On the return trip, the traders brought back mainly Chinese goods, silks and the like, obtained from trading vessels on the California coast. They also

drove back horses and mules for American markets.

On its way up Cajon Canyon, the old caravan trail crossed and recrossed the wash; it continued for a distance of about eight miles from the mouth of the canyon, until it reached the "Narrows," where it turned northeast. From the mouth of Cajon Canyon to Mission San Gabriel, and also from "Fork of Roads" (east of Barstow) to "Lane's Crossing" (Oro Grande), along the Mojave River, the Santa Fe Trail followed the line of the historic Old Mojave Indian Trail.

By the year 1832, there were two definitely established southern overland routes into California. First, the old trail of the Patties, running through Socorro and along the Gila to the Colorado, thence over the old Anza Trail through what is now Imperial County, to Carrizo Creek, reaching what is now San Diego County by way of the pass, later to be named for the pioneer trader, Jonathan T. Warner (Don Juan Jose Warner).

This new pass through the unknown mountain country, was first opened up by Pedro Fages in 1782, on his way back to San Gabriel from a campaign against the Yumas. The trail was rediscovered in 1825 by Santiago Arguello, while pursuing Indian horse thieves. In January, 1826, the Mexican Government sent Romualdo Pacheco, lieutenant of engineers, to investigate the route. With his approval, it was adopted as an official mail route; and that same year, Pacheco established a small garrison on the Colorado River. From that time on, the trail was used occasionally by traders from Sonora. In 1831, the former partner of Jedidiah Strong Smith, David E. Jackson, and his trading party were perhaps the first Americans to cross the mountains by way of what was later to be called Warner's Pass. Warner himself was a member of the expedition.

There was also the Old Spanish Trail, the route of the Santa Fe Caravans from Santa Fe, New Mexico to Los Angeles, by way of the Mojave Villages and the Cajon Pass; thence into the San Joaquin Valley by way of either the Tejon or the Tehachapi Pass.

In 1833-34, a third route was to be opened by Joseph Reddeford Walker, also a native of Tennessee. Walker had engaged in the Santa Fe trade for some time, and was well seasoned for this rugged experience by having previously served as sheriff of one of the frontier counties of Missouri. As a skilled mountain man, the trader had established an enviable reputation and was selected by Captain Bonneville to serve as his chief lieutenant in the latter's western expedition.

On July 24, 1833, Walker left the main command under Bonneville on the Green River and with a company of 35 or 40 men, started westward to explore the country beyond the Great Salt Lake. The exact course pursued by Walker and his men across the Sierra Nevada has never been definitely determined. One member of the expedition, George Nidever, later claimed that the route down the western slope of the Sierra, lay "through a valley between the Merced and the Tuolumi Rivers." This statement does carry considerable significance, since Walker's tombstone bears the inscription, "Camped at Yosemite, Nov. 13, 1833."

By whatever route he came, Joseph Walker claims the distinction of being the first American to blaze a trail across the Sierra Nevada directly into California from the east. His discoveries made on this and later expeditions, such as the now famous Owens River Valley, places his name high on the list of California pathfinders.

Probably more than any other group of men, the fur traders contributed to the development of the West. Spurred on by their love for adventure, they dodged death at every turn. In spite of the dangers, many lived to return to the land beyond the Missouri River, to familiarize settlers of the American frontier with the climatic virtues and the vast resources of the "Paradise" along the Pacific. After opening up the overland approaches to California, many of the mountain men became guides for the emigrant parties who were later to follow their routes. They made possible the success of government exploring expeditions such as that of the great American pathfinder, John Charles Fremont.

Today, many of the trails so laboriously blazed by these dauntless "knights" of the frontier have become smooth, luxurious avenues of travel, over which the motorist may reach his destination comfortably, within a few brief hours. The old route of the Santa Fe traders into California by way of the Mojave Indian villages (near the present site of Needles), and into the San Bernardino Valley over the Cajon Pass, is now traversed by the beautiful highway, U. S. 66. Their lonely pack trail along the edge of the Sierra Madre is followed by the famous Foothill Boulevard, so popular with the motorists of Southern California. Into the great Valley of the San Joaquin, by way of the present Tehachapi Pass, the path of the fur traders is now closely followed by U. S. Highway 466; by way of Tejon Pass and Grapevine Canyon, their route is traversed by California's principal inland highway, U. S. 99.

As sources of information, the author acknowledges:

Harrison Clifford Dale: The Ashley-Smith Explorations and the Discovery of a Central Route to the Pacific, 1820-1822. Cleveland, 1918.

Robert Glass Cleland, Ph.D.: History of California, The American Period. New York. The Macmillan Company, 1922.

Mildred Brooke Hoover and H. E. and E. G. Rensch: Historic Spots in California. Stanford University Press, Stanford, California, 1948.

—A. F. S.

Chapter VIII

Westward Roll the Wagon Trains!

PART I

During the early 1840's, California's history ran its slow, even course, with the rancheros contentedly raising cattle and trading hides and tallow to New England shipmasters in exchange for American products. They gave little thought to establishing factories of their own; but rather preferred to enjoy life, singing and dancing away the happy hours.

To the foreigners who chanced to visit the Pacific Coast, it became obvious that the stagnated state of conditions was only superficial. Beneath the surface, the forces of Destiny were actively at work: Old California, with its decadent institutions, its Old World background and traditions was fast approaching the end of its pastoral, romantic era.

The famous author, Richard Henry Dana, who came to California as a common seaman on a hide and tallow vessel, was probably one of the first to influence western emigration. In his book, "Two Years Before the Mast," he presented a graphic picture of California and its people. Upon publication in 1840, the interesting work soon found its way into virtually every hamlet and town from New York to the Missouri Valley.

There were others too, who raised their voices high in praise of California. About the time Dana's book came out, Thomas Jefferson Farnham published his popular book, "Life and Adventures in California," giving a highly exaggerated but colorful account of life in the "Utopia of the Pacific."

Lured by the promise of greater freedom from the restraints of society, wider separation from their neighbors, frontiersmen along the Missouri River began to grow restless. The hard times of Van Buren's administration further stimulated interest in California among the hard-hit settlers of the back country. Here, they reasoned, was a land of ideal climate, with abundant supply of game, natural resources and wonderful agricultural possibilities—to be had for the taking!

In Platte County, Missouri, the settlers' enthusiasm was aroused to fever pitch when a trapper named Rubidoux, recently returned from the Pacific Coast, gave an address on the marvels of California, describing it as a land of "perennial spring and boundless fertility." "* * * Innumerable herds of cattle and wild horses dot the hillsides and grassy plains," he told the land-hungry Missourians. "* * * Oranges and other fruits grow in profusion."

The result was the organization of the Western Emigration Society, designed to enlist recruits and provide a systematic program for an expedition to California. Prospective emigrants were contacted as far off as Kentucky, Indiana and Arkansas. Eventually the society circulated a pledge, binding its signers to meet the following May at Sapling Grove, in what is now eastern Kansas. Each party was required to be suitably equipped and armed, ready to start for California.

The response was overwhelming; in less than a month 500 signatures were obtained. But by spring, the enthusiasm had waned. Instead of the 500 who signed, only about 69 appeared at the rendezvous; and only one of these had signed the original pledge of the Emigrant Society. He was a trustworthy young man by the name of John Bidwell, who had recently come to Missouri from Ohio. In spite of every discouragement, young Bidwell stayed with the project, manifesting the determination of spirit that was one day to elevate him to a place of honor in the West.

It was a poorly organized group that met at Sapling Grove in May of 1841, to begin the long journey to California. Their knowledge of geography was extremely limited; moreover, John Bartleson, totally unqualified for leadership, had been chosen as the company commander by popular vote. Matters were further complicated by the presence of 15 women and children in the party.

As far as what is now Idaho, the group experienced no extraordinary hardships other than getting the wagons over a country that only once before had been traversed by a wheeled vehicle, the wagon of a fur trader. But on their journey across what is now Utah and Nevada, the emigrants endured untold suffering. On the salt plains they were bewildered and famished, going as long as 24 hours without water. At length they were forced to abandon their wagons, struggling along mostly on foot.

It was in late October, 1841, barely in advance of the first snowfalls, that the party ascended the Sierras on the north side of what is now the Walker Pass. Here they endeavored to follow a little stream (the headwaters of the Stanislaus) flowing westward instead of toward the east. But the course of the river through the mountains was too rough and precipitous for weary feet to travel. In seeking a way out of the mountain fastness, the bewildered pathfinders became entangled in gorges and canyons, many of which were more than a mile deep. Here they were forced to abandon the greater part of their animals. The few remaining horses and mules were now so weak they could scarcely travel; and as the exhausted emigrants dragged themselves down the last formidable ridge of the Sierras, fatigue had dulled their senses to the point where they were unable to realize that the great Valley of the San Joaquin lay before them. Thus, under the most grueling conditions, the Bidwell-Bartleson Party ushered in the first organized emigration into California.

Almost a contemporary was the Workman-Rowland Party, who reached California in November, 1841, over the "man-killing" overland route from New Mexico to Los Angeles by way of the Gila and the Colorado. Among the 25 or more male emigrants, recruited partly in

Missouri and partly from American residents in New Mexico, was Benjamin Davis Wilson, who was to become one of California's most distinguished pioneers, and the first mayor of Los Angeles under American rule. (Still later, he was to become the grandfather of the famous hero of World War II, General George S. Patton, Jr.)

With 1843, two more emigrant parties reached California: One from the north, and the other, the Chiles-Walker Party, entering from the east. At the start, the party consisted of approximately 30 men, besides a considerable number of women and children. Joseph B. Chiles, who commanded the expedition, had come to California with the Bidwell-Bartleson Party in 1841, and had returned to Missouri expressly to organize a new overland party. The emigrant train left Independence, Missouri, in May of 1843, far better equipped than most of the other expeditions, almost to the point of absurdity. The wagons were loaded, not only with household goods, but with heavy furniture; and even the complete equipment for the erection of a sawmill "on the Sacramento."

At Fort Hall, a small party of the men under command of Chiles, turned northward to Fort Boise for supplies, while the main part, led by the former trapper, Joseph R. Walker, took a more southerly course. From Fort Hall they drove their heavily ladened ox wagons to the Humboldt River, following the stream to its sink in western Nevada. Then, turning south, the party came to Walker Lake. From here on, their course south took them through difficult mountainous country and across semidesert wastes, until they reached the alkaline body of water, now known as Mono Lake.

Slowly the caravan laboriously made its way over a succession of sandy ridges to the crest of a pine-clad ridge. Here flagging spirits were bolstered by the sight of a river, clear as crystal, looping its way through a pleasant green valley, which sloped gently to the south. Herds of elk, deer and antelope grazed peacefully on the lush vegetation covering the valley floor. To the left rose a range of barren, brown-gray mountains; while on the right, stood the majestic wall of the Sierra Nevada. At first the trip was pleasant through the valley, which two years later, the great American pathfinder, John Charles Fremont was to name, "Owens," in honor of Richard Owens, one of his own men. But as the emigrant train reached the lower end of the valley, travel became more difficult. The oxen were scarcely able to pull the heavy, overloaded wagons through the wide, sandy stretches; in other places they were forced to make many tedious detours around the boulder-strewn base of the mountains. Finally, near the lake which was later named Owens Lake, the emigrants were forced to abandon their wagons and load what goods they could upon the backs of the horses and oxen. The heavy mill machinery was reluctantly buried in the sand, where 20 years later it was unearthed by a mystified group of prospectors.

After several days' hard travel from the lake, Walker and his party entered the pass through which the trapper had led the Bonneville Company out of the San Joaquin in 1834. Through this broad gateway, the Sierras were successfully crossed without the hindrance of snow or other difficulty; but on the California side of the range, the emigrants were to undergo intense suffering. From the western outlet of Walker Pass (situated about 60 miles northeast of the present City of Bakersfield), in trying to reach the western side of the San Joaquin Valley, the party became trapped in a region of hot, choking alkali wastes. For nearly a hundred miles there was practically no water. By the time they found their way out and reached one of the tributaries of the Salinas River, they were nearly half-dead from exhaustion. But with a few weeks of recuperation in a pleasant little valley which Walker had previously discovered, the emigrants were able to complete the last lap of their long journey, reaching the Gilroy Rancho, in what is now Monterey County, in January of 1844. Today their arduous trail past Mono Lake and through the Owens River Valley is closely followed by U. S. Highway 395; and over Walker Pass by State Sign Route 178.

By the time hostilities broke out between California and the United States, in July of 1846, much had been accurately learned regarding the climate, geography and natural resources of California. The United States Government had taken a hand in making the province better known to the American people by sending out several exploring expeditions: One, a naval squadron under the command of Lieutenant Charles Wilkes, reached the Pacific Coast in 1841; another in 1843, under the direction of the chief of the Corps of Topographical Engineers of the United States Army, headed by Lieutenant John Charles Fremont.

A third exploring expedition beyond the Rocky Mountains, to discover the most feasible route from the Mississippi to the Pacific, brought the famous pathfinder to California for the second time, in 1845, just when relations between California and the United States were becoming strained. In the subsequent conflict, which began on July 7, 1846, when Commodore Sloat raised the Stars and Stripes over the Custom House at Monterey, Fremont played an important role.

With the Treaty of Guadalupe Hidalgo, signed February 2, 1848, California formally became a part of the United States. Two weeks before, by a strange act of fate, a few golden flakes had been discovered in the tail race of Sutter's sawmill at Coloma. Once again shipmasters were to carry word of the newly acquired territory to the eager inhabitants of the Atlantic seaboard. This time, it was no mere account of climatic charms and fertile valleys, where men might carve a homestead in the wilderness. It was exciting news of a fabulous hidden treasure, suddenly yielded by Mother Nature; news that set men's souls on fire and started one of the mightiest migrations the world has ever known.

During the winter of 1848, the overland routes were naturally closed to travel, and the first great influx came by sea. But by spring of 1849, the wagon trains began to roll! Within a three weeks' period alone, nearly 18,000 emigrants crossed the Missouri River. Over the parched plains and the great American deserts, the endless train of white-covered wagons (and vehicles of nearly all types and descriptions), the herds of animals, and the migrating mass of humanity—men, women and children—resembled a virtual nation on the march.

PART II

Emigrant Trails of '49 (The Southern Route)

In addition to the heavily traveled northern routes into California, by way of the Humboldt and Truckee Rivers, and from Oregon by way of the Willamette and the Shasta route, emigrants also poured in from the south. The old Spanish Trail, the historic route of the trading caravans from St. Louis to Santa Fe, became a well-beaten path. From Santa Fe westward there was a choice of two routes: One, the old Pattie Trail, by way of Socorro, thence along the Gila to the Colorado, crossing to the coast by way of the pass named for the Connecticut Yankee, Jonathan T. Warner. The trader had come to California in 1831 with the David E. Jackson party, the first Americans to pass over this route.

The land surrounding the famous hot springs, which also bear Warner's name, comprised about 49,000 acres, and came under the joint control of Missions San Diego and San Luis Rey. After secularization of the missions, and the confiscation of their lands in 1836, the entire valley, known as the Valle de San Jose, discovered and named by the Spaniards in August, 1795, was granted to Silvestre de la Portilla. For some reason, the grant lapsed; and Jonathan Trumbull Warner (Juan Jose Warner), applied for title to the land in 1844.

Don Juan was a liberal host and dispensed generous hospitality at his great estate known as Warner's Ranch. In 1846 the site became a camping place for Stephen W. Kearny's regiment and other divisions of the Army of the West. The Mormon Battalion passed that way in 1847; and with 1849 Warner's Ranch became a haven for the gold-seekers who entered California over the old Emigrant Trail, which traversed Anza's old route across the Colorado Desert from Yuma. (Today, State Sign Route 79 passes close to the historic ranch.)

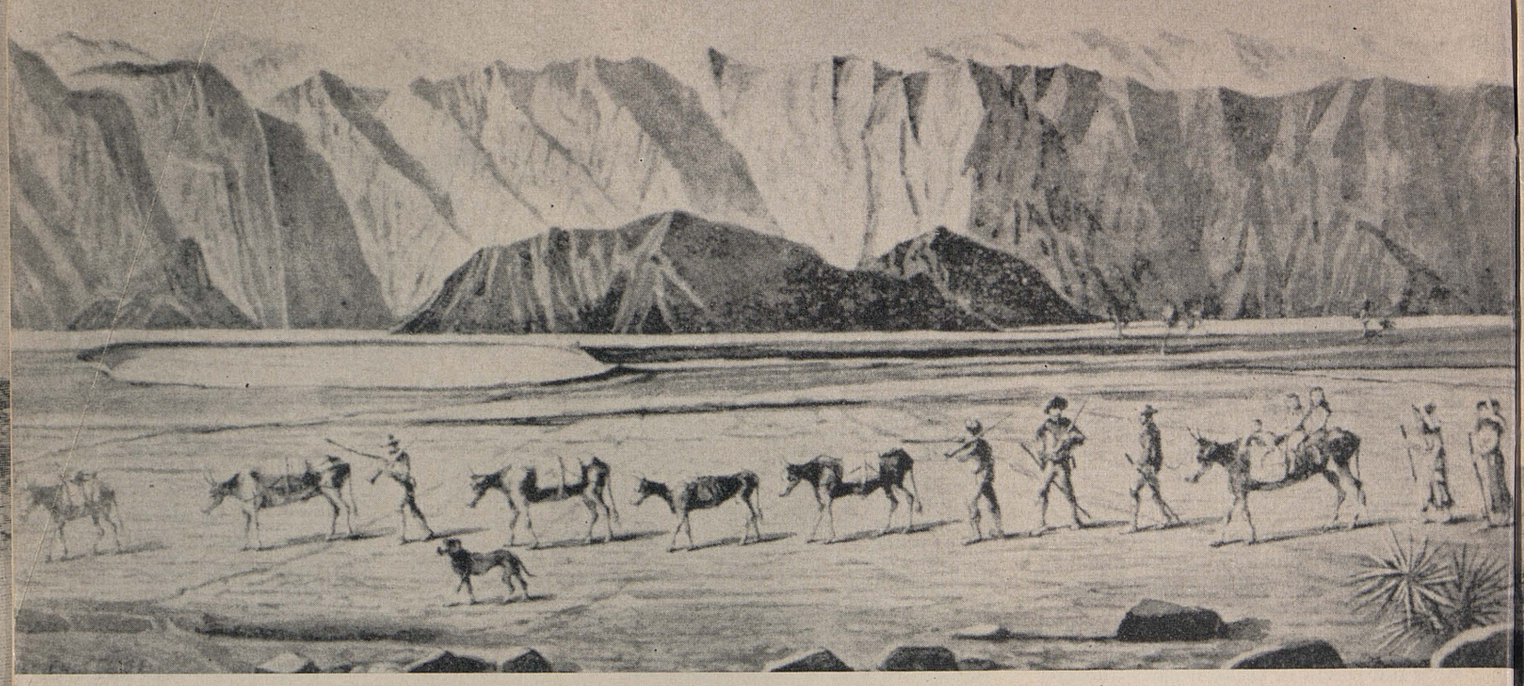
Another of the southern overland routes, followed Wolfskill's trail of the early thirties, and the route of the old Santa Fe-Los Angeles caravans. This trail reached the Colorado by way of the Grand, Green, Sevier and the Virgin Rivers. From the Colorado, near the present site of Needles, the route continued on to Southern California by way of the Cajon Pass. The latter route had been well charted by the Mormons in 1847, when Captain Jefferson Hunt of the Mormon Battalion left California by way of the square, box-like canyon called the Cajon.

Monument on the Old Emigrant Trail in San Bernardino County, erected by the Daughters of the American Revolution, in honor of the mothers of covered-wagon days, who passed over this part of the historic road

East of the Cajon, the trail turned northward into the Valley of the San Joaquin by either the old Tehachapi Pass or the Tejon. (The old trail ran by way of Oak Creek Pass and Tehachapi Creek. Originally, the latter pass was called the Tehachapi; with the building of the railroad in 1876, the name was transferred to the present Tehachapi Pass.)

Still another emigrant trail was the route down the Owens River Valley, through what is now western Inyo County (U. S. 395). Over Walker Pass (State Sign Route 179), the trail led to the South Fork of the Kern River, named by Lieutenant John C. Fremont in 1845, for Edward Kern, a member of his expedition who mapped the river.

At Isabella, the junction of the South and North Forks of the Kern River, the trail divided. One branch went south by way of Bodfish, Havilah and Walker's Basin; thence west by several routes to the ferry on the Kern River (Gordon's Ferry), about five miles northeast of the present City of Bakersfield. The other branch of the trail crossed the Kern River near Isabella, passed over the Greenhorn Mountains, either to Poso Flat, or to Linn's Valley (near Glennville), and then turned north to the White River and what is now Visalia.



The Manly-Bennett-Arcane Party rescued from the silent Valley of Death
From Manly's book: Death Valley in '49
Courtesy, California State Library

Even with the overland routes well established, many emigrant parties met with disaster en route to California. In their fever to reach the gold fields, some attempted to blaze new trails, seeking a shorter route. One of the greatest of such tragedies occurred in the devastated region lying east of Owens River, which because of the suffering of the emigrants trapped there, acquired the grim appellation of Death Valley. Two companies are known to have wandered off the beaten path into the long, sunken desert surrounded by high mountains (the lowest spot in the Western Hemisphere, 267 feet below sea level). A graphic account of the tragedy enacted there is given in the book, "Death Valley in '49," by William Lewis Manly, a member of the first emigrant party.

Manly and his followers joined a wagon train near Salt Lake, supposedly following the regular Salt Lake-Los Angeles route. But instead of pursuing the trail all the way to the Mojave villages, part of the train led by Captain Smith, turned off near Mountain Meadows, with the intention of traveling west to the San Joaquin. Manly, together with a friend named Bennett who commanded several wagons, and another named Rogers, followed the Smith party.

Several of the company turned back to the regular Los Angeles trail even before reaching the desert. The remainder separated into two groups. One division calling itself the "Jayhawkers," was composed almost entirely of young, unmarried men, who had started from Galesburg, Illinois, in the spring of 1849. In their rush to reach the gold fields, the adventurers branched out on their own, leaving Manly and the men with women and children to make their own way alone.

On Christmas Day Manly and his party entered "the Valley of Burning Silence," and set up camp beside what was later called Furnace Creek. It was imperative that relief be secured immediately, or the entire party would perish in the sandy wastes. Manly and Rogers volunteered to cross the mountains to seek help, while the rest of the party, consisting of 13 adults and seven children, remained at the camp.

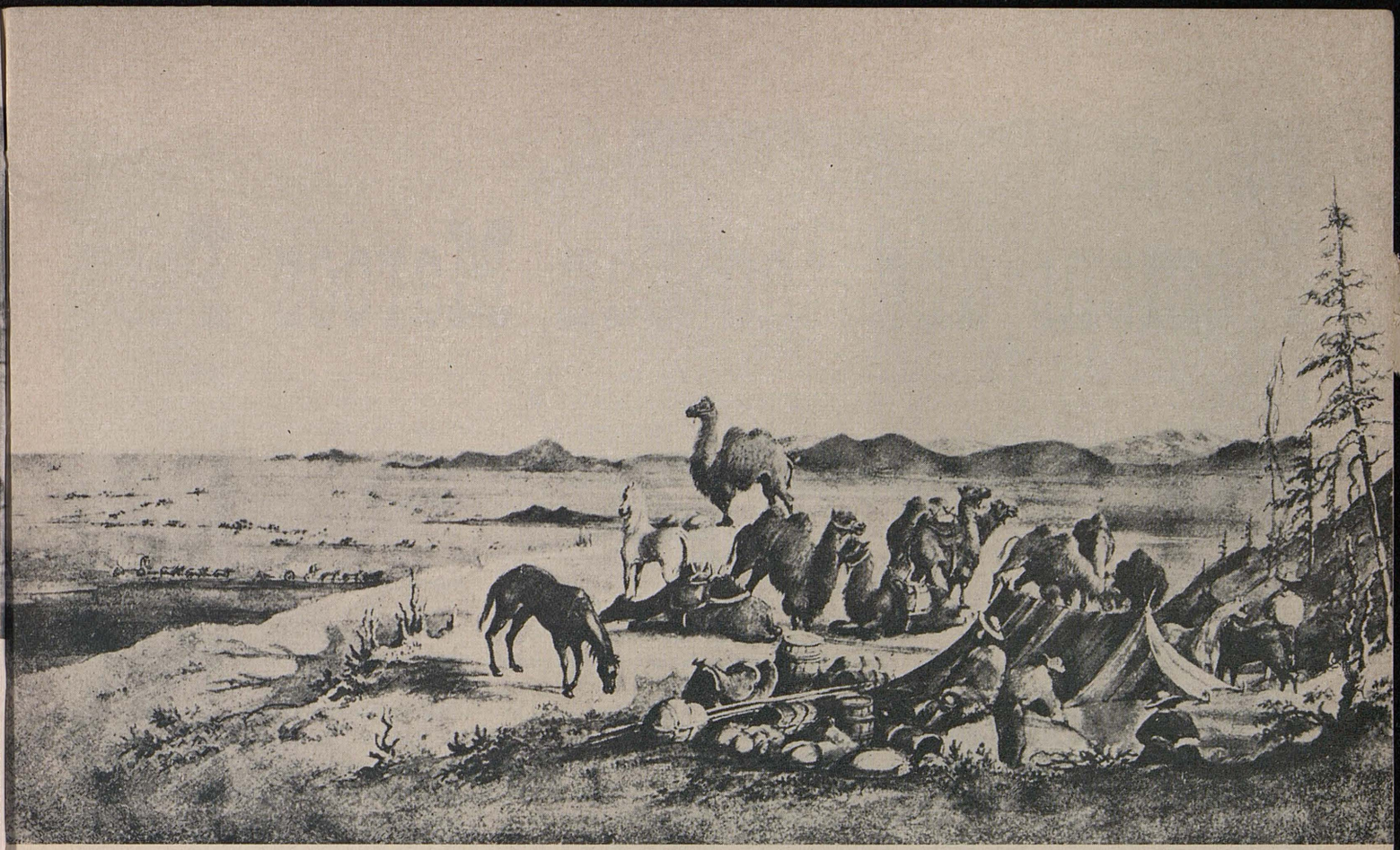
On their mission of mercy, the two intrepid heroes endured the most dreadful privations; but at last succeeded in reaching the little settlement of San Fernando, a few miles north of Los Angeles. Obtaining supplies and a few pack mules, they started back to rescue their friends.

A few miles from camp the ghastly sight of a member of the party lying dead upon the sand, his empty canteen by his side, increased the men's anxiety for the safety of those left behind for nearly 26 days—starving and thirsting in the death-like silence of the lonely region. Within sight of the camp, they noticed that several of the wagons were missing. There was no sign of life about and it was doubtful whether any of the party still survived. Manly fired his gun and a man crawled feebly from beneath one of the wagons. For the moment he seemed too weak to comprehend that the messengers had returned. Then, suddenly, with renewed life, he threw his arms in the air and cried out: "The boys have come—the boys have come!"

Only the Bennett and Arcane families remained in camp. Most of those who had straggled on alone were never heard from again. As for the adventurous Jayhawkers, some historians maintain that nine of their number perished to the east of Death Valley; and four more died after leaving it, but while still in the desert.

Manly's own words can best describe the moment of departure from the grim, sunken valley. "We took off our hats," he wrote, "and then overlooking the scene of so much trial, suffering and death, spoke the thought uppermost in our minds, saying: 'Goodbye, Death Valley'!"

Once released from the tortuous region, the forlorn party followed along the eastern slope of the Sierra, past Walker Pass, through Red Rock Canyon, into the Mojave Desert and on to the San Gabriel Mountains. There they finally passed through Soledad Canyon



Less than 10 years after the emigrant trains fought their way across the desert wastes, Uncle Sam tried the novel experiment of a "camel express." The huge beasts were used to carry supplies to the different army posts and to haul materials for the construction of military roads.—Drawing by Edward Vischer, courtesy University of California

and over Newhall Pass into the San Fernando Valley.

Others who came in the Gold Rush Era and in the years immediately following, likewise contributed materially toward laying the foundation for California's vast system of highways, regarded as one of the best in the Nation today.

The Mormon occupation of what is now San Bernardino County in 1851, and the subsequent founding of the City of San Bernardino by those hardy, industrious pioneers, not only marks a milestone in the county's history, but in the history of some of Southern California's most important highways. The fine, wide streets of the City of San Bernardino, the numerous roads leading to the sawmills erected in the mountain areas, and the opening up of the present Foothill Boulevard as far as Cucamonga are all credited to the Mormon settlers.

In reviewing California's past, one finds a history fascinating and dynamic, tinted with romance and stained with pathos; sprinkled with names long since stricken from the roll, but never to be forgotten: The names of the immortal pathfinders and the heroic pioneer mothers, who braved the hazards of the Overland Trail to lay the foundation for a new and mighty Empire on the shores of the Pacific.

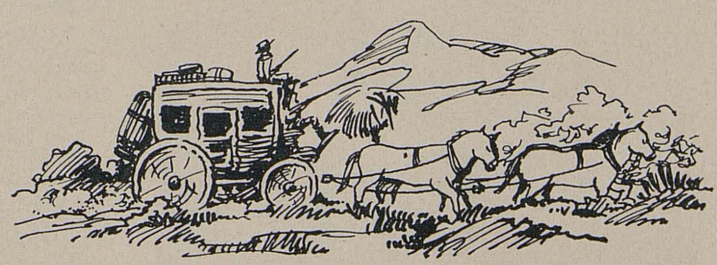
As sources of information, the author acknowledges:

1. William Lewis Manly: Death Valley in '49. San Jose, 1894.

2. Robert Glass Cleland: History of California, The American Period. New York, The Macmillan Company, 1922.

3. Joseph J. Hill: History of Warner's Ranch. Los Angeles, 1927.

4. Hero Eugene Rensch and Ethel Grace Rensch: Historic Spots in California, The Southern Counties. Stanford University Press, Stanford, California, 1932. A. F. S.



Chapter IX

Fremont and the San Marcos Pass

EACH YEAR thousands of motorists make the trip over the scenic San Marcos Pass Road, State Sign Route 150, little realizing that they are traveling over one of the most historic routes in California. Extending northerly from the Coast Highway, U. S. 101, at a point about two and one-half miles west of the City of Santa Barbara, the San Marcos Pass Road follows up a steep ridge on the southern slope of the Santa Ynez Mountains.

In this rugged, isolated region 104 years ago, was enacted one of the most stirring episodes in the military history of the West. The two characters playing the leading roles were Lieutenant John Charles Fremont, commander of the California Battalion in the war with Mexico, and a heretofore obscure figure, the ranchero named Benjamin Foxen—destined to wield a powerful influence on the fate of California.

Since the north had already been conquered and was in possession of the Americans, it was Fremont's plan of strategy to cut the territory of California in two by crushing opposition, or by driving the California forces ahead of him. Near Los Angeles, he planned to unite with Commodore Stockton, who was marching north from San Diego. The main army of the Californians was entrenched at or near Los Angeles, and it was there that Fremont believed the deciding battle of the Mexican War would be fought, as far as California was concerned.

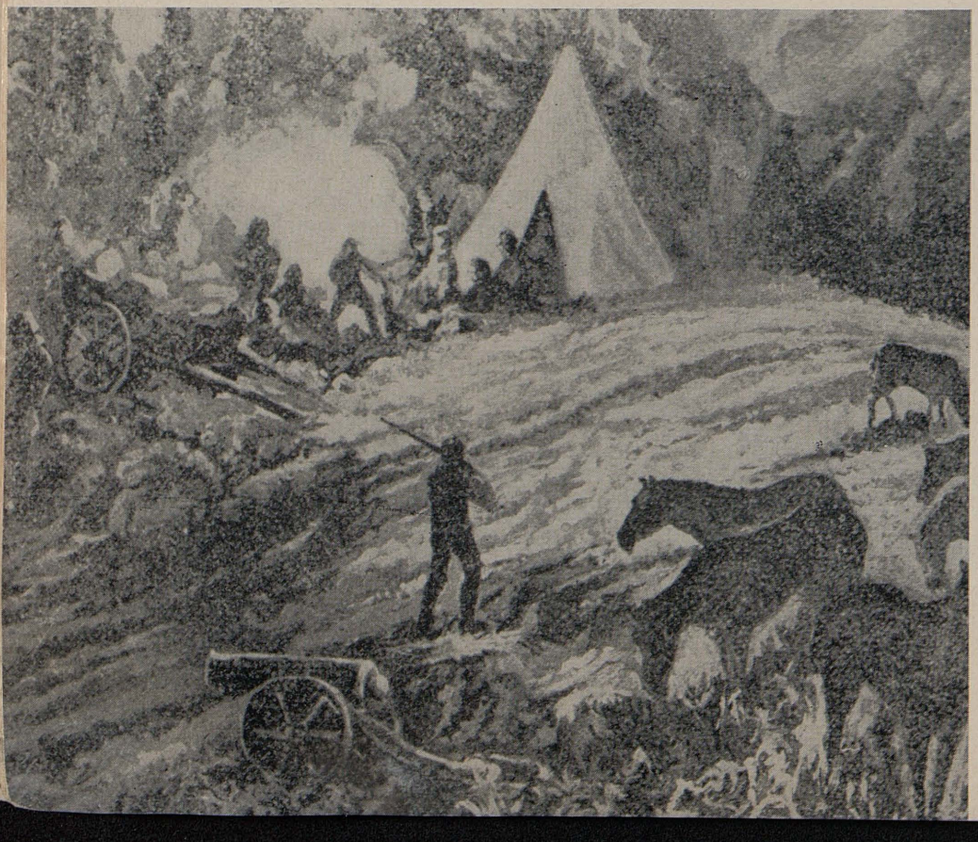
Preparatory to engaging the enemy at Los Angeles, Fremont started south to take possession of Santa Barbara. In the latter part of November, 1846, he left his camp in the San Juan Valley (in what is now Monterey County), with a nondescript company, several pieces of artillery and the usual wagon train. The battalion consisted of around 500 men.

From Monterey down, the hard winter rains had turned the trails into virtual quagmires; only 15 miles could be traveled in a day. Stream beds, which in summer were dry gorges, had now been turned into raging torrents by the winter storms. In many sections traces of the trail had been completely washed away. For want of food, the animals became too weak to travel and were left by the roadside; soon most of the battalion was marching on foot in the pouring rain. But in spite of the inclement weather and other hardships, Fremont and his men reached San Luis Obispo on December 14th, capturing the mission and the little settlement without incident.

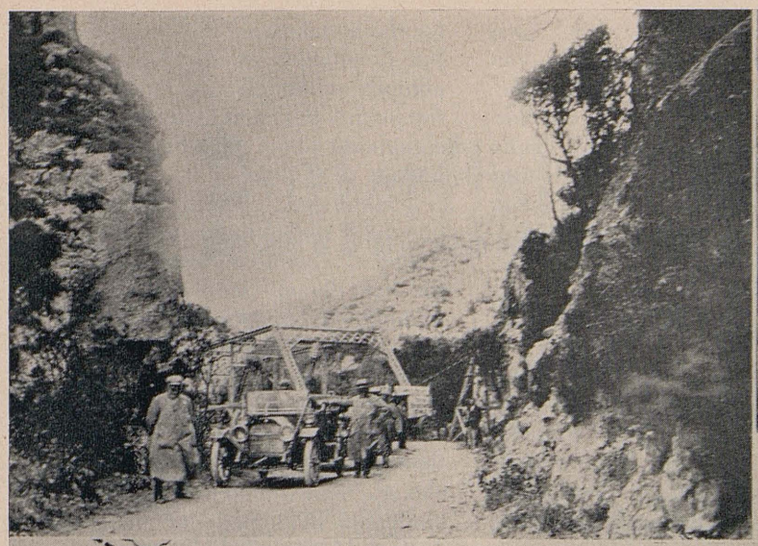
Later in December, at the suggestion of Don Juan Francisco Dana of Nipoma Rancho, they set up camp on the Rancho Tinaquaic (just above the present town of Los Olivos). Lord of Rancho Tinaquaic was Benjamin Foxen, an Englishman by birth. At the time of his marriage to Senorita Eduarda Osuna at Mission Santa Barbara, the ranchero had been rechristened William Domingo by the Padres; while the Indians nicknamed him "Don Julian," a name which he afterward retained.

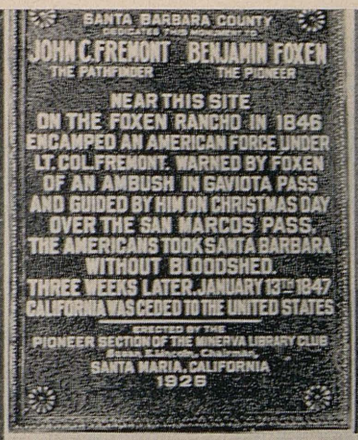
Foxen first came to Santa Barbara about 1818, as a merchant sailor and entered into partnership with Captain Jose De la Guerra, in the coastwise shipping trade. About 1832, he was given a grant of three leagues of land in a beautiful, long valley, now known as Foxen Canyon, a few miles northward beyond Gaviota Pass. Midway of the canyon, opening near Sisquoc on the upper end, and running southward for 14 miles, Don Julian built a handsome adobe ranch

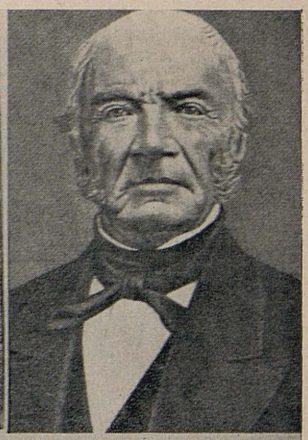
John C. Fremont and his men encamped on one of his famous marches
Courtesy California State Library

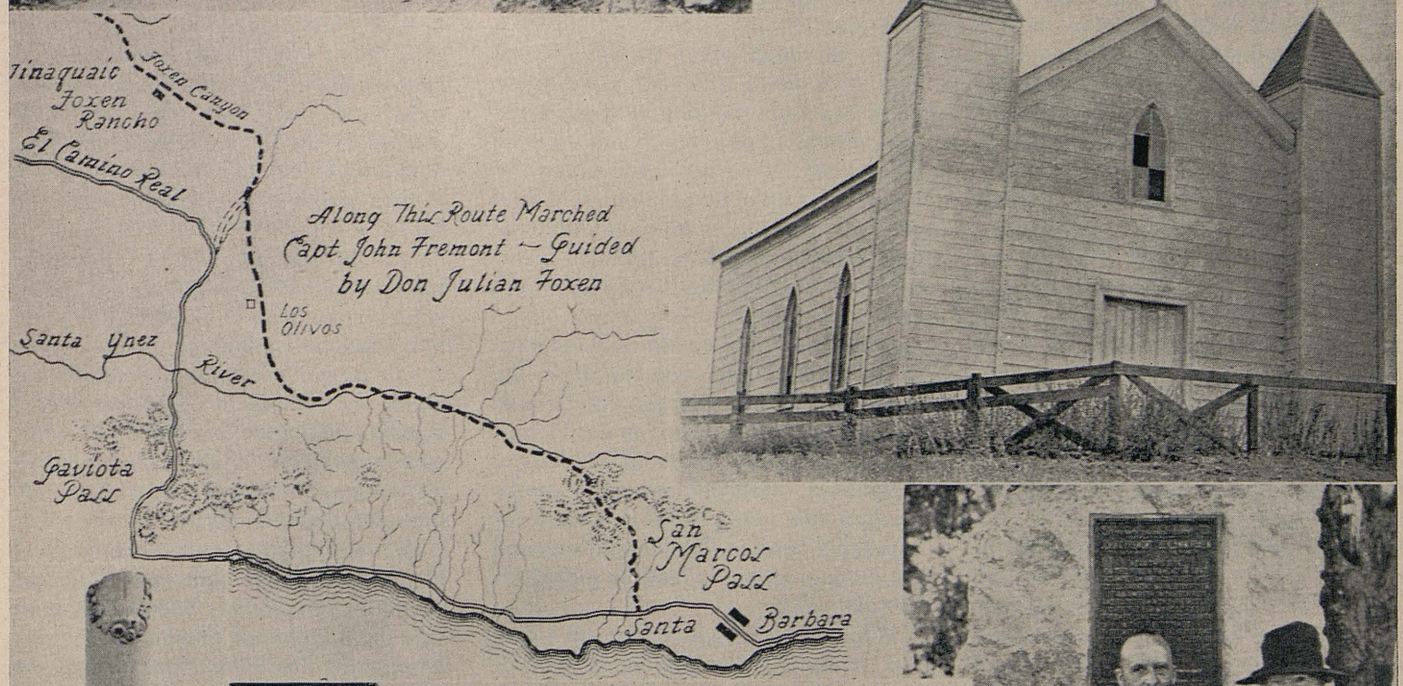


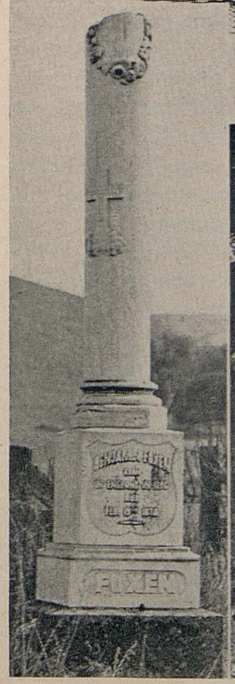
Scenes and characters figuring in dramatic story of San Marcos Pass and Gaviota Pass. UPPER ROW—Gaviota Pass in 1912. Inscription on Fremont-Foxen monument and Benjamin Foxen. CENTER ROW—Sketch map of old Foxen Ranch and route over which Foxen guided Fremont to San Marcos Pass. Restored Sisquoc church. LOWER ROW—Monument at grave of Foxen. Section of new San Marcos Pass State Highway. Mrs. Maria Antonia Foxen Cooper, daughter of Foxen; Benton Fremont, grandson of John C. Fremont; Mrs. Matilda Foxen Carteri, daughter of Foxen, at Fremont-Foxen memorial monument

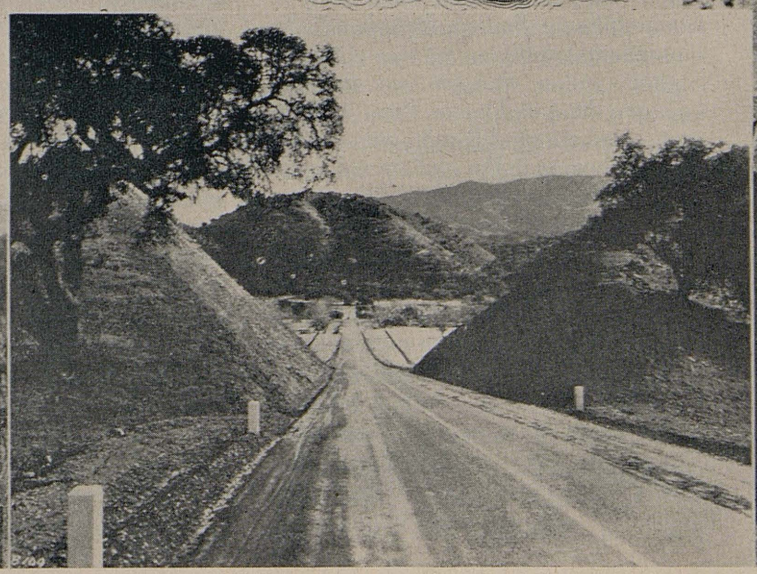












and Public Works 43

house, comparatively close to both the Purisima and Santa Ynez Missions.

Having reached middle age, Don Julian was a respected and influential figure in the community. Allied to the Californians by reason of his marriage into one of the prominent Spanish families, he had thus far taken no part in the contest for California, now looming ominously on the horizon. He might also have held aloof from aiding the Americans by reason of allegiance to his native England, whose warships hovered dangerously close to the California Coast.

For two weeks Fremont and his men had camped under the spreading oaks on Foxen's ranch, about two miles from the latter's home. The party had been well supplied with provisions by the generous Englishman, who provided Fremont with a quantity of flour and bran, also 40 head of cattle. The bran was mixed with water in a pan and drunk by the famished Indians; while the soldiers killed the cattle, and after filling their hungry stomachs, jerked the remainder of the meat.

During his stay on Tinaquaic Rancho, Fremont frequently rode down to the Foxen home, where he and Don Julian enjoyed many friendly chats together. One evening, approaching the third week of his encampment on the property, the dashing lieutenant, as usual, tied his white horse to a sturdy oak timber, standing upright in the ground in front of the hospitable ranch house. In the course of the evening's conversation with Don Julian, the lieutenant confided to the latter that he was planning to leave shortly for Santa Barbara.

"By way of Gaviota Pass we can be in Santa Barbara in two days," he said confidently.

Don Julian was thoughtful—visibly disturbed. Finally he brought himself to speak the thing that had been haunting his mind for days.

"You must go back and try to reach Santa Barbara by some other course," he warned Fremont. "The Californians are laying for you in Gaviota!"

"But that's impossible!" Fremont asserted vigorously. "A delay would prevent me from meeting Stockton in the San Fernando Valley. It might change the whole course of the war!"

Then, knowing full well the vengeance that would be wreaked upon him by the infuriated Californians, Don Julian disclosed to the discouraged Fremont, the plan of the enemy. Gumesindo Flores, comandante at Santa Barbara and Augustin Janssens of Santa Ynez had assembled every able-bodied man in the district, several hundred in number. They were waiting for Fremont's battalion to move through the narrow, sheer-walled Gaviota Pass, where they had planned to trap the commander and his men and annihilate them.

The servants and everyone at the rancho were in sympathy with the plan, Foxen stated, with exception of his wife. For days the unhappy Senora had pleaded with her husband to warn the American officer, so the slaughter might be averted.

On the high peaks of the Gaviota Pass, Don Julian revealed, the Californians had been standing sentinel, marking every move of Fremont and his men. They lined the "Pass of the Gulls" for more than a mile, he went on to explain, watching for the company to pass the spot where it would be hemmed in between two sheer walls of rock, in a canyon so narrow that a wagon could scarcely pass between the high perpendicular cliffs. Here, upon the advancing "Gringo" force laboring through the narrow defile, the Californians would hurl down tons of rock, loosened by blasts of gunpowder. Men and horses would be crushed like ants; the pass would be effectively blocked. Those who survived the barrage of rock would be picked off by rifle bullets.

While Foxen spoke, Fremont's face was tense. "Is there no other way of reaching Santa Barbara from here?" he queried anxiously.

Don Julian thought a moment. "There's the San Marcos Pass," he suggested hesitatingly. "But it's only a wild, narrow horse trail; I'm afraid you'd never get your wagons through."

"We'll have to try it!" Fremont uttered with determination. "There's no other way!"

Meanwhile in the Gaviota Pass Region, nights were given over to feasting and reveling—so confident were the Californians of success. When Fremont broke camp, the sentinels on the cliffs, assuming that the battalion was headed for Gaviota, galloped off to advise Janssens. But their wait was a long one; for the battalion led by Don Julian and his 17-year-old son Guillermo, turned abruptly to the left after emerging from the mouth of Foxen Canyon, instead of continuing across the valley of the Santa Ynez.

Past the site of the present town of Los Olivos Foxen led the party, following the Santa Ynez River toward the wall of the San Rafael Mountains in the east, to begin the assault of the wild, dangerous San Marcos Pass. A southeasterly storm was raging while Fremont and his company labored to open a path for the wagons. Foxen and his son worked shoulder to shoulder with the men, using axes and crowbars to hack and chisel the semblance of a road over the perilous heights. Men worked until they fell with exhaustion; several died from exposure. Heavily-laden pack animals slid over the rocks and fell down the precipices, blinded by the driving rain. Three hundred horses lay dead along the wayside—victims of the terrific struggle with the forces of nature.

On Christmas Day, 1846, the summit was reached. Don Julian now returned to his rancho, leaving Guillermo to guide the American pathfinder and his men down the precipitous face of the mountain to the plain below. The descent was equally laborious: More than a hundred horses were lost. Artillery and baggage were strewed along the way as on the trail of a departed enemy.

But the bright, sunny morning of December 27th brought new hope and strength to the weary, footsore battalion. The men gathered themselves into an appearance of order and made their way into Santa Barbara. Just as Foxen had predicted, almost to a man the male population was assembled in the Gaviota Pass, awaiting Fremont's company; the rest of the townspeople were attending mass. Thus, thanks to the courage and ingenuity of two great men—Foxen and Fremont—the Stars and Stripes were raised over Santa Barbara without bloodshed.

The dramatized narrative is based on facts and information gleaned from the following sources:

Michael J. Phillips: History of Santa Barbara County. Clarke Publishing Company, Los Angeles, 1927.

Laurance L. Hill: Historical pamphlet, Santa Barbara. Security-First National Bank, Los Angeles, 1930.

Kenneth C. Adams: California Highways and Public Works, August, 1936.—A. F. S.

Chapter X

The Butterfield Overland Mail

With statehood in 1850 the people of California were no longer satisfied with the monthly mail service between the East and the West conducted by the Pacific Mail Steamship Company. Pleas for a new overland service began to appear daily in the newspapers. With the same purpose in mind, the State's first senators, William M. Gwin and John C. Fremont presented resolutions and petitions in Congress.

Finally in April of 1850, Congressman R. H. Stanton championed the cause of the isolated Californians. In his report on post offices and post roads, the congressman recommended that something be done immediately to relieve the critical situation.

Slowly and methodically the Federal Government took the first feeble steps to establish overland communication, when on April 25, 1851, a contract was granted to Absalom Woodward and George Chorpenning to carry the mails monthly between Sacramento and Salt Lake City, with a single team making the entire trip. No provision was made for passenger service.

In the South, the communication service was equally deplorable. Although the Pacific Mail Steamship Company drew an annual government subsidy of $700,000 for carrying a monthly mail between New York and San Francisco, Southern California suffered the most exasperating delays in receiving eastern mail. Letters from New York were sometimes seven or eight months reaching Los Angeles, due to the inefficiency of the Pacific Mail service.

What the Californians were really striving for was to get Congress to pass a Pacific Railroad Act. In 1856 four such bills were introduced, all of which failed to pass. Finally, in February, 1857, a bill relating to improved western communication again came to the congressional floor, only to meet with disagreements between the House and the Senate. After a compromise, however, on March 3, 1857, Congress finally passed the measure, and the Post Office Appropriations Bill was subsequently approved by the President.

Under the terms of the act, the Postmaster General was authorized "to contract for the conveyance of the entire letter mail from such point on the Mississippi River as the contractors may select, to San Francisco, in the State of California." The measure further stipulated "that the contract shall require the service to be performed with good four-horse coaches or spring wagons, suitable for the conveyance of passengers as well as the safety and security of the mails."

While the question was being decided as to who would be given the contract and what route the stages would follow, the already existing mail line over the old Santa Fe Trail was extended to California by United States Postmaster General Aaron V. Brown. In June of 1857 a contract was awarded to James Birch, a well-known stageman of the West, and former President of the California Stage Company, to operate what was officially called the San Antonio and San Diego Mail.

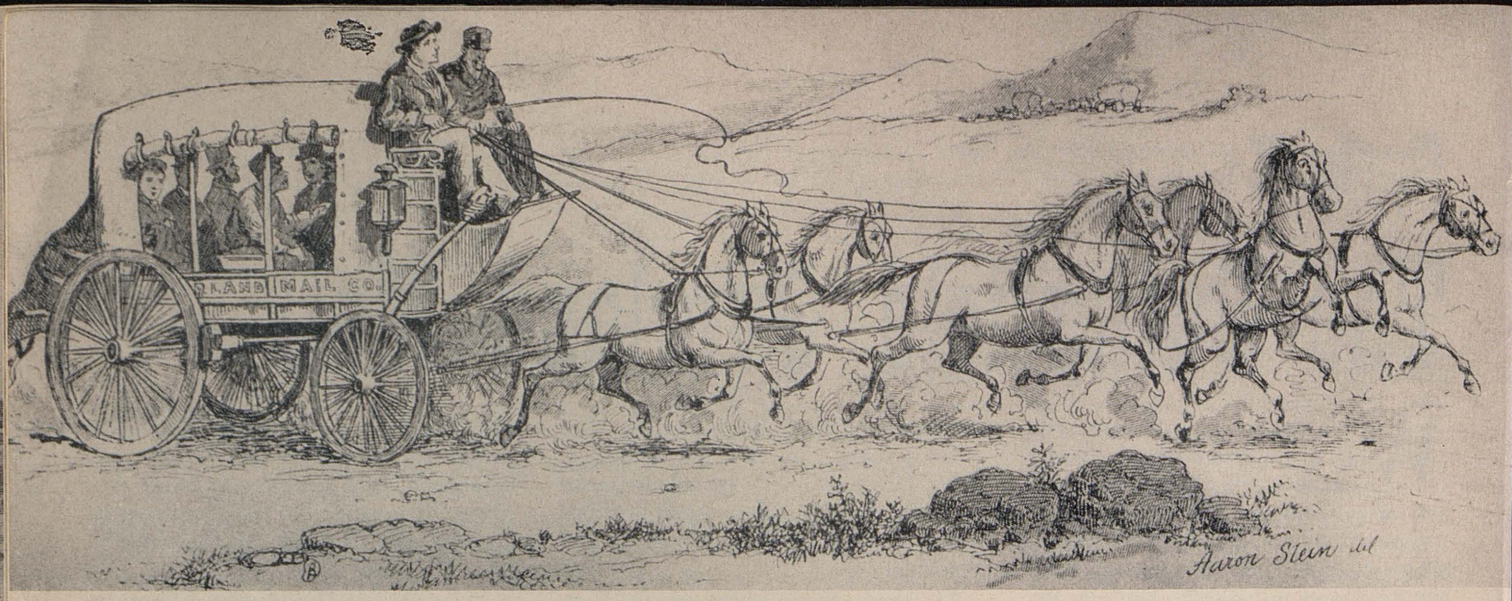
The new line would provide semi-monthly service on a 30-day schedule between San Antonio and San Diego, with Birch receiving $150,000 per year in compensation from the Government. In less than 30 days, Birch had fulfilled the terms of his contract by dispatching the first mail west from San Antonio. Mules instead of horses were used to pull the coaches. Because of this fact, and also since pack mules were used to transport the mails over the final 180-mile stretch from Fort Yuma to San Diego, Birch's new line was derisively dubbed, the "Jackass Mail." Even though the efficiency of the line was much criticized, it managed to make the 1,476-mile trip in less time than the contract called for. While it did relieve the communication problem to some degree, it was still far from adequate to meet the demands of the rapidly growing West.

Meanwhile in Washington, bids were coming in right and left for the contract to operate the new overland mail service voted by Congress. Chief among the bidders was John Butterfield of New York, an associate of William G. Fargo and William B. Dinsmore. Butterfield was a self-made man, who had risen from a common stage driver to become the founder of the American Express Company in 1850. As a fellow New Yorker, he was a personal friend of President Buchanan; and it was undoubtedly due to the President's influence that Butterfield received the contract from Postmaster General Brown.

At first the route selected by Brown caused much controversy, as when put into operation it would be the longest mail stage route in the history of the world. In spite of Brown's contention that it would be found safe and usable during every season of the year, there were many who scoffed, branding it as a "speculation scheme."

On the lower Mississippi River, the route would have two eastern terminals —one to be St. Louis, the other Memphis—which happened to be the Postmaster General's home town. At Fort Smith, Arkansas, the routes from the two places would converge, and continue on together from there. The western portion would pass through Indian Territory to Colbert's Ferry, Texas, on the Red River; thence in a southwesterly direction across Texas to Franklin, and westward across the southern part of New Mexico Territory to Fort Yuma, California, on the Colorado River.

Within the State of California, the Butterfield Trail was to dip southward from Fort Yuma into Mexico;



THE CALIFORNIA OVERLAND STAGE—From A. L. Stimson's History of the Express Business. Courtesy, Stanford University Press

it would reenter the State near the New River (in what is now southern Imperial County), and proceed to Los Angeles by way of Warner's Ranch. It would not lead through the San Bernardino Valley, however, after leaving Warner's Ranch; but would reach Los Angeles by way of Temecula, Sierra Rancho and Chino. From Los Angeles the trail was mapped to run north through the San Joaquin Valley to Fresno City (approximately over what is now U. S. Highway 99); thence over the Pacheco Pass (State Sign Route 152), and through the towns of Gilroy and San Jose, terminating at San Francisco.

There was little time to lose, since the service would begin on September 16, 1858, one year after the contract was signed, and many obstacles were yet to be overcome. Butterfield drew heavily on his years of experience in the communication service and set to work to organize the new line. He arranged for rail transportation from St. Louis to Tipton, the western rail terminal in Missouri. From Tipton to San Francisco, the trip would be made entirely by horse-drawn stages. One hundred and thirty-nine stage stations were erected, averaging about 18 miles apart. The buildings were hastily thrown up, constructed of any type of material the locality afforded; some were of lumber, others of stone and adobe. In the desert areas, wells were sunken at tremendous cost and effort; in places without water, it was hauled in.

Next the veteran stageman turned his attention to the type of coaches to be used. On rough, mountainous stretches he selected the "Celerity" or mud wagon. Concords were much preferred, but Troy coaches would have to serve for the present. Mules and horses were acquired by the hundreds—wild mustangs rounded up on the range and broken for service. Hiring the various types of personnel was another major task: Division managers, station attendants, hostlers, stage drivers and shotgun messengers. To his drivers, all specially picked men, John Butterfield gave the following admonition: "Remember, boys, nothing on God's earth must stop the United States mail!"

As the months of 1858 flew by, Butterfield and his associates worked feverishly to meet the September 16th deadline. So efficiently had they managed the project, that the eastbound stage left San Francisco one day ahead of schedule; and on the morning of the 16th, as stipulated in the contract, the first mail marked "Per Overland Mail" left St. Louis for the West. There were only two bags of mail and the only through passenger was young Waterman L. Ormsby, a special correspondent for the New York *Herald*.

In a series of newspaper articles written about the trip, Ormsby described the coach as sturdy, with the body resting on thorough-braces. The three seats could be let down to form one bed, accommodating four to ten people. Travel continued day and night, with brief stops to change the four-horse teams and for meals. Drivers were changed every two or three hundred miles. It took some time to get accustomed to the bumping and jolting over the rough road, the rocks and the log bridges, Ormsby wrote; but by the end of the third day he was "quite oblivious" to the discomfort of stagecoach travel.

Once across the Colorado River and into California, the Butterfield route traversed approximately the same old desert trail across Imperial Valley that was first opened by Juan Bautista de Anza in 1774, and later followed by hundreds of emigrant wagons. Warren F. Hall, a veteran stageman, endowed with much energy and initiative, was in the driver's seat as the first overland mail stage arrived at the Indian Wells Station on Tuesday, October 5, 1858. From there the route continued northwest over the desert wastes for 16 miles to Hall's Well. Not until Carrizo Creek was reached, 16 miles northwest of Hall's Well, did the weary traveler glimpse the first vestige of vegetation.

From Carrizo Creek the stage headed northwest through the heavy sand for Palm Springs, thence to Vallecito (Little Valley) in what is now San Diego County—a veritable oasis in the desert. Eighteen miles northwest of Vallecito, was the San Felipe adobe station, situated close to the road, on the west bank of San Felipe Creek (about 300 yards north of the present Julian-Kane Springs road, State Sign Route 78).

At Warner's Ranch, Ormsby had the feeling of being back in civilization. Chino Ranch came next and then "The City of the Angels," with its 6,000 inhabitants, most of whom were Mexicans and Indians. The next stop was Cahuenga, 12 miles northwest of Los Angeles, the junction point of the coast and in-

land routes. (The site is an historic one, as it was at old Cahuenga Rancho that the treaty was signed by General Andres Pico and Lieutenant Colonel John C. Fremont, ending the War with Mexico.)

Fourteen miles northwest of Cahuenga, the abandoned Mission of San Fernando, used as a Butterfield station, provided Ormsby with a glimpse into the romantic days of the Spanish regime. Then came the San Fernando Pass, which had long presented a formidable barrier to all who crossed it, including the Butterfield Overland Stage. From the summit of the pass, the mail route wound down the canyon through what is now Oak Glen, much as does the present highway, U. S. 99.

Ascending Tejon Pass, the stage made its next important stop at Fort Tejon, the military post established in 1854, for the purpose of guarding the pass and controlling the Indians. From the fort, the Butterfield route followed a winding course down the steep grade through the Canada de las Uvas (Grapevine Canyon), crossing and recrossing the creek as it made the descent for six miles into the southern extension of the great basin of the San Joaquin Valley. At the various small stations the driver stopped just long enough to water his horses and at some places teams were changed.

Visalia was the next important stop. The little town of 500 inhabitants was the largest on the inland route between Los Angeles and Gilroy, a distance of 300 miles. The excited townspeople were on hand to greet the arrival of the first westbound overland stage as it swung into the station at exactly 11 o'clock on the night of October 8th. Over a foaming glass of lager the correspondent enjoyed a chat with several fellow New Yorkers who had settled in the vicinity. Then precisely at 11.50 that same night, the mail coach was on its way again, rolling swiftly along toward the little settlement of Fresno City (then located on the east bank of Fresno Slough, a mile and a half north of the present town of Tranquillity).

From Fresno City to the next stop at Firebaugh's Ferry, a distance of 19 miles, the driver traveled at breakneck speed. Over the Pacheco Pass to Gilroy, on the night of October 9, 1858, Ormsby experienced the wildest ride of his young life, as he sat in the box beside the driver "Tate" Kinyon.

The old adobe stage station at Warner's Ranch in San Diego County. From the book, Romance of the Highways of California, by Commander A. W. Scott

"Why don't you put on the brake?" he queried anxiously, as the stage, rocking and swaying, rumbled down the steepest grade at top speed.

The driver rolled a wad of tobacco in his mouth and replied calmly: "You got 'a keep the wheels turnin', or they'll slide!"

By the time the stage reached Gilroy, late on the night of October 9th, it had actually made 12 miles in one hour and five minutes. By 1 p.m. it was in San Jose, driving the last lap of the trip in the darkest hours of the night. At sunrise on Sunday morning, October 10, 1858 (over what is now the Coast Highway, U. S. 101), the first westbound overland stage was heading up the Peninsula for San Francisco. At exactly 7.30 a.m., just 23 days, twenty-three hours and a half since it set out from St. Louis, the stage of the great Butterfield Overland Mail was clattering over San Francisco's streets on its way to the station at Portsmouth Square. The driver sounded a shrill blast on his horn to announce to the townspeople the arrival of the first United States Mail over the overland route.

All through 1859 and 1860, the Butterfield line continued to grow in public favor. Over the lonely prairies and the silent deserts, its drivers and passengers resisted Indian attacks, weathered cloudbursts and sandstorms. Travelers accepted the rough and tumble of stagecoach travel without complaint; and nearly every man complied with the company's orders by equipping himself with a Sharp rifle; a Colt navy revolver and two pounds of balls; a knife and sheath. Each coach carried three sacks of letters, averaging 170 pounds in weight and a newspaper bag of about 140 pounds.

While the South enjoyed the efficient mail service made possible by the Butterfield line, the people of the North were protesting bitterly over the slow, wagon mail service provided by George Chorpenning. The result was that several attempts were made to cancel Butterfield's contract in favor of a more northerly route; but all attempts failed.

Then came 1860; storm clouds were gathering over the Nation. The old question of slavery between the North and the South had become a bitter issue, threatening open conflict. Seven states had already seceded from the Union. The problem of communication and transportation between the East and the West now became a major concern. The long round-about southern route versus a more central northern route became a hotly contested issue. The matter was finally settled, when on March 2, 1861, Congress voted that mail service on route 12578 be discontinued; and that the Butterfield service be transferred to the central route. Thus the old southern route

of the Overland Mail came to a glorious end.

More than any other institution, the Butterfield Overland Mail contributed to the development and expansion of the great Southwest. A quarter of a century after its abandonment, the old Butterfield Trail continued to be a main artery of travel for cattlemen, homesteaders and traders. Still later it served as a guide for the railroad builders, who, in many sections, established their grades over the rutted tracks of the old trail. Today, the best all-year route for automotive travel between St. Louis and San Francisco approximates the line of the old stage route, over which Uncle Sam's mail first rolled westward more than 90 years ago.

As sources of information, the author acknowledges:

Walter B. Lang: The First Overland Mail, St. Louis to San Francisco, 1858-1861. Printed by the Roycrofters, New York, 1940.

Lyle H. Wright and Josephine M. Bynum, editors, The Butterfield Overland Mail, by Waterman L. Ormsby. Huntington Library, San Marino, California, 1942.

Oscar O. Winther: Via Western Express and Stagecoach. Stanford University Press, Stanford University, California, 1945.

Roscoe P. Conkling and Margaret B. Conkling: Butterfield Overland Mail, Vol. 2-3. Arthur H. Clark Company, Glendale, California, 1948.—A. F. S.

Chapter XI

Crossing the Sierra

By Stewart Mitchell, *Principal Bridge Engineer*

Traffic arteries connecting the Central Valley and San Francisco Bay with the East have played an exceedingly important part in the growth and development of California. All of them must cross the rugged mountain barrier which stands along the State's eastern border. Since no highway or railroad was ever built across the higher portion of the range extending south from Yosemite National Park, there is a gap of about 150 miles that separates the "northern" and "southern" routes to California. It is these northern routes that are covered in this article. They were particularly prominent during the period of settlement and early growth and are still a very vital factor in the economic and social life of the State.

Plodding toward California in their wagon trains the immigrants faced one obstacle after another. Whenever the going was difficult they spoke of it as "seeing the elephant." The crossing of the last mountain barrier between them and California usually provided the biggest elephant of all. Now, however, the almost trackless routes they followed have become graded roadways supporting a smooth ribbon of pavement. The ox carts have been replaced by speedy, smooth-riding automobiles and what was a slow, toilsome and hazardous journey is now an easy jaunt, free from discomfort if not altogether from hazard. After 100 years of travel across the Sierra the "elephant" is no longer to be seen.

The immigrants generally referred to this last great mountain barrier as the "Sierra." To be exact, the mountains of Lassen Volcanic National Park and those to the north of it are part of the Cascade Range. This range consists of high plateaus capped by volcanic cones and lava ridges through which rivers like the Pit and its tributaries have cut deep and winding paths. Two great volcanic cones, Mt. Shasta and Mt. Lassen, are landmarks which have guided travelers since the earliest times. On the other hand, the Sierra Nevada, which stands squarely across the more direct east-west routes, is a tilted block of the earth's surface surmounted by remnants of an older mountain range. The upraised, easterly edge of this block forms steep escarpments and rises to a serrated crest which gave the range its name. The surface of the block, which slopes gradually down toward the Central Valley, has been carved by stream and glacier into an irregular pattern of canyons and intervening ridges.

Pioneer Exploration

The first settlers and their guides discovered and opened up trails along all the passable routes through the mountains—and some which hardly deserved the term "passable." The "pass" through which a trail crossed the summit usually bore the name of its discoverer. However, the location of the route was influenced by other factors than the existence of a particularly low gap or pass at the summit. Its directness toward a favored destination was, of course, a prime factor.

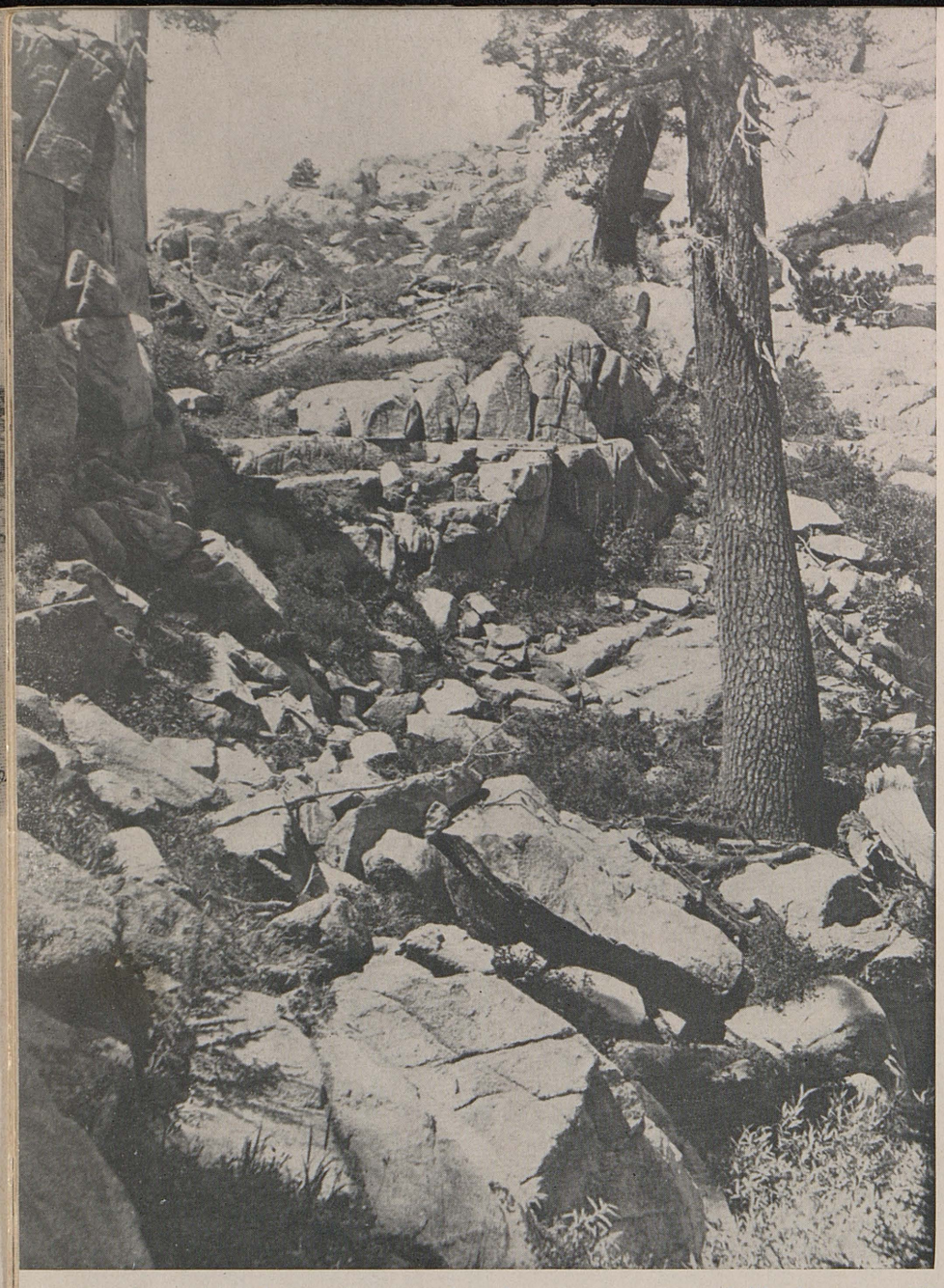
Natural approaches leading to the main summit had much to do with the location of the route. The early immigrants headed for one of the principal rivers of the eastern slope of the Sierra Nevada, either the Truckee, Carson or Walker. They followed the course of the river to the final escarpment at the summit and scrambled up it as best they could. Those who took more northerly routes through the Cascades could avoid the steep escarpment of the Sierra but had to travel a much longer way through rugged, dry and generally inhospitable country.

Without means to materially improve the roadway or to bridge canyons and streams the immigrants, after leaving the upland meadows of the Sierra, stuck to the top of a convenient ridge as long as possible and slid down the end of it when it ran out at a stream junction. They were always concerned with finding a reasonable supply of grass and water along the route but even though this is no longer a factor, the modern highways still follow, with but slight deviation, the trails of the pioneers.

The First Roads

While natural features of the terrain influenced the location of routes across the mountains, their development and relative importance were influenced by the events that took place and conditions that arose during the 100 years of California's statehood.

One might, on first thought, begin the history of roads across the Sierra with the year 1841 when the first train of immigrants, the Bidwell-Bartleson Party, crossed with pack animals in the vicinity of the present Sonora Pass. This party which followed up the West Walker River to the summit opened no trail across the mountains that was, or could be, followed by others. It is more fitting to begin with the year 1844 when the Stevens-Murphy-Townsend Party piloted by Caleb Greenwood, the 80-year-old "mountain man," was the first to bring wagons over the mountains into California. Furthermore, this party, which followed up the Truckee River and crossed over what is now known as Donner Summit, blazed a trail that was followed by immigrant wagons for the next two years. Then the war with Mexico put a temporary stop to immigration; the ill-fated Donner Party being the last wagon train to reach the eastern face of the Sierra in the late fall of 1846.



It took stout-hearted men and women and sturdy wagons to survive trails like this one over Kit Carson Pass in Alpine County. This photo of the route of pioneers was taken by Fred Werner of Sutter Creek and presented to Sutter's Fort by Mrs. Norma E. Werner-Ball of Jackson

Flood of Immigration

The discovery of gold in California, following immediately after the Mexican War, started a veritable flood of immigration to California. Setting out from the banks of the Missouri River in the spring of 1849, wagon trains plodded across the plains and mountains for nearly 20 years. Then the first transcontinental railroad was built, providing a more comfortable and rapid means of travel that superseded the picturesque prairie schooner.

Although the route along the Truckee River was favored by the earlier immigrants, the majority of wagon trains on reaching the Sink of the Humboldt, during the first years of the Gold Rush, headed for the Carson River and crossed the range via Carson's Pass. Fremont's report which told of crossing that pass in 1844 had called their attention to this route. Furthermore, many avoided the Truckee route because of the unfavorable publicity it had received as the result of the Donner Party's misfortune.

The establishment of a trading post at Mormon Station (Genoa) in Carson Valley probably had a great deal to do with drawing immigrants to the Carson Pass route. But whatever the cause it became the heaviest traveled route into California for the first three or four years after the discovery of gold.

Early Promotion

Hope of avoiding the known hardships encountered along either of these routes and efforts to divert traffic toward particular areas resulted in new routes being scouted out. These were advertised by their discoverers and proponents as being preferable to all others. The merits of a particular route were influenced by what they, or the community they represented, hoped to gain if immigrants were diverted that way.

The earliest case of this kind was Peter Lassen's "Horn Route" over which he diverted many immigrants to his trading post at the mouth of Deer Creek in Tehama County. The trail he blazed left the Humboldt at Lassen's Meadows (near Imlay, Nevada) and went northward over the Applegate Trail to Oregon as far as Goose Lake in Modoc County, crossing the Warner Range by Fandango Pass instead of Cedar Pass on the present state highway. Then back again via Big Meadows (now Lake Almanor) to the destination he had chosen for them.

A glance at the map will show the humor, or tragedy, connected with the name "Lassen's Cut Off." Few traveled over this route after the year 1849 but many suffered terrible hardships before the nature of the route became generally known.

Sonora Immigrant Road

Another ephemeral wagon route was the "Sonora Immigrant Road." It is told that in 1853 one G. W. Patrick, Mayor of Sonora, a man of considerable persuasive power and not too much regard for the truth, influenced a number of immigrants to follow a route leading directly to the town of Sonora. This route followed the West Walker nearly up to its source and crossed the main summit of the Sierra some seven or eight miles south of the present Sonora Pass. For a season, immigrant parties struggled painfully over a route which today can be traveled only on foot or horse.

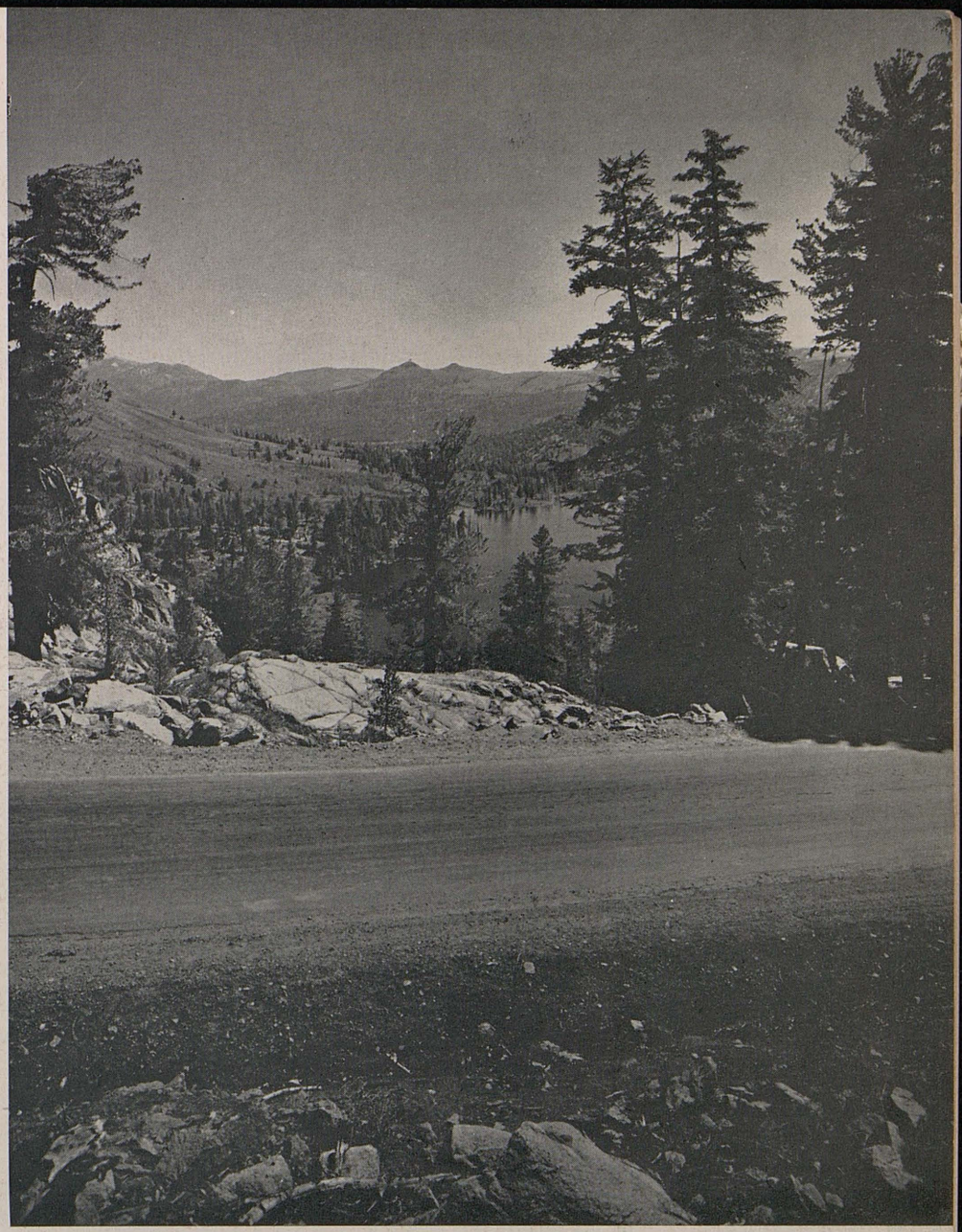
Early records refer to a pass discovered by "Major" John Ebbetts. Geo. H. Goddard, who knew the country as well as any surveyor of his day, referred to it as a route of great promise—probably the best one for a transcontinental railroad. Anyone who has driven over the present Ebbetts Pass highway (Sign Route 4) will wonder at this.

In 1853, the "pass" was pointed out to Goddard by Ebbetts from a mountain near Antelope Valley (probably Antelope Peak) from where it is certain they could not have seen the present pass. Anyhow, no immigrant train ever used what is now called Ebbetts Pass, which is on the stage road built later to reach the mining region of Silver City. However, an immigrant road starting from Murphys in Calaveras County was constructed and used extensively following its completion in 1856 and again during the summer of 1857. This road followed the route of Sign Route 4 to Hermit Valley but left it there and crossed over the divide via Faith and Charity Valleys into Hope Valley where it joined the Carson Pass Road.

Choice of Routes

Immigrant trains followed the early trail along the Humboldt River. At its sink, just below the present town of Lovelock, they had to make a decision. A 40-mile desert lay between them and either the Truckee or the Carson Rivers with a rendevous in either Truckee Meadows (where Reno is now located), or in Carson Valley. On reaching either place they had, by the year 1853, a choice of routes over the Sierra. The particular route chosen depended on the settlement or mining area they had picked on as their final destination. The popularity of the route increased or declined with the fortunes of the area it served and also with the ability of its proponents to convince immigrants of its real or fancied advantages. The pioneer spirit manifested by the early settlers in promoting their local interests matched the better organized efforts of today's chambers of commerce and other pressure groups.

From Truckee Meadows most of the travel continued up the Truckee River as far as the present town of Verdi. The Stevens-Murphy party followed the canyon of the river to Donner Lake, as does the present highway (U. S. 40), but the trains that followed them turned from the river and climbed the "Dog Valley Grade" to the rolling plateau country above. This road, used and improved through the years, was taken over and maintained as a state highway until the present highway was built in 1925.



Present day Carson Pass Highway—Red Lake is in background. Pioneer route shown on opposite page was just behind trees on right

On climbing the grade the immigrants had a choice of two routes. One was the Truckee or Donner Pass route; the other a route that followed up the Little Truckee River past Weber Lake to Henness Pass. The former road is, in a general way, followed by U. S. 40; the latter by an unimportant county road. It was, however, the more direct road to the Yuba River mining regions and immigrants used it extensively in the late 'fifties.

Beckwourth Pass

Those whose destination was in the basin of the Feather River turned northward at Truckee Meadows and crossed Beckwourth Pass into Sierra Valley. This pass is now crossed by the Western Pacific Railroad. Jas. Beckwourth led the first wagon train this way in 1852 and in that train Ina Coolbrith, the first poet laureate of California, rode as a little girl. From Sierra Valley several routes diverged to the mining areas along branches of the Feather. One road led via

Quincy (American Valley and Bucks Ranch), another via Mohawk Valley and La Porte. A pack trail also crossed Yuba Pass to the North Fork of the Yuba River and Downieville but the first wagon road into that region was via the Henness Pass road and Goodyears Bar.

Abortive efforts were made to divert traffic over other routes crossing the main Sierra. Two of these crossed the Carson Range to Lake Tahoe. The "Placer County Emigrant Road" followed down the Truckee River and up Squaw Valley to the summit, then along the ridge south of the North Fork of the American River to Yankee Jims and Forest Hill. The other route crossed Lake Tahoe to McKinney's climbed to the summit, crossed the Rubicon River and followed the ridge to the south of the river to Georgetown. Although used by immigrants for short periods, neither of these routes became popular because of their indirectness compared to other routes. Portions of both routes are now followed by county roads.

Johnson's Cut-Off

As previously stated, much of the travel during the first years of the Gold Rush went via the Carson River and crossed the mountain via Carson Pass. In 1852, Col. J. B. Johnson opened a route across the mountains between Carson Valley and Placerville which, with a few deviations from its original location, has become highway U. S. 50. Johnson's "Cut-off" gradually increased in popularity and importance, diverting travel from the Carson Pass road. Its chief advantage was lower elevation with relative freedom from snow in winter. This largely accounted for it being chosen as the route of the transcontinental mail and passenger stages.

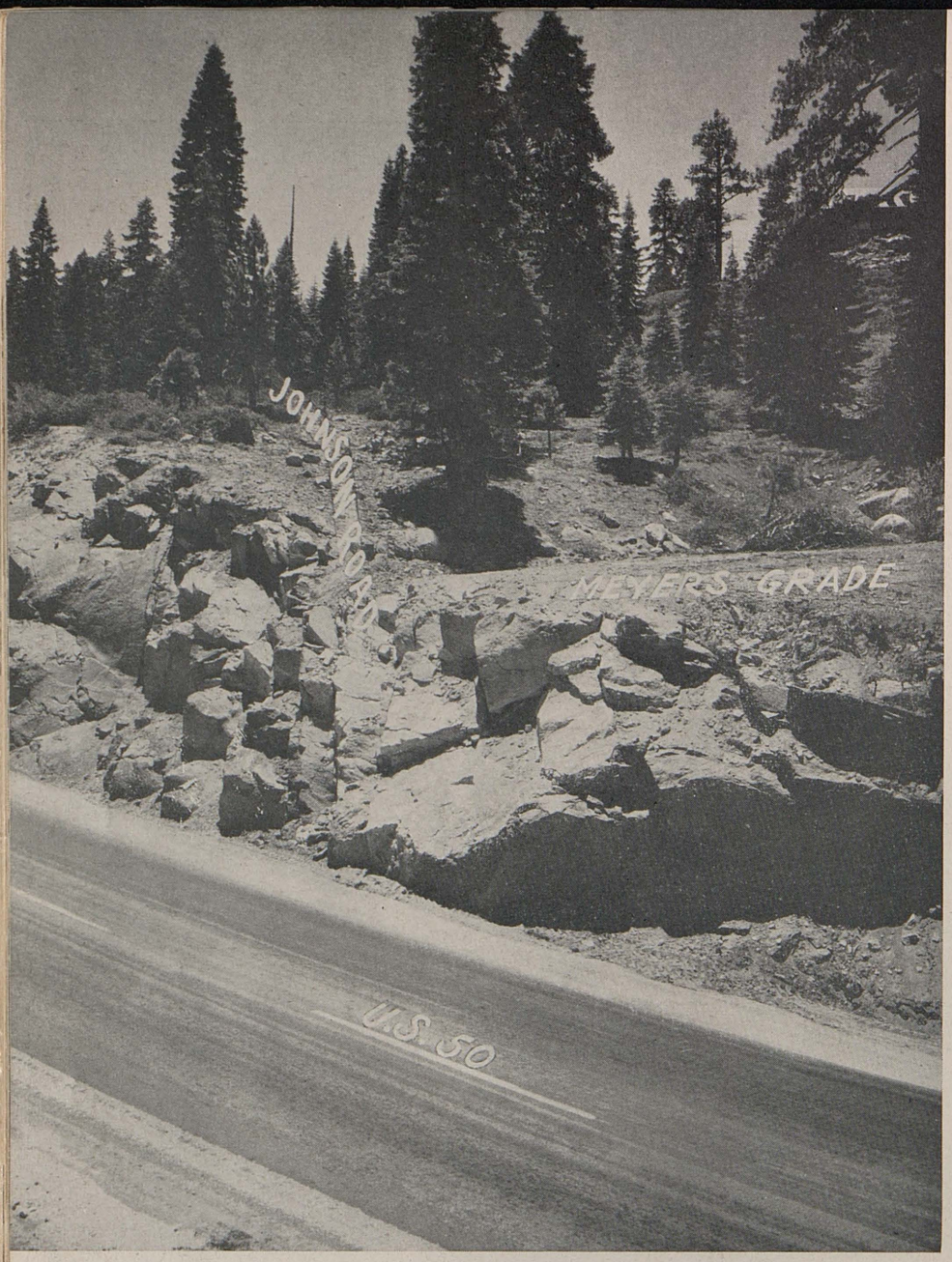
As the more northerly mining regions in the Sacramento Valley developed, there arose a demand for a more direct

route from the Humboldt to the mining area around Ft. Reading and Old Shasta than either Lassen's route or the more southerly routes just described. A man named Noble scouted a trail which left the Humboldt at Lassen's Meadows and followed the Lassen or Applegate Trail to the Black Rock Desert. From there, however, he turned west along the edge of the Smoke Creek Desert and crossed over the hill into the Honey Lake basin. Going west from Susanville the route crossed the plateau at the head of Susan River and joined the Lassen Park highway just south of Manzanita Lake. From there it followed, approximately, the location of Sign Route 44 to the Valley.

Era of Trails

The decade of the 'fifties may be called the era of trails. It is true that some work was done by individuals for the purpose of collecting tolls or by organizations interested in improving the primitive condition of their local roads. However, no public funds for the purpose could be raised until toward the end of the decade. Such work as was done was of the order of clearing away brush and trees, removing rocks, building bridges and sections of causeway, etc. Even the stage roads between the valley and mining camps scattered throughout the mountains were the cause of endless complaints by travelers because of dust in summer, mud in winter, and general roughness of the roadbed.

However, it must not be thought that the people of California accepted the conditions without protest or made no effort to improve them. From the beginning the Americans devoted a great deal of energy toward better means of transportation across the Sierra. It was natural that their first choice would be the construction of a transcontinental railroad. Railroads had already proven their supe-



A MEETING OF THE OLD AND NEW—Straight ahead is the old Johnson Cut-off emigrant trail which climbed 1,000 feet from the floor of Lake Valley to Echo Summit in three-quarters of a mile. To the right is the two and one-half mile Meyers Grade, the lower hairpin turn of which has been cut off by the modern highway of U. S. 50

riority as a rapid and economical method of transportation and were fast supplanting the stage and canal boat throughout the East.

By 1850 a network of tracks extended as far west as Chicago and financing appeared to be the only obstacle in the way of extending a track to the Pacific Coast. The value of such a railroad seemingly was accepted by all. Federal assistance was needed but this was withheld for another decade because of sectional rivalry and political jealousy.

Congress Orders Survey

The contending sections and proponents of various routes could, and did, agree on the need for better information on the country through which a railroad would have to be built. As a result, an act was passed by Congress in 1853 which provided for "A careful reconnaissance of the proposed routes for a railroad from the Mississippi Valley to the Pacific Ocean."

Five routes were surveyed, only one of which crossed the mountains in Northern California. This one reached the eastern border of the State in the vicinity of Honey Lake and from there it was thought that a railroad could be built to reach the Sacramento Valley either along the location of Nobles Road or somewhat farther to the north via Madeline Plains and the Pit River. No consideration whatever was given to Donner Summit which was to be on the route of the first transcontinental railroad, the Central Pacific, or to Beckwourth Pass through which the Western Pacific Railroad was later built.

Californians Disappointed

The report on the explorations, signed by Jefferson Davis who was the Secretary of War, indicated that any route across the Sierra was impractical chiefly because of the deep snows. Instead it recommended a route which swept in a great arc down to the Mexican border and back up to San Francisco which was hundreds of miles longer.

It would be putting it mildly to say that the citizenry of the State, who favored a direct route from Salt Lake City as a means of speeding up the mail service and facilitating immigrant travel, were disappointed and dissatisfied with the decision of the Secretary of War. They soon realized that the political conditions preceding the Civil War had made immediate agreement on the route for a transcontinental railroad very unlikely. Therefore, they turned their energies toward the building of a transcontinental wagon road along the Salt Lake trail as a temporary measure.

Popular clamor, evidenced by petitions and recommendations from organized groups of citizens in San Francisco, Sacramento, Marysville, Placerville, and other cities and towns, caused the State Legislature to act. A bill was signed by the Governor on April 28, 1855, which provided for the construction of a wagon road from the Sacramento Valley to the eastern border of the State. The road over the Sierra to Carson Valley was to be let to contract at a cost not to exceed $105,000 including the cost of the survey. As to the survey the act stated: "The Surveyor-General of the State shall cause to be surveyed a good wagon road over the Sierra Nevada Mountains at an ex-

pense not to exceed five thousand dollars; and no further liability shall be incurred for this purpose." But the Legislature failed to appropriate the $5,000 dollars!

The Day Survey

The Surveyor-General, H. S. Marlette, undaunted by this negligence, appealed to local citizens and the supervisors of the counties interested in a road terminating in Carson Valley. Enough money was raised by June, 1855, so that a survey of practicable routes could be started by Sherman Day, civil and mining engineer and State Senator. Starting from Georgetown he followed the general route of the immigrant road to Lake Tahoe previously mentioned. Then Marlette and he together made a reconnaissance of the Carson and Johnson Pass routes. Day reported that, as the result of his explorations, these two routes only were worthy of further consideration. He further intimated that if it were considered necessary to provide for winter as well as summer travel, then only one route (Johnsons) need be surveyed and let to contract immediately thereafter.

It was evident to him that the high elevation of such a long portion of the Carson route, and the fact that deep rock cuts would be required and would fill with snow, made it an impractical one for winter travel. The highway maintenance forces who must dig their way through the snow each spring on the present road around the Carson Spur will appreciate the wisdom of his recommendations.

The Goddard Survey

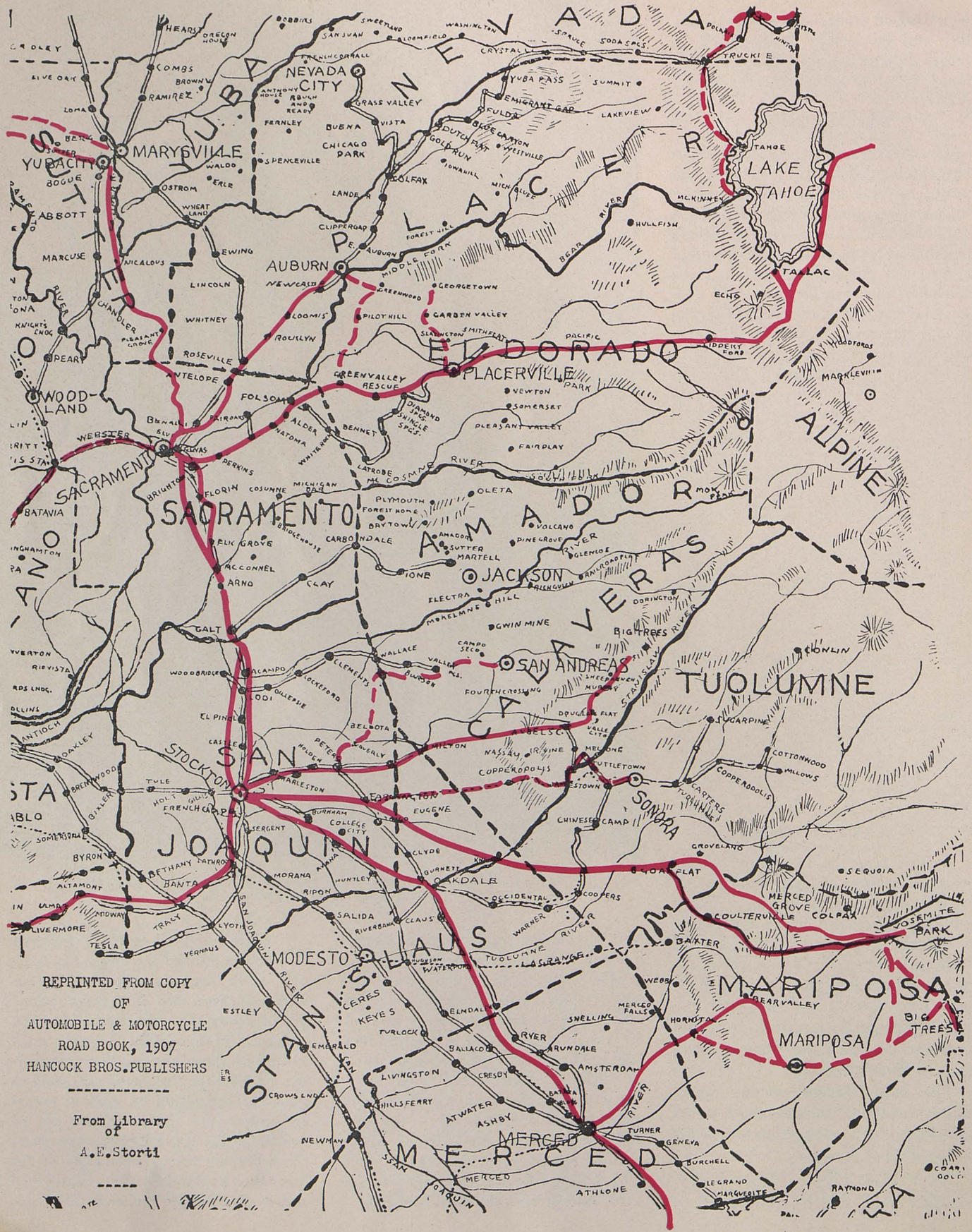
At this time the Legislature of the Mormon territory of Utah wanted to set up a local government in Carson Valley and, in consequence, found it necessary to establish the easterly boundary of California. Orson Hyde to whom the task had been delegated called on Marlette for assistance and the latter employed George H. Goddard, artist and engineer, to make the survey—apparently at Hyde's expense.

This gave Marlette another opportunity to obtain information on the merits of the existing routes as indicated by his instructions to Goddard:

"From Placerville to Carson Valley, via Cold Spring Ranch and Carson Pass, you will take such barometrical observations as will enable you to construct a profile of the route. You will also take, so far as practicable, a somewhat accurate sketch of the country traversed, and collect such other data as in your opinion will be of service in comparing the merits of this with other routes, for the Immigrant Wagon Road, in respect to both practicability and economy of construction." **The route to be followed on the return trip was to be decided later. The Johnson Route being chosen, like information was obtained along it.**

This is U. S. 50 on Echo Summit today, replacing old Johnson Cut-off and old Meyers Grade shown on opposite page

We are indebted to the reports of Day and Goddard for the most complete and trustworthy information regarding these two important immigrant roads. On the basis of their reports, local officials became convinced of the practicability of building a road over the Sierra via Johnson Pass but opposition by various interests prevented the appropriation of funds by the State Legislature. Furthermore, the constitutionality of the State Wagon Road Act was challenged and it was finally declared to be un-


NEVADA
YUBA
PLACER
SUTTER
EL DORADO
ALPINE
SACRAMENTO
AMADOR
CALAVERAS
TUOLUMNE
SAN JOAQUIN
STANISLAUS
MERCED
MARIPOSA
NEVADA CITY
MARYSVILLE
YUBA CITY
AUBURN
PLACERVILLE
LAKE TAHOE
SACRAMENTO
JACKSON
SAN ANDREAS
STOCKTON
SONORA
MODESTO
MERCED
MARIPOSA
YOSEMITE PARK
BIG TREES
WOOD-LAND
LIVERMORE
ALTAMONT
TRACY
LYOTI
VERNALS
ESTLEY
CERES
KEYES
TURLOCK
EMERALD
LIVINGSTON
CRESBY
ATWATER
ASHBY
NEWMAN
SNELLING
MERCED FALLS
HORNITOS
BEAR VALLEY
ARUNDALE
AMSTERDAM
TURNER
GENEVA
BURCHELL
ATHLONE
LEGRAND
MARGUERITE
RAYMOND
COULTERVILLE
COLFAX
GROVELAND
SEQUOIA
MERCED GROVE
CHINESE CAMP
COPPEROPOLIS
TUTTLETOWN
JAMESTOWN
SONORA
CONLIN
SUGARPINE
COTTONWOOD
WILLOWS
CARTERS
TURNERVILLE
OAKDALE
OCCIDENTAL
COOPERS
WARNER
RIVER
SALIDA
RIVERBANK
CLAUS
MORANA
RIPON
HUNTLEY
CLYDE
BURNETT
EUGENE
FARMINGTON
MARLESTON
PETERS
WAVERLY
MILTON
NASSAU
IRVINE
MELONE
VALLE CITY
DOUGLAS FLAT
BELLOTA
SHEEPRANCH
MURPHY
STANISLAUS RIVER
FOURTH CROSSING
WALLACE
VALLEY PK.
BURSON
CAMPO SECO
CLEMENTS
LOCKEFORD
LODI
GILLESPIE
ACAMPO
WOODBRIDGE
EL PINAL
CASTLE
HOLDEN
TULE
FRENCH CAMP
BURNHAM
COLLEGE CITY
SERGENT
BETHANY
LATHROP
BANTA
MIDWAY
TESLA
BYRON
SOMERSVILLE
ALTAMONT
BRENTWOOD
OAKLEY
ANTIOCH
RIO VISTA
YVERTON
GALT
ARNO
CLAY
ACCONNEL
ELK GROVE
CARBONDALE
IONE
ELECTRA
MOKELUMNE HILL
GWIN MINE
BIG TREES
DORINGTON
MARTELL
SUTTER
AMADOR
PINE GROVE
VOLCANO
GLENCOE
RIVER
SAN ANDREAS
OLETA
PLYMOUTH
FOREST HOME
BRYTOWN
MC COSMNE RIVER
SOUTH FORK
MOKELUMNE RIVER
MOK PEAK
LATROBE
BENNET
WHITE ROCK
NATOMA
ALDER
FOLSOM
FAIRPLAY
PLEASANT VALLEY
SOMERSET
NEWTON
PARK
DIAMOND SPGS.
SINGLE SPGS.
GREENVALLEY
RESCUE
PILOTHILL
GARDEN VALLEY
GEORGETOWN
GREENWOOD
NEWCASTLE
LOOMIS
ROCKLYN
ROSEVILLE
ANTELOPE
PERKINS
COSUNNE
MICHIGAN BAR
FLORIN
BRIGHTON
SACRAMENTO
WEBSTER
BATAVIA
PEARY
KNIGHTS LNDG.
CHANDLER
PLEASANT GROVE
WHITNEY
LINCOLN
EWING
NICALOUS
MARCUSE
ABBOTT
LOMA
BERRY
SUTTER
YUBA CITY
BOGUE
OSTROM
WHEATLAND
EARLE
WALDO
MARYSVILLE
SPENCEVILLE
FERNLEY
BUENA VISTA
CHICAGO PARK
GRASS VALLEY
NEVADA CITY
ANTHONY HOUSE
ROBBINS
SAN JUAN
SWEETLAND
BLOOMFIELD
WASHINGTON
CRYSTALLI
SPRUCE
SODA SPGS.
TRUCKEE
SUMMIT
YUBA PASS
EMIGRANT GAP
LAKEVIEW
FULDA
BLUE CANYON
DUTCH FLAT
WESTVILLE
GOLD RUN
IOWA HILL
MICH BLUFF
COLFAX
LANDER
CLIPPERGAP
FOREST HILL
AUBURN
MIDDLE FORK
BEAR RIVER
HULLFISH
MCKINNEY
TAHOE
TALLAC
ECHO
PACIFIC
SLAUGHTER
SMITHFLAT
PIPPEY FORD
WOODFORDS
MARKLEEVILLE
REPRINTED FROM COPY
OF
AUTOMOBILE & MOTORCYCLE
ROAD BOOK, 1907
HANCOCK BROS. PUBLISHERS
From Library
of
A.E. Storti

constitutional by the Supreme Court on December 8, 1856.

Several Routes Surveyed

Meanwhile, the citizens in other parts of the State were not idle. All the interior towns wanted to be the terminus of the first transcontinental road. Several routes were surveyed and advocated by various communities.

D. B. Scott had made a reconnaissance along the Henness Pass Route from the Truckee River to Camptonville and reported his findings to the Surveyor-General. A. P. Chapman also had reported on an alternate route via Yuba and Beckwourth Passes which left the Henness Pass Road just south of Goodyears Bar. Then O. B. Powers of Calaveras County made a report to the Surveyor-General covering the route from the Calaveras Big Trees to the Carson Road in Hope Valley. Construction work started on this route with funds raised locally and the Calaveras Chronicle of August 23, 1856, stated that this road, "the first over the Sierra," was ready for travel. As already mentioned, a considerable portion of the immigration used this road for a season or two but then went elsewhere because of failure to maintain it in passable condition.

Various Routes Proposed

Also in August of the same year a party headed by John A. Brewster, the newly-elected Surveyor-General, made a reconnaissance from Downieville over Yuba and Beckwourth Passes to the Truckee River, returning via Henness Pass. A considerable portion of the route they traveled was that previously covered by Chapman and Scott. Nothing in the way of road construction followed the completion of these surveys.

Wm. Gamble and Job T. Taylor proposed a route over the mountains which they claimed could be constructed for $5,000. From Marysville it was to follow the route of the present county roads through Magalia, Humbug Valley, Big Meadows (Lake Almanor) and join Nobles Road near the head of Susan River.

The map of 1907 on opposite page indicates that the Placerville Road, now U. S. 50, was the only route passable for automobiles crossing the Sierra. Donner Summit and even Nevada City could be reached by railroad only. Directions in the road book from which the map was taken included such remarks as "Follow telephone poles," "Very dusty in places," and "Grade steep and rough"

"THE PROMISED LAND"—Andrew Grayson, his wife and son, looking out on the distant Valley of the Sacramento, the goal of Grayson's ambition since childhood. Grayson and his family were part of the Donner Party which turned off at Fort Bridger and arrived in California safely after a six months' journey. A few years later Grayson paid the artist Jewitt $2,000 to paint this picture. From the painting by Jewitt, in Sutter's Fort Historical Museum

A party led by Thomas A. Young, surveyor for Placer County, surveyed the route of the "Placer County Emigrant Road" previously mentioned. He reported that it was his impression the road could be built with less expense than any other route.

Memorial to Congress

None of these routes received the support or backing evidenced in favor of a route out of Placerville. But the rivalry and conflicting reports tended to cloud the issue insofar as the Legislature was concerned. The year 1856 passed without any work being done on the Marlette-Day survey.

Meanwhile progress was being made toward favorable action by the Federal Government. A transcontinental stage line had been incorporated and its directors appealed for aid to Congress and asked the cooperation of the citizens of California. This resulted in a petition (signed by 70,000 or more persons it is claimed) which was forwarded to Congress asking for the immediate construction of a military wagon road along the Central Overland Trail via Salt Lake. This impressive memorial aroused the support of eastern businessmen and bankers and forced Congress to act.

A wagon road act was signed by President Pierce in February, 1857, but because of the political situation, the act also provided for the improvement of the southern or border route. It received $200,000 and the Salt Lake route received $300,000. However, there was a catch to this latter appropriation—the terminus of the road was to be Honey Lake and not Carson Valley which the larger part of the citizenry favored. This again raised the hopes of the people of Lassen and adjacent counties who became quite vehement in their opposition to the Johnson Pass Route. In spite of the disappointment over the action of the Federal Government a few optimistic Californians refused to give up the fight for the more direct route via Carson Valley.

Counties Unite

No help could be expected from the powerful California Stage Co. which had moved its headquarters to Marysville be-

SIERRA VALLEY
AUG 1856
LONG VALLEY
LAKE BIGLER
CARSON VALLEY
CARSON CANYON
SHERMAN DAY JUNE 1855
SILVER CREEK
DAY MARLETTE
SHERMAN DAY
F. S. MARLETTE JULY 1855
PLACERVILLE
NORTH FORK COSUMNES
MIDDLE FORK COSUMNES
SOUTH FORK COSUMNES
SURVEYS OF THE
CENTRAL SIERRAS
C.L. WHITE

cause of the extension of the railroad from Folsom toward that city. It naturally favored more northern passes leading toward Honey Lake. Representatives of several counties in the San Joaquin Valley held a meeting at which Surveyor-General Brewster and "Snowshoe" Thompson spoke of the superior advantages of the Big Trees Route. Proponents of other routes also held meetings, appointed committees, and talked of raising the all-important funds. But, they raised no funds and events began to shape themselves in favor of the Johnson Road.

The Counties of Yolo, Sacramento, and El Dorado subscribed a total of $50,000 for the construction of a wagon road on Sherman Day's survey and a Board of Wagon Roads was appointed. The noted stage driver, J. B. Crandall of the firm of Crandall and Sunderland, who operated the stage line between Placerville and the railroad at Folsom, offered to drive the members of the board over the route. The trip starting on June 11, 1857, was a rough and rugged one but it demonstrated to the Nation at large that a stage route across the terrible Sierra was quite practicable. The trip provided the board an opportunity to learn first-hand which sections of the route were most in need of improvement.

First Stage Trip

It is perhaps to be regretted that Crandall was not the first to drive a stage across the mountains. Only a few days previously, the California Stage Co. had taken a convivial party from Marysville to Honey Lake and back along the route proposed by Gamble and Taylor. Since the trip did not lead to the inauguration of any stage route, and apparently stimulated no road construction toward Honey Lake, it may be considered of relatively small importance.

A considerable amount of work was done on the road during the summer of 1857 by private subscription. By legislation passed in May, 1858, a Wagon Road Commission was appointed with power to award a contract for the construction of a road following Day's survey as closely as practicable. With the money raised by the interested counties a contract was let on June 29, 1858. The contractor was unable to complete his contract and the remaining work had to be relet. There were arguments among the road officials as to whether the work, finally completed in November, 1858, fulfilled the contract; but differences were ultimately adjusted and the contract accepted. These events mark the beginning of wagon road construction across the Sierra which gradually replaced the pioneer wagon trail.

Crandall Stage Route

Crandall's stage followed the Johnson immigrant road until the county road on the Day survey was constructed. The immigrant road crossed the South Fork of the American at Brockless' Bridge (just north of Pacific House), and climbed to the top of Peavine Ridge to avoid the spurs and ravines of the canyon. The county road which also crossed the Brockless Bridge was cut into the north wall of the canyon opposite the modern highway and far below the immigrant road on the ridge. Near Silver Fork the county road descended to the bottom of the canyon and followed the line of the present highway past "Georgetown Junction," where the immigrant road joined it, to Strawberry some four miles further east. From that point the old and the new roads follow along the South Fork past Twin Bridges to Echo Summit.

After dropping from the summit of the Sierra into Lake Valley it was necessary to again climb over the equally lofty summit of the Carson Range before reaching the level of Carson Valley. Johnson's road crossed the Carson Range at the head of Clear Creek (Spooner Summit), as does highway U. S. 50. It did not drop directly down to the level of Lake Tahoe as does the modern highway because of the difficulty of passing the rocky spurs that jut into the lake and the swampy ground at the mouth of the ravines between the spurs. Of this portion of the Johnson Road, Sherman Day, in 1855, had this to say:

Day Report

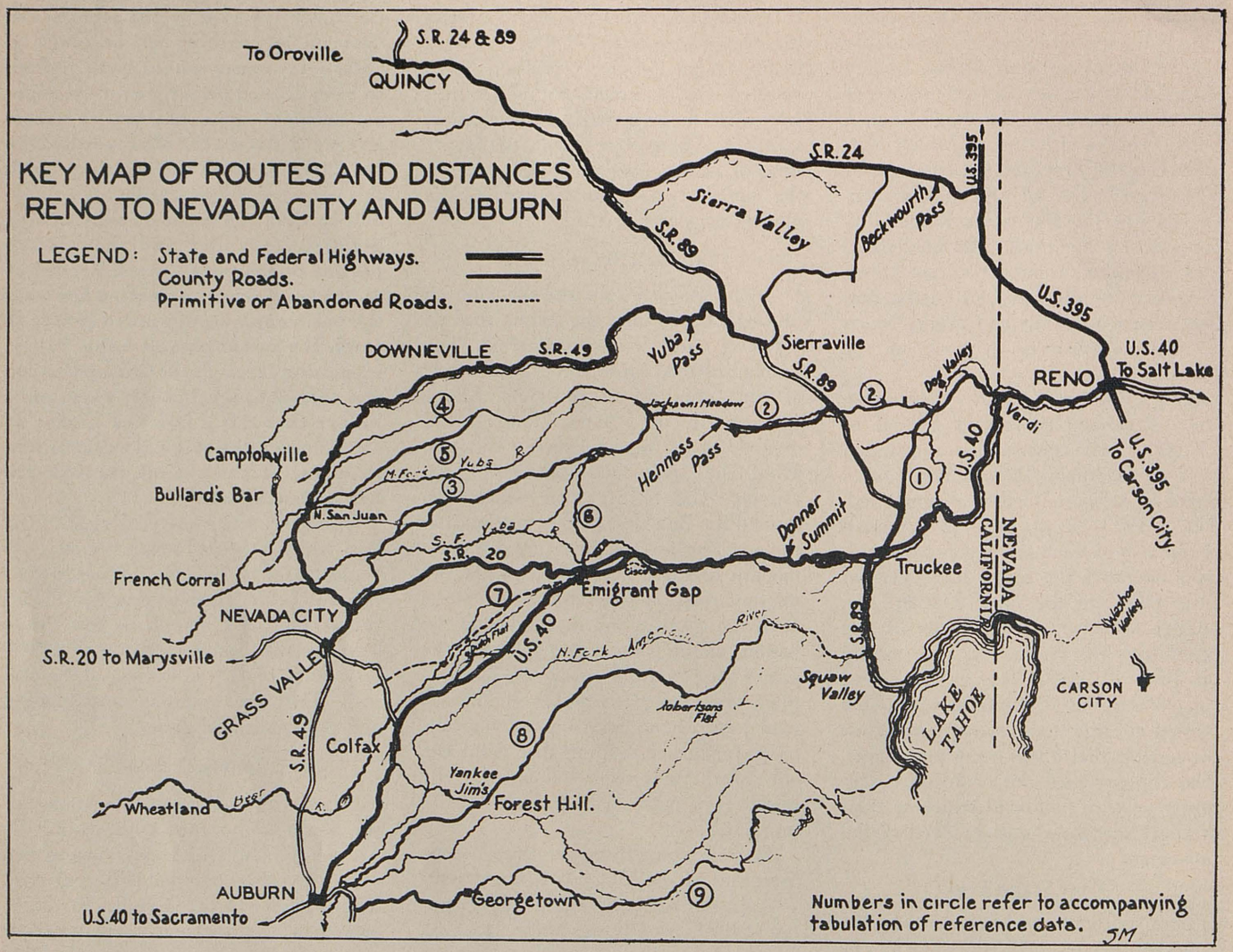
"It winds its way along the western side of the mountains near the origin of the larger spurs and gulches, and—as it appeared to me—(although I had no instrument with which to test it) in several cases ascends to a much greater altitude than that of the pass through which it crossed the summit. Certainly the sum of the ascents and descents in climbing six or seven of these lofty spurs would have sufficed to have crossed directly over the highest knobs of the mountain, at almost any point. Before the old road through the Carson Canyon had been improved, this wagon road was probably preferable to that as a mode of approaching Bigler Lake Valley and the western portion of Johnsons Cut-off Road; but at present, I think any person knowing the two routes would much prefer to reach the upper pass of Lake Valley, by passing through the Carson Canyon and then through Luthers Pass; and I believe that this is now the opinion of Mr. Johnson, the original explorer and improver of the cut-off through the Eagle Ranch Pass."

Crandall's stages traveled via Luthers Pass which Day says was first crossed by wagon in 1854, by "Mr. Luther of Sacramento." He further remarks: "This pass is, naturally, one of the best I have seen over this range of mountains. Several miles of it are now good natural road. The other portions need grading and the removal of rocks."

Johnson's Road

Johnson's Road crossed the summit of the Sierra at the same point as did the Meyers Grade which was abandoned some 10 years ago except as a stock trail. The Hawley Grade, built in 1858, crossed at a point about three-quarters of a mile farther south, as recommended by Day. It is buried by the fill of the present highway which crosses at the same location. The Hawley Grade ran south and reached the valley floor about where the present grade on SR 89 starts up to Luthers Pass. Over Luthers Pass and the Hawley Grade came Horace Greeley on the trip made famous by his ride into Placerville with Hank Monk. By September, 1860, Kingsbury and McDonald had finished a toll road over Daggett's Pass through the Carson Range, now known as the Kingsbury Grade, and by the end of the same year they apparently had a passable road along the Meyers Grade from Lake Valley to Echo Summit. Completion of these roads again diverted traffic toward the route originally laid out by Johnson.

The fact that the mail carried over the Central Route traveled by way of Placer-



GENERAL NOTE: U. S. 40 follows in general the route of the Central Pacific Railroad and, except for highway realignments in the vicinity of Dutch Flat and Cisco and routes (1) and (7) noted below, is on the general route of both immigrant and stage roads. The latter known as the "Dutch Flat and Donner Lake Wagon Road" connected with the railroad as it was built eastward. (Newcastle, May, 1864; Colfax, 1865; Cisco, 1867.) Stage and freight business was practically diverted from the Placerville road by 1867.

(1) County road on the immigrant trails to Donner Summit and Henness Pass. It was also the "Dutch Flat and Donner Lake" stage road and maintained as the state highway until the present highway was built through the Truckee Canyon in 1926. (Immigrants descended into Dog Valley but the road follows the ridge and the "Dog Valley Grade."

(2) "Henness Pass road, now a graveled road east of Weber Lake and unimproved west to Jackson's Meadow where it divides, one branch via Forest City and the other via the "San Juan Ridge" (3). Used by immigrants during the fifties and by stages and teams 1860-68. (Second in importance to the Placerville road.)

(3) Graveled road via Bowman Lake, Graniteville (Eureka) and North Bloomfield to Nevada City. Road built by the Henness Pass Turnpike Co. in 1860.

(4) Unimproved road on the route followed by immigrants coming through Henness Pass. Stages first ran to Camptonville, the terminus of the stage line from Marysville. (A road ran north from Forest City to Goodyears Bar and Downieville.)

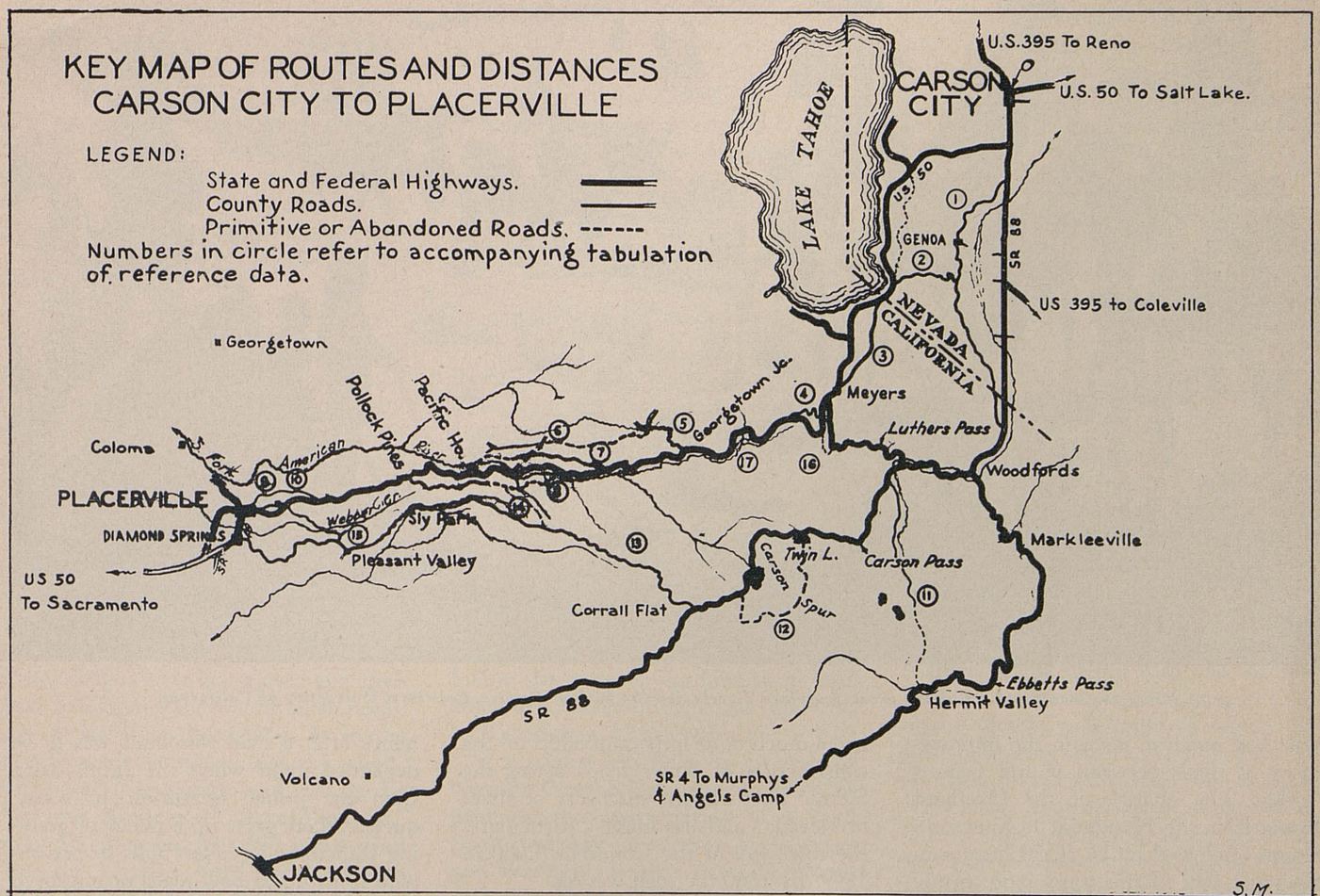
(5) County road from Forest City to North San Juan connecting with the stage road through French Corral and Smartsville. Route followed by immigrants and later by the stage road built by the Truckee Turnpike Co. in 1860. Both companies (See (3)), cooperated in building the road east of Jackson's Meadow.

(6) An unimproved county road, built as the "Culbertson Grade" in 1864 to connect the railroad and the Dutch Flat road at Emigrant Gap with the Henness Pass road.

(7) Immigrant route, Bear Valley to Johnson's Ranch (near Wheatland). Now unimproved roads or trails.

(8) Route of "Placer County Emigrant Road" (1852). Now a county road as far as the summit.

(9) County road to Wentworth Springs and from McKinneys to Miller Lakes. Route used to some extent by immigrants. (Surveyed by D. B. Young, 1856).



(1) County road via Genoa. On the route followed by immigrants via the Carson Canyon (just west of Woodfords), and used by stages going via Luthers or Daggetts Pass.

(2) "Kingsbury Grade" over Daggetts Pass, completed in the summer of 1860 and used by stages and freight teams until traffic was diverted to the present route via Spooner Summit ("Waltons Road" completed November, 1863, now U. S. 50).

(3) Stage road, via the Sierra House. A graveled road maintained as a state highway until 1931 when the present highway via Bijou was built. Stages also traveled via "Lake House" located on the lake shore east of the Upper Truckee River.

(4) "Meyers Grade," completed in the fall of 1860, crossing Echo Summit and used as the state highway until 1940 when the upper portion was rerouted via the Hawley Grade ("Henderson's") summit. (The reconstruction of the lower portion completed 194?.) The emigrant road over "Johnsons Pass" reached the Echo Summit in a distance of about three-fourths mile starting near the site of the Lake Valley Ranger Station.

(5) An unimproved county road which was a portion of the Georgetown-Virginia City stage road. It leaves U. S. 50 at the site of "Georgetown Junction" (chimney) and is somewhat below line of the immigrant trail which climbed to the top of Peavine Ridge.

(6) Existing primitive roads and stock trails which follow the route of the immigrant road down Peavine Ridge to Bartlett's Bridge (site near Pacific Ranger Station) and, after 1855 to Brockliss Bridge (at site of present bridge below Pacific House).

(7) Road built by the counties in 1858 from Brockliss Bridge to Cedar Rock, near Silver Fork, and used by stages and freight teams during 1859-61. Used by stages and westbound (light) freight wagons afterward. Route of the first transcontinental telegraph. Generally abandoned to the west of the Riverton-Ice House road and still unimproved road to the east of it.

(8) "Oglesby Grade," toll road used by stages and teams during 1861-64 leaving U. S. 50 about the 14-mile stone (west end of Pollock Pines) and joining it again east of Whiteball. Bridge and road at east end out are abandoned. Road still used at west end. Road, along the present general highway route, via Fresh Pond and Riverton (Moores Station), was built about 1864 at which time Oglesby Road was being rebuilt on lower grade on opposite side of the river.

(9) Existing oiled county road via the "Hill Road" east of Placerville. It follows the general route of the immigrant road and was also used by stages.

(10) Existing oiled county road via Smith's Flat, the route of the stage road and of the state highway until 1932.

(11) County road from Hope Valley to Blue Lakes and a forest trail to Hermit Valley. On the route of the original "Big Trees" road which generally follows the existing oiled State Route No. 4. Stage road to Silver Mountain and Markleeville built in 1864 from Hermit Valley over the present Ebbetts Pass.

(12) Abandoned route of the immigrant road over the Carson Spur ("West Pass"). The present oiled State Route No. 88 follows the stage road (built 1863-64 as the "Amador and Nevada Wagon Road") via Silver Lake and around the end of the Carson Spur.

(13) Unimproved county road along the ridge, on the route followed by immigrants going to Placerville (Hangtown) or Diamond Springs via the Carson Pass.

(14) Unimproved roads and trails along the emigrant route of the fifties which left the present county road near Iron Mountain and followed down the divide between Plum and Sly Park Creeks, via "Cold Springs" (near Zumwalts), to a junction with the Johnson's Pass road above Fresh Pond. Road branched near the "Junction House" to Pleasant Valley and Diamond Springs.

(15) Various county roads, graded and oiled, follow immigrant and stage roads used at various times, via Stonebreaker Grade to Sly Park and Pleasant Valley and then to Placerville (via Newtown), to Diamond Springs or to the Cosumnes River mines.

(16) Forest trail on the "Hawley Grade" built by El Dorado County in 1858 on the stage road via Luther's Pass. Used during 1859-60, when traffic was diverted to the Kingsbury Grade. See (2).

(17) "Slippery Ford Grade" on the stage road, and maintained as the state highway until 1931 when highway was rerouted between Strawberry and Sayles Flat.

Over the plains and across the great American deserts, lay the path of Empire. Courtesy, University of California

ville had much to do with the improvement of roads between it and Carson Valley. The change of the Overland Route from the Humboldt to Simpson's Route (followed by U. S. 50 for a considerable part of the way) more firmly fixed Carson Valley as the terminus for the stage road across the Sierra. Perhaps, had the political scheming of the Postmaster General not forced the mail to the southern route, to be carried in the stages of Butterfield, more work might have been done on the northern or central route.

Butterfield Route

The Butterfield Route entered the State at Yuma, dipped into Mexico, passed through Warners Ranch in San Diego County on the way to Los Angeles, crossed the Tehachapi and followed along the eastern edge of the San Joaquin Valley to Visalia, thence to Fresno City, now nonexistent, and then across to Pacheco Pass and San Francisco.

Starting on September 15, 1858, Butterfield stages operated regularly and efficiently until the outbreak of the Civil War which put a stop to travel through the South. Whatever influence the transcontinental mail route may have had, it is certain that an event which now occurred close to the borders of California had a much more important effect on the construction of better roads across the Sierra. This was the discovery of silver in Nevada (and also Idaho), particularly the discovery of the Comstock Lode in 1859. By 1860 the rush was on.

Road Quagmire

The Sacramento Weekly *Union* of March 17, 1860, describes the condition of the recently built county road as a "continuous quagmire." It went on to say that walls have slid away, there are no proper culverts, and, if funds are not provided for repairs, the investment will be lost. In October, 1860, the same paper reported that: "After hauling a load from Sportsmans Hall to the bridge (Brockless), which includes a section of some seven miles of the hardest road on the route, teamsters will be disposed to pronounce the graded road built by the two counties a first rate one for the mountains. The objections are the width, drainage and the location. It is too narrow; it is not properly drained; and in the opinion of those best acquainted with the route, was not judiciously located by the engineers."

Toll Roads Legalized

It was evident that neither the needed road improvements nor proper maintenance after a road was built was to be depended upon when the funds came from the public treasuries. In consequence, there grew up a policy of granting franchises to collect tolls to persons who constructed new roads or improved sections of the existing roads. Competition, or the threat of it, brought about a great improvement in the standards of construction and maintenance of the principal roads used for staging and freighting to the mines of Washoe and elsewhere. Additional roads were constructed as soon as new developments indicated their probable value. All this brought about an era of road-building across the Sierra which, in general, reached its heyday in 1865 and then declined with the building of the transcontinental railroad.

In the fall of 1861, Oglesby began the construction of a road on the south slope of the South Fork Canyon. At that time the road going east from Sportsmans Hall stayed on the ridge to the "Junction House" at the head of Fresh Pond Ravine. From there the Johnson Road descended the ravine to a crossing of the South Fork of the American River, first at Bartletts Bridge (just north of Pacific Ranger Station) and then, after 1855, at Brockless' Bridge.

The Carson Pass road continued easterly from the Junction House and climbed to Iron Mountain along the divide between Plum Creek and Sly Park Creek. Ogelsby's road left this at "Five Points," descended the canyon slope on a fairly regular grade, crossed the South Fork and continued up the river for four miles to a junction with the county road near the present Silver Fork store.

Floods of 1861-62

The unusual floods of the winter of 1861-62 raised havoc with the roads and left the road built by the counties in particularly bad condition. The general condition of the road is described by a correspondent of the Sacramento Weekly Union writing from Strawberry on April 14th. Snow was still falling. Stages were running from Placerville to a point 25 miles east of there. The remaining 22 miles to Strawberry had to be covered on horseback. From Strawberry to Lake Valley sleighs were being used and from there to Carson Valley it was again necessary to travel on horseback. As to the county road, he stated that the stages, which had their stations and feed on the "old road up the north side of the river," went that way but all other travel went over the Ogelsby Road which was in better condition. The South Fork Bridge, however, was washed out and would not be rebuilt for a month. Later sources of information indicated that loaded feight wagons always used the Oglesby Toll Road even when the county road was toll-free, and that the latter road was used by the stages and by freight teams returning empty from Nevada.

Slippery Ford Grade

Other important work done on the Placerville Road during the first years of the decade included the construction of the Slippery Ford Grade and its operation as a toll road by Swan. By 1865 a road had been built on the route of the present highway between the 14-Mile House (east limit of Pollock Pines) to a junction with the Oglesby Road where it crossed the river, passing through Moore's Station now called Riverton. It was built and operated as a toll road by Pearson and McDonald and the reconstruction of the Oglesby Road on a lower and better location could not prevent it becoming the main artery of travel. On the Nevada side, Walton's Road up Clear Creek to Spooner Summit (the present route of U. S. 50) being gradually improved and supplemented by the construction of the Kings Canyon Road in 1863, traffic was diverted from the Kingsbury Grade. The road construction during the years 1860-65 fixed the location of what came to be known as the "Lake Tahoe Wagon Road" for 60 years or more.

Henness Pass Road

The chief rival of the stage road through Placerville was the Henness Pass Road. Cities like Marysville and Nevada City realized that if they were to obtain their share of the rapidly increasing Washoe trade they must build a good wagon road to tap the region. The Truckee Turnpike Co. was organized in November, 1859, to build a road through Henness Pass to connect with an existing road from Marysville to North San Juan via Bridgeport. This road, which would follow the route of the immigrant road down the Pliocene Ridge, was supported by the citizens of Marysville.

A meeting was held by citizens of Nevada City on December 3, 1859, to promote the construction of a road from that city up the San Juan Ridge and through Henness Pass. The Henness Pass Turnpike Company was an outgrowth of that meeting and by the following June it had constructed a road to Jackson's Ranch on the Middle Yuba. Here they joined the road of the Truckee Turnpike which had also reached that point. An agreement was reached and the two companies united in building the road on through the pass toward Virginia City. It was stated at the time: "It must be remembered that the route was already traversed by an imperfect road which was made by the immigrants hauling their wagons over it, with occasional slight improvements from settlers or persons having hay ranches along it."

Placerville Road

Although the Henness Pass Road was used a great deal, both by stages and by freight teams, the bulk of the traffic used the Placerville Road. "Q. S." writing for the Sacramento Union in July, 1864, said that the Henness Pass Road was a mixture of good and bad—"excellences and abominations mixed like hash." The summit was an easy one but there was too much up and down along the way. Of course, when a citizen of Nevada City, say, made a trip over the Placerville Road and wrote about it, the reader would be led to believe it barely passable —at least in comparison to the Henness Pass Road.

Another rival of the Placerville Road was the Amador and Nevada Wagon Road. A bond issue to cover the cost of this road failed to carry in 1861 but when submitted again in May, 1862, it was approved. A franchise was granted to eight citizens of the county to build the road and collect tolls thereon. Bonds paying 12 percent interest were issued and a road 16 feet wide with a maximum grade of 18 percent was to be constructed by October, 1862. The road was to start at Antelope Springs (about 25 miles east of Jackson on Sign Route 88), to which point a road was already constructed. The location of the wagon road was, except for local improvements, the same as that of the present state highway which instead of turning south at Twin Lakes and climbing another thousand feet to cross the Carson Spur as the immigrant road did, is built around the rocky point of the spur at an elevation of about 8,000 feet. Passing Silver Lake it meets the immigrant road again on the ridge just east of Tragedy Springs.

The wagon road reached Silver Lake in August, 1862, and was ready for through travel by the end of that year. The hauling to Washoe of fruit and produce raised in the county and lumber from mills along the road created quite a bit of traffic. However, little traffic was diverted from the Placerville Road which, probably because of its relatively lower elevation and freedom from heavy snows, maintained its leadership over competing roads.

Start on U. S. 40

In view of the present day importance of U. S. 40 the reader may wonder at the failure to include it with the important stage roads described so far. Immigrants had continued to use the route as it suited their convenience or fancy. As early as 1860 a survey for a wagon road was made by one S. G. Elliott and in March, 1861, the Lake Pass Turnpike Company was organized. But it was not

until officials of the Central Pacific Railroad saw the advantages of building a turnpike out ahead of their track that things began to happen.

They formed the Dutch Flat and Donner Lake Wagon Road Company which completed a few miles of road in the fall of 1862. Work was resumed the following June but snow in November prevented completion of the work that year. The road was opened to traffic in June, 1864, and on July 16th the California Stage Company began operating stages over it from the end of the railroad at Clipper Gap to Virginia City.

The first rail on the Central Pacific was laid in Sacramento on October 27, 1863. Although progress was slow for a time, by September, 1865, the track had been laid to Illinoistown, which then became Colfax. By this time the combined railroad and toll road was getting a large part of the trans-Sierra traffic. In November, 1866, the railroad had reached Cisco, which was to remain the rail terminus until the summit tunnel was completed in 1869, and traffic on the great Placerville Road, as well as its rivals, dwindled to but a small part of the previous volume.

Pacific Turnpike

Other roads were built that connected with the Dutch Flat and Donner Lake Wagon Road. Construction was started in May, 1863, on the "Pacific Turnpike" by Culbertson. Connecting with the Donner Lake Road at Emigrant Gap it descended into Bear Valley, crossed the South Fork of the Yuba and joined the Henness Pass Road at Bowman's Ranch (now Bowman Lake). In Bear Valley it was joined by a road, owned by the same company, which came up the Washington Ridge from Nevada City and is now part of Sign Route 20. The "Culbertson Grade" and the road through Henness Pass are now unsurfaced county roads having very light traffic. However, it is said that these roads for a few years after their opening to traffic in May, 1864, handled quite a bit of transmountain business.

The driving of the last spike at Promontory, Utah, on May 10, 1869, may be said to mark the end of stage road supremacy as a means of transportation across the Sierra. The railroad was king. Of course, stage roads still did business to points not reached by the railroad or its branch lines. For example, in 1874 Truckee had become quite a stage center according to Thompson and West's History of Nevada County. It had several daily and tri-weekly stage lines running to Tahoe City, Donner Lake, Sierra Valley and to Graniteville on the San Juan Ridge (then known as Eureka South). Other examples of stage lines were those from Marysville to Nevada City along a portion of Sign Route 20, from Marysville to North San Juan along the present county road through Bridgeport and French Corral, from Nevada City to Dutch Flat, and from Nevada City to Graniteville. Business on such roads was either local in nature or the roads were feeders for the great transcontinental railroad.

Sonora-Mono Wagon Road

There were trans-Sierran roads, however, which at least for a time served areas on the east side of the mountains that were not served by the railroad. The Sonora-Mono Wagon Road, which has become Sign Route 108, was built to reach the Esmerelda mining district, of which Aurora and the perhaps more notorious Bodie were the chief towns.

Started in 1861 with funds raised by a bond issue it was intended to be a free road. However, the money was all spent on the portion of the road over the summit and, as in the other cases previously mentioned, a franchise for a toll road was granted. The road was to join existing "good" roads from Sonora to Strawberry and between Aurora and Hot Springs (Fales Hot Springs on U. S. 395). Financial troubles delayed the completion of the road. It was reported in May, 1864, that the company building the road had forfeited its franchise but in August work was being prosecuted with the aid of Bridgeport and Aurora. During this time the stage line used pack animals on what was known as the "Sonora Trail," which followed the Clarks Fork of the Stanislaus instead of the Middle Fork and Deadman Creek like the present highway does. The trail crossed the summit at the same place as the present road whereas the "Sonora Emigrant Road" had crossed several miles farther to the south on an entirely different route between Strawberry (near Pinecrest) and Leavitt Meadows. The stage road was not opened for wagons until after 1870 and traffic, which was never very heavy, declined with fortunes of the Esmerelda district and also as better roads were built to connect that district with the railroad in Nevada.

Oroville-Susanville Route

Turning now to stage roads built in the sixties to reach Susanville and the silver mines of Humboldt and Idaho, roads originating in Oroville, Chico and Red Bluff took on considerable importance. It will be recalled that the first stage over the mountains from Oroville to Susanville traveled by way of Humbug Valley to Nobles Road at the head of Susan River. Later on, traffic used the route from Big Meadows (Lake Almanor) through Mountain Meadows and Fredonyers Pass along the present Sign Route 36.

The Legislature passed an act in April, 1863, granting a franchise to John Bidwell and others to construct a toll road from Chico to Honey Lake. They incorporated as the Chico and Humboldt Wagon Road Company and started work in the spring of 1865 on what is now known as the "Humboldt" Road. The older "Humbug" Road was a little to the south of it at a generally higher elevation and the Humboldt Road being better maintained as well as freer from snow in the winter drew most of the traffic. The portion of the latter road from Chico to Lomo is now a part of Sign Route 32, a modern highway along Deer Creek having been built from that point on to Lake Almanor. A contract was granted in 1866 to haul mail between Chico and Boise, Idaho, via the Humboldt Road. From Honey Lake the route followed Nobles Road to Black Rock and the Quin and Owyhee Rivers to Idaho. Staging and freighting through Susanville became heavy.

The road from Red Bluff, along what is now Sign Route 36, having been completed at the same time as the Humboldt Road, a daily stage operated between Susanville and that town as well as Chico, Oroville and Virginia City. All this caused a local paper to remark: "* * * Susanville—a town which by reason of these discoveries, and its situation on the great thoroughfare leading from California to Black Rock, Idaho, Montana and Humboldt, bids fair to

NOTE: Staging west of the Mississippi and Missouri rivers within the period involved and other than that within the area shown on this map was between:
Independence, Mo., and Santa Fé, N.M. (☆)
Los Angeles, Cal. and San Pedro, Cal. (⊛)
Portland, Ore. and Lafayette, Ore. (●)
Reached by pack train from "Porter's Bar" and Minnesota. Stage connections were not established till 1859.
123°
122°
121°
120°
40°
39°
38°
37°
Trinity Diggings
Pitt R.
Shasta
Middleton
One Horse Town
Dangerfield Ferry
Cottonwood
Prairie House
Red Bluff
Tehama
Eel River
Clawson
Honey L.
Onion Valley
Grass Valley
Johnson's Ranch
American Bar
Monroeville Placer
Biddwell Bar
Biddwell's
Hamilton
Foster's Bar
DOWNIEVILLE
Minnesota
Oak Grove
Virginia
Dabbin's Ranch
Oregon House
Industry Bar
French Corral
Bridgeport
Rough and Ready
Nevada City
Grass Valley
Colusa
Sacramento R.
Feather River
Marysville
Eliza
Plumas
Nicholas
Auburn
Georgetown
Greenwood Valley
Vernon
Fremont
Salmon Falls
Coloma
Placerville or Hangtown
Mormon Island
Webberville
American R.
Washington
Sacramento City
Cosumnes R.
Drytown
Volcano
Ione Valley
Jackson
Mokelumne Hill
Mokelumne R.
San Andreas
Calaveras R.
Angels Camp
Robinson's Ferry
Columbia
Sonora
Stockton
1849
Benecia
San Francisco
San Francisco Bay
San Mateo
Redwood City
Alviso
Santa Clara
San José
New Alamedan
San Joaquin R.
Stanislaus R.
Tuolumne R.
Merced R.
Chowchilla R.
Fresno R.
Coulterville
Pleasant Valley
Santa Cruz
Monterey Bay
San Benito R.
San Juan
Monterey
San Joaquin R.
MAP OF
NORTHERN CALIFORNIA
THE PIONEER STAGING WEST
SHOWING THE MAIN AREA OF STAGE-COACH COMMUNICATION PRIOR TO 1854
Note that all towns shown had stage-coach service through periods as indicated by their various devices, i.e.:
☆ Having stage connections prior to 1851 and thence onward;
● Having stage connections prior to 1852 and thence onward;
⊛ Having stage connections prior to 1853 and thence onward;
● Having stage connections prior to 1854 and thence onward;
with the exception of Benecia whose service began and was discontinued in 1849, and of Downieville, see note at location on map

become, next to San Francisco, the most important town on the Pacific Coast."

Coming of Central Pacific

The Central Pacific by the following year (1867) had laid its track almost to Winnemucca, thus directly serving the Humboldt mines and cutting in half the length of the stage route to Idaho. All the business was diverted to the railroad and the glowing hopes for Susanville did not materialize.

Time and space does not permit of covering in detail the other roads by which it was possible to cross the Sierra. These included the road from Oroville through Quincy to Beckwourth Pass—for a long time the route of the "Feather River" highway, from Marysville through La Porte, from Nevada City through Downieville and Yuba Pass to Beckwourth Pass or to Truckee, and from Murphys over Ebbetts Pass to Silver Mountain and Markleeville. All of these had their periods of importance and their story is equally as interesting as that of more important roads. Following the completion of the transcontinental railroad, such roads, as well as the great thoroughfares like the Placerville Road, carried only "local traffic." Thirty or more years were to pass before the advent of the automobile was to turn the limelight on any of them.

First State Highway

The growth of the modern automobile highway system is a separate story and just a few of the highlights concerning the roads across the Sierra will be mentioned. The first indication of a new era was an act, approved March 26, 1895, creating the "Lake Tahoe State Wagon Road" which included the Placerville Road from the junction of the Newtown and Placerville Roads near Smiths Flat to the Nevada line. Tolls had been collected from users of this road until the rights were purchased by El Dorado County and it was declared a public highway in 1886. With the signing of an indenture dated February 28, 1896, it became the first state road in California.

The first work, done on this road, other than ordinary repairs, was the construction of an 80-foot stone arch over the South Fork at Riverton with the necessary approaches completed in 1901. Within the next several years culverts and small bridges had replaced the original primitive log bridge or brush and log fills in the watercourses. Large arch culverts were built at Oglesby Canyon and at Trout Creek.

New Era for U. S. 50

Dust on the westerly portion of the road was a serious drawback and so, about 1910, funds were obtained to sprinkle the road in summer, a procedure that had caused Richardson, Bowles and others to laud the condition of the stage road when they passed over it in 1865. In general, progress in improving the road with the exception of the bridges at Riverton and elsewhere, was slow—almost negligible by present day standards. However, the incorporation of the road into the State Highway System in 1917, as a portion of Route No. 11, marked a change in highway thinking. The road was no longer a personal and separate responsibility, it became part of a state road system subject to engineering supervision.

Beginning with a day labor job of placing a 15-foot asphalt macadam surfacing between Five-Mile House and Camino in 1923, the road has been continually improved in keeping with the large volume of both summer and winter traffic which now uses it. It would be hard to say on what part of the road the improvements have been of greatest benefit but it seems safe to say that the most noteworthy changes have been the new roads replacing the old Meyers Grade on the east side of the summit and the Slippery Ford Grade between Strawberry and Camp Sacramento.

Sonora-Mono Toll Road

In 1901, the Legislature made that portion of the "Sonora and Mono" Toll Road (Sign Route 108) between Long Barn and Bridgeport a state highway—but appropriated no funds for its maintenance or improvement. The report of the Department of Highways states: "The 61 miles of this road from Long Barn to the junction was, in July 1901, in a very bad state of repair; the 22 miles over the granite formation was nothing more than a creek bed, while all the bridges on the route were either in a rotten condition or else fallen down."

Beginning in 1905 the Legislature appropriated $4,000, and later $6,000 annually for maintenance of the road and set up $20,000 for improvements. Seven years after it was reported that it was now "fit for travel in the summertime" and 20 years thereafter minor improvements and maintenance had made it a reasonably safe and passable mountain road. Then came the complete reconstruction of the road eastward from Sonora, which has resulted in a modern highway being built as far as the old Patterson Grade. Although the steep grades over the summit are still a trial to many motorists, the road in its present state is a far cry from the agony of navigating the Q' de Porka or of climbing the "Golden Stairs" still within the memory of many motorists.

Tioga Pass Road

While the completion of the Tioga Road across the Sierra was a comparatively recent event, the road is deserving of brief mention. Following an appropriation by the Legislature in 1899 for the construction of a free wagon road connecting Mono County roads with the Tioga Road in Yosemite National Park west of the summit, studies of possible passes over the summit were made. A toll route through Mono Pass and down Bloody Canyon, following the old pack trail, was first given consideration. However, further studies resulted in the adoption of the route through Tioga Pass and down Leevining Canyon and work was started late in the summer of 1902. Construction progress was slow.

In 1910 the road had not been completed to the satisfaction of the State, tolls were still being charged on the old road through the park and automobiles were not permitted in the park. However, through the efforts of Stephen T. Mather of the National Park Service with the cooperation of State Engineer McClure the toll road was purchased, a considerable amount of improvement was done and various difficulties overcome so that Mather could report to the Sierra Club by the end of 1915 that: "The end of next season should make the Tioga Road a perfect mountain highway, with grades that any car of moderate power can negotiate, and scenery

along the route that will be the equal of any in the land." Continued improvement has made the road more and more popular with tourists and campers.

Added to State System

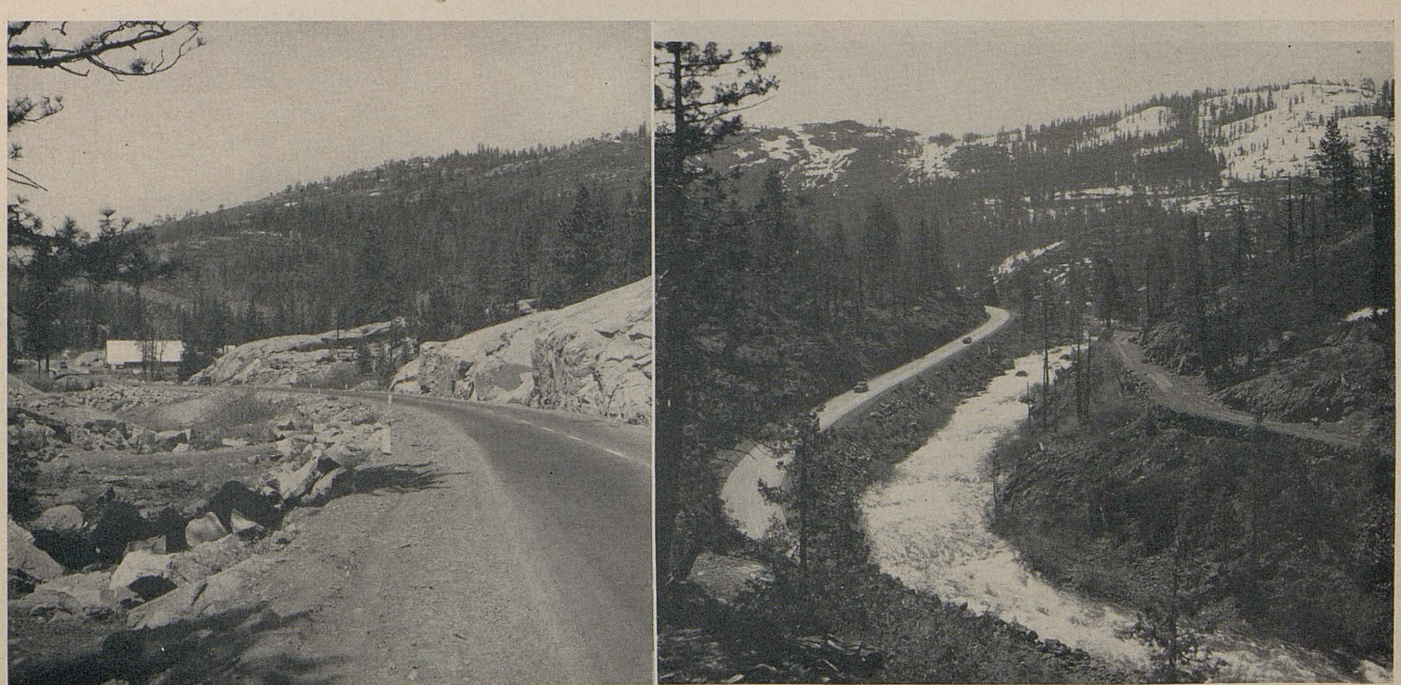
Certain roads in the mountain regions of El Dorado, Amador, Alpine, Calaveras and Mono Counties, built or acquired by these counties, were created state highways by the Legislature in April, 1911. They included the roads through Luthers, Carsons and Ebbetts Passes and through the West Walker Canyon. The northerly limit was Osgoods Station at the foot of the Meyers Grade; the southerly limit was the junction of U. S. 395 and Sign Route 108. The easterly terminals were Jackson and the Calaveras Big Trees. Early work consisted only of general maintenance done without general supervision or planning. Later on small contracts and a great deal of minor improvements and heavy maintenance transformed these roads into comfortable if not always high-speed highways.

Funds for U. S. 40

Once more the history of U. S. 40 trails behind that of the other roads across the Sierra. Not until March, 1909, did the Legislature see fit to appropriate funds for the location, survey and construction of a state highway from Emigrant Gap through Truckee Pass (Donner Summit) to the west end of Donner Lake. The State Engineer, on taking over the road, reported it was in such abominable condition that you could scarcely call it a road. It will be evident that this portion of the Dutch Flat and Donner Lake Wagon Road being located parallel to the tracks of the Central

Pioneer State highway engineers constructed a route, now U. S. 40, over these granite heaps between Emigrant Gap and Donner Summit

LEFT—This is how U. S. 40 looks today at about same spot as shown in photo above. RIGHT—This picture shows present highway on left and old route on right east of Emigrant Gap.



Pacific Railroad had little excuse for being maintained after the railroad was completed.

The first work done was to try to make the road passable throughout, and to improve the drainage in order to reduce the damage from the winter snows as much as possible. A blind railroad crossing through the snow sheds at the mouth of the summit tunnel with its 22 percent approach grade received unfavorable comment in the early reports. Like the other mountain roads minor repairs and improvements were the rule until the law placing a tax on gasoline boosted highway construction.

Victory Highway

It was natural that the Placerville road which had continued to serve for a much reduced stage and freight traffic during the "dark age" of roadbuilding preceding the automobile era should receive first attention. The fact that it was chosen as the route of the transcontinental "Lincoln Highway" added to its importance. However, the better condition of the "Victory Highway" through Utah, its more favorable grades along the Humboldt and the growing importance of Reno and other towns along the route brought about pressure to improve the Truckee River route. Starting in immediately after 1924, major reconstruction and relocation of the existing highway has been continuous but has hardly kept pace with its growing importance.

The first construction work of importance was the grading of a new highway on the east side of the summit which replaced the steep and rocky grade of the wagon road. This work done in 1923 was followed by a relocation of the road west of the summit as far as Soda Springs which replaced the old winding road with a narrow subway under the Southern Pacific Co.'s track. This subway had replaced the treacherous grade crossing mentioned above.

Yuba Gap-Emigrant Gap Route

In 1929 a highway through Yuba Gap between Emigrant Gap and the Big Bend Ranger Station was graded, doing away with the old wagon road which climbed over Bear Trap Summit and passed by Crystal Lake. Two dangerous grade crossings through the snow sheds were eliminated by the relocation. The abandoned portion of the old road between Crystal Lake and Cisco Flat is still visible to the motorist speeding along the highway on the opposite side of the South Fork of the Yuba River. Relocation of the highway along the Truckee River with the abandonment of the old route via the Dog Valley Grade has already been mentioned. These are the major deviations from the route of the old wagon road although there are many places where one can observe the old road weaving back and forth across the new. However, even the old stage road is a far cry from the immigrant road that pitched down into Bear Valley at Emigrant Gap, climbed the ridge to the north of Bear River and followed its undulating crest only to slide down again into Steep Hollow.

Many such scenes are visible to the motorist riding on the present-day highways. To one who will trouble to learn the geography of the country through which he travels and something of its history the trip can become an adventure instead of a duty. Nowhere is this more true than in riding over the roads across the Sierra.

Chapter XII

The Story of Marlette

IN THESE DAYS when the people of California contribute millions of dollars in gas taxes for construction and maintenance of highways, it is rather difficult to visualize the situation that confronted the State's first road builder, Surveyor General S. H. Marlette, who, in 1855, was forced to advertise in the Sacramento newspapers for a loan of $500 to finance a survey ordered by legislative act for the Emigrant Wagon Road over the Sierra by way of Placerville to Carson Valley, Nevada.

At the first session of the Legislature in 1850, before California had been admitted to the Union, a law was passed defining the duties of the Surveyor General. As a member and ex officio Chief Engineer of the Commission of Internal Improvements, he was required **"to make plans and suggestions for improvements of navigation, construction of roads, railroads and canals, preservation of forests, * * * and surveys of boundaries of the State and counties."**

An Ambitious Project

Public agitation for a "post road, or other road, from the Sacramento Valley to the Missouri River, by way of Great Salt Lake," resulting in mass meetings of citizens in San Francisco, Sacramento, Marysville, Placerville and other places in 1854 and 1855, finally culminated in the Legislature taking action.

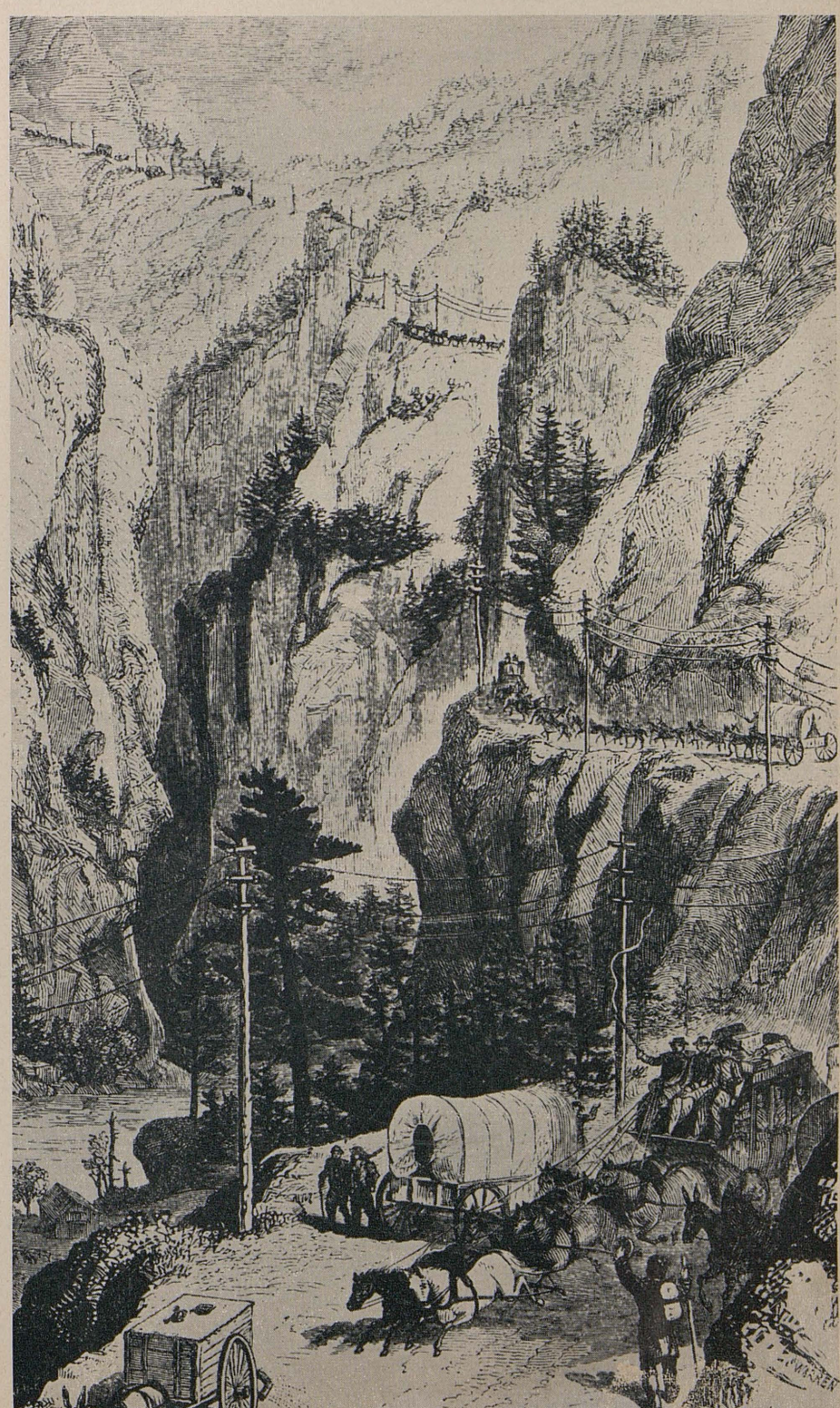
It passed a bill creating a commission to consist of the Governor, Secretary of State and Surveyor General, which body was authorized to call for bids for the construction of a wagon road from the valley of the Sacramento over the Sierra to Carson Valley at a cost not to exceed $105,000. Governor Bigler signed the measure April 28, 1855.

The act provided:

"The Surveyor General of the State shall cause to be surveyed a good wagon road over the Sierra Nevada

and Public Works

Old woodcut picture of Emigrant Wagon Toll Road in 1865 from Albert D. Richardson's book "Beyond the Mississippi," published in 1867 illustrating his description of a trip in a six-horse coach from Lake Tahoe to Placerville



Mountains at an expense not to exceed $5,000; and no further liability shall be incurred for this purpose."

No Funds Provided

Through an oversight, the Legislature failed to appropriate any money for a survey of proposed routes.

Poor Marlette was left with a survey on his hands and no money with which to make it.

In desperation he called upon public-spirited citizens for help. He wrote in one of his official reports:

"On the seventeenth of August, 1855, finding it impossible to comply with the requirements of the Wagon Road Act, in a mode commensurate with the importance of the same, in the vain hope of obtaining assistance from some ardent friend of the road, the following advertisement was inserted in Sacramento papers:

" 'Wanted immediately, on the credit of the State, $500 to enable the undersigned to complete the explorations for the Emigrant Wagon Road. Any gentleman who is willing to advance the above-named sum and will signify the same, will be called upon immediately by the undersigned.

S. H. MARLETTE
Surveyor General'."

"Two gentlemen," General Marlette recorded, "called to inquire what security could be given for the above-named amount to which I replied: 'The justice and liberality of the next Legislature'."

The Surveyor General then appealed to the people of Sacramento, El Dorado and Calaveras Counties for subscriptions to make a survey and funds were raised for the purpose. Marlette commissioned State Senator Sherman Day, a well-known engineer, to locate a route for the Emigrant Road over the Sierra to Carson Valley and Day began his task on June 11, 1855.

He completed a preliminary survey and returned to Sacramento whereupon Marlette set out with him to make a second survey. Day favored a route which today is the course of the state highway from Sacramento through Placerville to Lake Tahoe (then called Bigler Lake), thence into Carson Valley, Nevada. Later, General Marlette directed George H. Goddard, grandfather of Al Goddard of Sacramento, to make a third investigation.

With the information gathered by his engineers, Marlette and the Wagon Road Commissioners advertised for bids for the work of building the road and a contract was awarded to L. B. Leach of Stockton. Subsequently it was found that Leach was a fictitious person and the charge was made that enemies of the proposed road had connived to submit an exceptionally low bid in order to delay construction.

Declared Unconstitutional

Meanwhile, the State Controller refused to audit accounts under the Wagon Road Act and Marlette and those who had contributed money for the surveys were out of pocket. Their claims remained unpaid until April 30, 1857. The Controller later was sustained, the Supreme Court in December, 1856, declaring the Wagon Road Act unconstitutional.

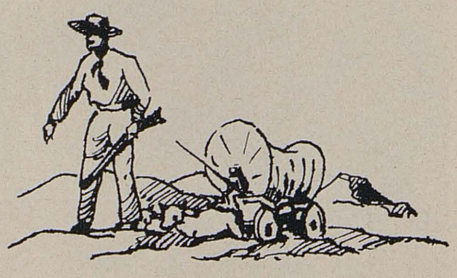
With the legality of the statute questioned, the citizens of Placerville in June, 1856, voted $5,500 for a road from there to Carson Valley over the Day-Marlette route. In February, 1857, President Pierce approved a congressional appropriation of $300,000 for a wagon road from Fort Kearney, via South Pass of the Rocky Mountains and Great Salt Lake Valley to the eastern boundary of California, near Honey Lake.

Immediately, Californians set to work to raise funds for a road over the Sierra to meet the projected federal road at Honey Lake. On May 11, 1857, representatives of Sacramento, El Dorado and Yolo Counties met in Sacramento. Twenty thousand dollars were subscribed by Sacramento, an equal amount by El Dorado and $10,000 by Yolo. The Day route was approved.

Finally, in November, 1858, the road linking Sacramento and Placerville with Carson Valley was completed.

Lack of legislative support for the Emigrant Road and opposition by interests involved in building the first transcontinental railroad resulted in the road being taken over by private capital following the discovery of great silver deposits in Nevada and the excessive traffic from Sacramento over the Sierra to the Comstock and other Nevada mines. The route became a toll road and paid huge dividends to its operators.

Years later, in 1895, when the Legislature created the State Bureau of Highways, the old pioneer toll road, known as the Lake Tahoe Wagon Road, was taken over by the State, thus becoming the starting point of the vast California Highway System of today.



Chapter XIII

Start of Highway System

By KENNETH C. ADAMS, *Editor*

THE STORY of the Division of Highways of the Department of Public Works has its beginning back in 1895. In that year California, by act of the Legislature, created the State Bureau of Highways and acquired the Lake Tahoe Wagon Road, a pioneer toll road, as the first state highway. From this humble start there has developed the California State Highway System which totals some 14,000 miles and serves every section of the State with paved public thoroughfares.

Over the 65 miles of the historic Lake Tahoe Wagon Road from Smiths Flat at Placerville to the state line, east of Meyers, had flowed the variegated traffic of early California. It was typical of the main highways along the Pacific slope prior to the advent and rise of railroads, when the thoroughbrace stages and high-wheeled freighters of the Pioneer Stage Line required 50 men and 600 horses for the service between Placerville and Carson and Virginia Cities. In the year 1862, thirty thousand tons of freight and 36,500 passengers traveled this mountain road with an estimated yearly business for the operating company of more than $4,000,000.

Highway Pioneers

Under the Act of 1895 the Governor was empowered to appoint three members of the Bureau of Highways and he named R. C. Irvine, Sacramento; Marsden Manson, San Francisco, and J. L. Maude, Riverside.

These officials purchased a team of horses and a buckboard wagon. During 1895 and 1896, Irvine and Maude drove into every county of the State, covering 7,000 miles along the coast, through valleys, mountains and deserts, and on November 25, 1896, submitted to the Governor a report recommending a system of state highways "traversing the great belts of natural wealth which our State possesses, connecting all large centers of population, reaching the county seat of every county and tapping the lines of county roads so as to utilize them to the fullest extent."

In 1896 Commissioners R. C. Irvine and F. L. Maude of the newly created Bureau of Highways purchased a buckboard and team of horses and traveled seven thousand miles, mapping out a state highway system. Maje, Irvine's Gordon setter, made the entire trip

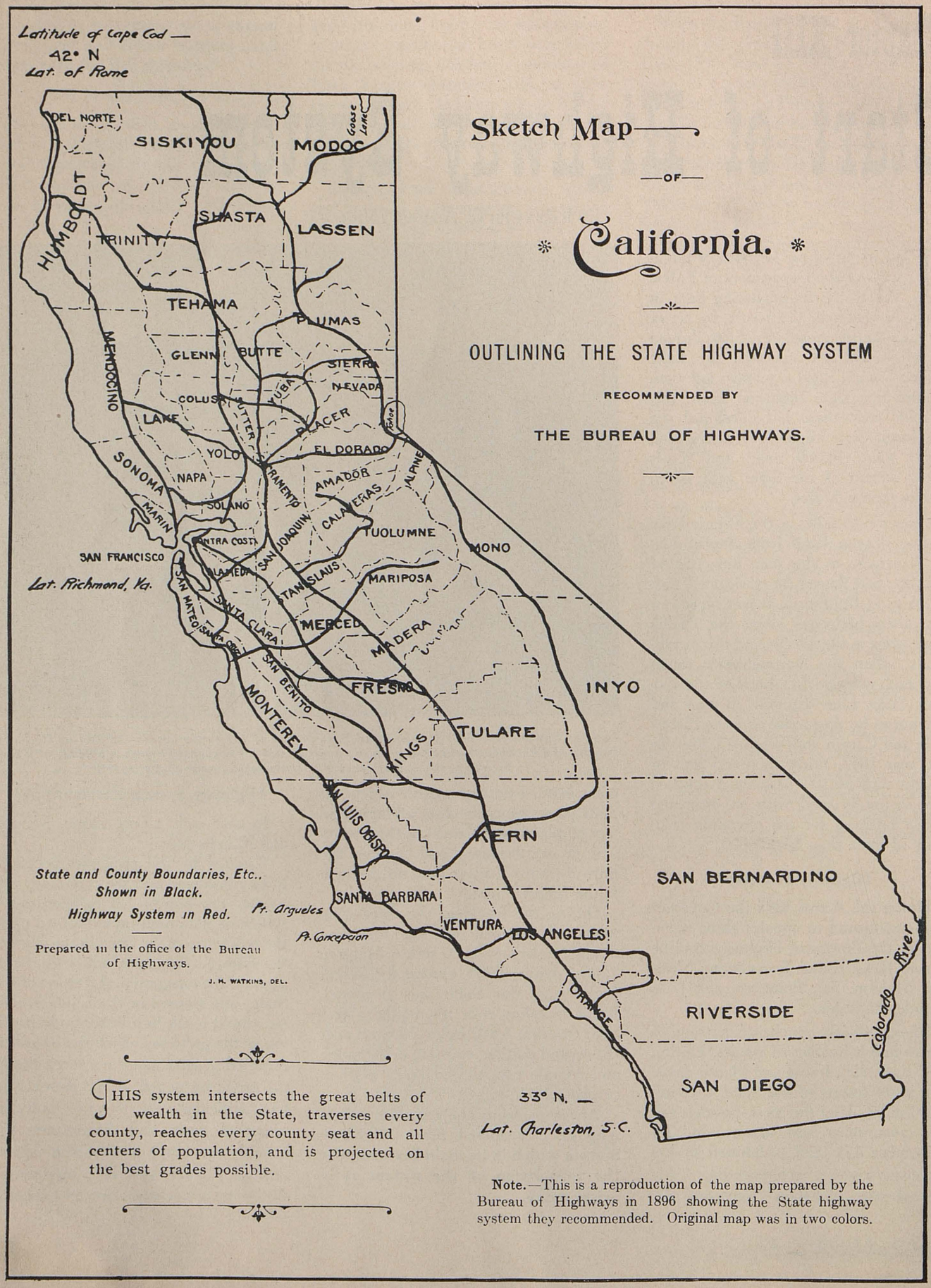
During the first year the three commissioners traveled over the following distances: Irvine, 3,000 miles; Manson, 2,818; Maude, 1,950. During the second fiscal year, the State was districted, Irvine traveling over the northern portion, covering 3,500 miles; Manson over the central portion, covering 4,262 miles; and Maude over the southern portion, covering 1,300 miles.

Accompanying their report was a map of a proposed State Highway System which in its main features was the foundation of the system as it exists today.

Highway System Recommended

In that early report Irvine, Manson and Maude said:

"Guided by the principles necessary to be considered and the conditions presented, the bureau has mapped out a system of state highways, outlined upon the relief map of the State in the office of the bureau. This map, which shows at a glance the topographical features of the State, was secured in the belief that its use would result in a better understanding of the problems which the bureau is expected to solve, point out more clearly the errors incidental to our present system, particularly the defect of faulty location of roads, and demonstrate the breadth and scope of the plan recommended. Upon it have been represented all the important roads now in existence



Sketch Map
—OF—
California.

OUTLINING THE STATE HIGHWAY SYSTEM

RECOMMENDED BY

THE BUREAU OF HIGHWAYS.

THIS system intersects the great belts of wealth in the State, traverses every county, reaches every county seat and all centers of population, and is projected on the best grades possible.

Note.—This is a reproduction of the map prepared by the Bureau of Highways in 1896 showing the State highway system they recommended. Original map was in two colors.

M. J. WRIGHT,
Surveyor-General and Ex-officio Register
State Land Office.

F. E. WRIGHT, Deputy.

STATE OF CALIFORNIA,
OFFICE OF
SURVEYOR-GENERAL
AND
REGISTER STATE LAND OFFICE.

Sacramento, April 11th, 1895.

This is to certify that at a meeting of the members of the Bureau of Highways, viz: Marsden Manson, Joseph Lee, Maude and Richard L. Irvine; held in the office of the State Surveyor General this 11th day of April 1895 at 11.30 a.m. under Section 7, Chapter CCIII, of the Act Approved March 27, 1895.

Marsden Manson was unanimously elected Chairman of said Bureau.

M. J. Wright.
Surveyor General.
By F. E. Wright Deputy.

Photograph of minutes of first meeting of Bureau of Highways held in Sacramento on April 11, 1895

and the proposed system of state highways.

From Oregon Line

"The highways mapped out are as follows:

"1. A highway, commencing on the line between the State of California and the State of Oregon, at or near the point where said state line is intersected by the road from Yreka, California, to Ashland, Oregon, and extending thence southerly, along the best grades and alignments, through the Counties of Siskiyou, Shasta, Tehama, Butte, Yuba, Sutter, Sacramento, San Joaquin, Stanislaus,

Merced, Madera, Fresno, Tulare, Kern, Los Angeles, and San Diego, to Tia Juana.

"2. A highway commencing at Crescent City, in Del Norte County, and extending thence south and southeasterly, on the best grades and alignments, through the Counties of Del Norte, Humboldt, Mendocino, Sonoma, and Marin, to Sausalito.

"3. A highway, commencing in the City and County of San Francisco, and extending thence southeasterly, on the best grades and alignments, through the Counties of San Mateo, Santa Clara, San Benito, Monterey, San Luis Obispo, Ventura, and Los Angeles, to the City of Los Angeles.

Northern California Routes

"4. A highway, commencing at a point on the state highway through Tehama County, at or near the station of Tehama, and extending thence southerly, on the best grades and alignments, through the Counties of Tehama, Glenn, Colusa, Yolo, and Solano, to Vallejo.

"5. A highway, commencing at the City of Martinez, and extending thence southeasterly, on the best grades and alignments, through the Counties of Contra Costa, Alameda, San Joaquin, Stanislaus, Merced, Fresno, Kings, and Kern, to a point on the state highway through Kern County, at or near Bakersfield.

"6. A highway, commencing at a point on the state highway through Shasta County, near the westerly base of Mount Shasta, and extending thence southeasterly, on the best grades and alignments, through the Counties of Siskiyou, Shasta, Lassen, Plumas, Sierra, Nevada, El Dorado, Alpine, Mono, Inyo, and Kern, to Indian Wells, in the last-mentioned county.

Mountain Routes

"7. A highway, commencing at Arcata, in Humboldt County, and extending thence southeasterly, on the best grades and alignments, through the Counties of Humboldt, Trinity, and Tehama, to a point on the state highway through Tehama County, at or near Red Bluff.

"8. A highway, commencing at a point on the state highway through Shasta County, north of Redding, and extending thence northeasterly, on the best grades and alignments, through the counties of Shasta, Plumas, and Modoc, to Fort Bidwell, in the last-mentioned county.

"9. A highway, commencing at the City of Marysville, and extending thence northerly and northeasterly, on the best grades and alignments, through the counties of Yuba, Butte, Plumas, and Lassen, to Susanville, in the last-mentioned county.

Lateral Highways

"10. A highway, commencing at the City of Ukiah, and extending thence southeasterly, on the best grades and alignments, through the Counties of Mendocino, Lake, and Yolo, to the City of Sacramento; thence easterly, through the Counties of Sacramento and El Dorado, to a point on the state line between the State of California and the State of Nevada, at or near its intersection by the Lake Tahoe wagon road.

"11. A highway, commencing at or near the City of Santa Rosa, and extending thence southeasterly, on the best grades and alignments, through the Counties of Sonoma, Napa, and Solano, to Suisun, in the last-named county.

"12. A highway, commencing at a point on the state highway running north from Sacramento, and extending thence northeasterly, on the best grades and alignments, through the Counties of Sacramento, Placer, Nevada, and Sierra, to a point on the state highway through Sierra County, near Susanville, in the last-mentioned county.

"13. A highway, commencing at the City of Oakland, and extending thence easterly, on the best grades and alignments, through the Counties of Alameda and San Joaquin, to a point on the state highway through San Joaquin County south of the City of Stockton.

"14. A highway, commencing at the City of Oakland, and running thence northerly and easterly, on the best grades and alignments, through the Counties of Alameda and Contra Costa, to Martinez.

Through Mother Lode

"15. A highway, commencing at Ione, in Amador County, and extending thence easterly, on the best grades and alignments, through Amador County, to Jackson; thence southeasterly, through the Counties of Amador, Calaveras, and Tuolumne, to Sonora.

"16. A highway, commencing at a point on the state highway through Santa Clara County, at or near Gilroy, and extending thence northeasterly, on the best grades and alignments, through the Counties of Santa Clara, San Benito, Merced, and Mariposa, to the easterly line of the state grant, Yosemite Valley.

"17. A highway, commencing at a point on the state highway through Santa Clara County, at or near Gilroy, and extending thence southeasterly and easterly, on the best grades and alignments, through the Counties of Santa Clara, San Benito, Merced, and Fresno, to the City of Fresno.

"18. A highway, commencing at Modesto, and extending thence northeasterly, on the best grades and alignments, through the Counties of Stanislaus and Tuolumne, to Sonora.

Fresno Lateral

"19. A highway, commencing at or near Hollister, and extending thence southeasterly, on the best grades and alignments, through the Counties of San Benito and Fresno, to a point on the westerly highway through the last-mentioned county, near Huron.

"20. A highway, commencing at a point on the state highway through San Luis Obispo County, at or near San Miguel, and extending thence easterly, on the best grades and alignments, through the Counties of San Luis Obispo and Kern, to a point on the westerly state highway in the last-mentioned county.

"21. A highway, commencing at Port Harford, in San Luis Obispo County, and extending thence southeasterly and northeasterly, on the best grades and

alignments, through the Counties of San Luis Obispo, Santa Barbara, Ventura, and Kern, to Indian Wells, in the last-named county.

Orange Belt Highway

"22. A highway, commencing at the City of Los Angeles, and extending thence easterly, on the best grades and alignments, through the Counties of Los Angeles and San Bernardino, to the City of San Bernardino; thence southwesterly, on the best grades and alignments, through the Counties of San Bernardino, Riverside, and Orange, to Santa Ana, in Orange County.

"23. A highway, commencing at a point on the state highway through Shasta County, north of Redding, and extending thence northwesterly, on the best grades and alignments, through the Counties of Shasta and Trinity, to Weaverville, in the last-named county.

"24. A highway, commencing at Nevada City, and extending thence westerly through the counties of Placer, Yuba, Sutter, and Colusa, on the best grades and alignments, via the Cities of Marysville and Colusa, to a point on the state highway through said last-named county.

Alpine County Route

"25. A highway, commencing at Markleeville, and extending thence easterly, on the best grades and alignments, to a point on the state highway through Alpine County.

"26. A highway, commencing at Mariposa, and extending thence northwesterly, on the best grades and alignments, to a point on the state highway through Mariposa County.

"27. A highway, commencing at Visalia, and extending thence westerly, on the best grades and alignments, through the Counties of Tulare and Kings, to Hanford, in Kings County.

"28. A highway, commencing at a point on the state highway through Alameda County, at or near Niles, and extending thence southerly, on the best grades and alignments, through Alameda and Santa Clara Counties, to San Jose; thence southwesterly, on the best grades and alignments, through the Counties of Santa Clara and Santa Cruz, via the Cities of Los Gatos and Santa Cruz, to a point on the state highway through Santa Cruz County, near Watsonville."

PAST MEMBERS OF THE CALIFORNIA HIGHWAY COMMISSION

Name	Residence	Date of appointment	Termination of membership
Burton A. Towne*	Lodi	Aug. 2, 1911	Resigned Jan. 14, 1914
Charles D. Blaney*	Saratoga	Aug. 2, 1911	Resigned Mar. 1, 1917
N. D. Darlington	Los Angeles	Aug. 2, 1911	Resigned Jan. 8, 1923
Charles F. Stern	Eureka	Jan. 15, 1914	Resigned Dec. 21, 1918
Henry J. Widenmann*	Vallejo	Mar. 1, 1917	Died Oct. 6, 1918
Charles A. Whitmore*	Visalia	Nov. 29, 1918	Resigned Jan. 8, 1923
Emmett Phillips*	Sacramento	Dec. 21, 1918	Died June 18, 1919
George C. Mansfield*	Oroville	June 24, 1919	Resigned Jan. 9, 1923
Harvey M. Toy*	San Francisco	Jan. 9, 1923	Resigned Jan. 3, 1927
Louis Everding*	Arcata	Jan. 9, 1923	Resigned Jan. 17, 1927
Nelson T. Edwards	Orange	Jan. 10, 1923	Resigned Jan. 3, 1927
Ralph W. Bull*	Eureka	Jan. 6, 1927	Resigned Jan. 6, 1931
J. P. Baumgartner*	Santa Ana	Jan. 6, 1927	Resigned Jan. 6, 1931
M. B. Harris*	Fresno	April 18, 1927	Resigned Jan. 6, 1931
Joseph N. Schenck	Los Angeles	Aug. 19, 1927	Resigned Jan. 6, 1931
Fred S. Moody*	San Francisco	Aug. 19, 1927	Resigned Jan. 6, 1931
Earl Lee Kelly	Redding	Jan. 6, 1931	Resigned Oct. 18, 1932
Frank A. Tetley*	Riverside	Jan. 6, 1931	Resigned July 31, 1935
Timothy A. Reardon	San Francisco	Jan. 6, 1931	Resigned May 7, 1936
Harry A. Hopkins	Taft	Jan. 6, 1931	Resigned Oct. 14, 1937
C. D. Hamilton*	Banning	Aug. 1, 1935	Died April 24, 1936
Dr. W. W. Barham	Yreka	Dec. 20, 1932	Resigned May 21, 1935
Ray Ingels	Ukiah	May 21, 1935	Resigned Oct. 4, 1935
H. R. Judah	Santa Cruz	May 7, 1936	Resigned Oct. 5, 1937
Philip A. Stanton*	Anaheim	Jan. 6, 1931	Resigned Mar. 3, 1939
Paul G. Jasper*	Fortuna	May 7, 1936	Resigned Mar. 3, 1939
William T. Hart	Carlsbad	July 7, 1936	Resigned Mar. 3, 1939
Robert S. Redington	Los Angeles	Oct. 5, 1937	Resigned Jan. 27, 1939
Frank W. Clark	Los Angeles	Jan. 27, 1939	Resigned Mar. 10, 1939
Lawrence Barrett	San Francisco	Mar. 3, 1939	Resigned Jan. 11, 1943
Iener W. Nielsen	Fresno	Mar. 3, 1939	Resigned Jan. 11, 1943
Amerigo Bozzani	Los Angeles	Mar. 3, 1939	Resigned Jan. 11, 1943
Bert L. Vaughn	Jacumba	Mar. 3, 1939	Resigned Jan. 11, 1943
L. G. Hitchcock	Santa Rosa	Mar. 10, 1939	Resigned Jan. 11, 1943
†Gordon H. Garland	Sacramento	Jan. 11, 1943	Resigned Sept. 14, 1943
†Mrs. Dora Shaw Heffner	Sacramento	Jan. 11, 1943	Resigned Sept. 14, 1943
†Miss Helen MacGregor	Sacramento	Jan. 11, 1943	Resigned Sept. 14, 1943
†Verne Scoggins	Sacramento	Jan. 11, 1943	Resigned Sept. 14, 1943
†William Sweigert	Sacramento	Jan. 11, 1943	Resigned Sept. 14, 1943
C. Arnholt Smith	San Diego	Sept. 14, 1943	Resigned Jan. 1, 1949

* Deceased.
† Member of the Interim Commission.

Original Highway Report

With no crystal bowl to guide them, the original highway commissioners said this in their 1896 report:

"The bureau recognizes that, in the existing industrial conditions, it would not be wise nor just to advocate an increase in the maximum tax rate now authorized for highway purposes. The true way to lessen existing evils is to reduce and equalize the rate of present taxation and to expend economically and wisely the amounts raised. It is therefore recommended:

"1. That the limit of taxation for highway purposes in each county, now fixed by law at 40 cents per $100 of assessed valuation of outside property, be reduced to 35 cents;

"2. That a general state levy of one-quarter of a mill per $1 of assessed valuation be made, the proceeds of which shall constitute a state highway fund for the systematic location, construction, and maintenance of the system of state highways hereinafter outlined.

Highway Tax Minimized

"Under this system every taxpayer in the State will contribute to the construction of these main highways. At present only those owning property outside of incorporated cities are called upon to bear the expenditures on roads; but under the plan recommended those owning property solely in the cities, and who are likewise benefited either directly or indirectly, will bear a slight share in the cost

of this needed improvement. The amount is infinitely small, but the results will be of tremendous advantage to the entire State. The counties will gradually be relieved of the expense of maintaining that portion of the state highways within their limits, thus leaving a larger sum for their county thoroughfares and district roads. These latter, by proper construction, will gradually require smaller expenditures for maintenance, so that the system proposed herein, and found advisable in other states and countries, *will tend to lessen the burdens now endured.*

"Although the system of state highways recommended seems a gigantic undertaking, it is reasonably certain *that it can be built within the next few decades with what can be saved from the present extravagant and wasteful methods.*

Between Hood and Franklin in Sacramento County before first highway bond issue

Highway Department Created

The Legislature of 1897 dissolved the Bureau of Highways and created a Department of Highways, of which Marsden Manson, J. R. Price, and W. L. Ashe were appointed commissioners to serve for two years, at the end of which time their offices automatically should cease and all powers attached to them be vested in one man, "who must be a civil engineer," to be appointed by the Governor and to hold office for four years.

The members of the new Department of Highways bent their efforts in exhaustive studies of road construction practices and economics. Mr. Manson made a tour of Europe to observe the methods followed in England, France, Germany, Russia, and other countries. Their findings on drainage problems, roadbed, and pavement construction were based on fundamental engineering practice so that in its early beginnings modern highway development in California was placed on a firm foundation.

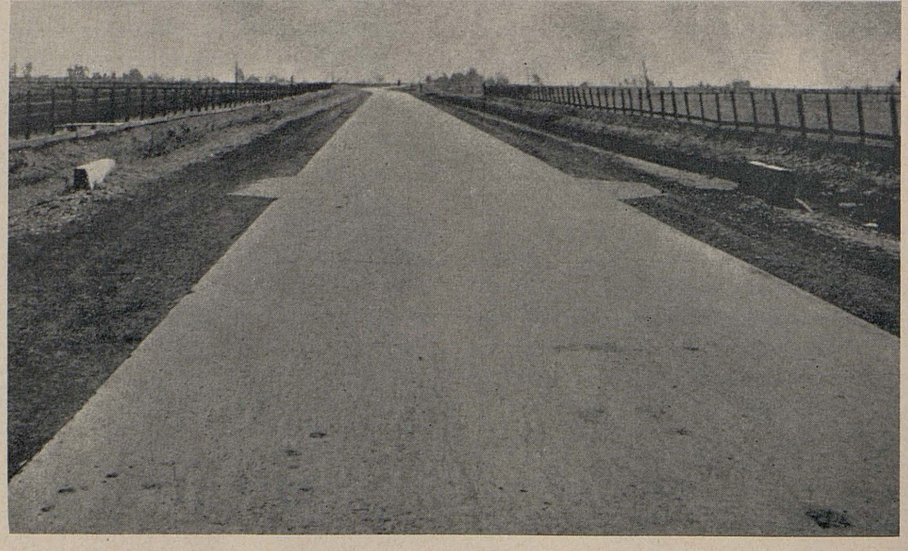
At the close of the two-year period of activity of the three commissioners, Mr. J. L. Maude, of the original Bureau of Highways, was appointed to the office of Highway Commissioner.

Highway System Authorized

As the result of the work of these pioneers of modern road construction, an amendment to the California State Constitution was adopted on November 4, 1902, giving the Legislature power to establish a system of state highways and to pass all laws necessary or proper for highway construction and maintenance, and authority to extend state aid to counties for their road systems. Prior to 1902, beginning with the Lake Tahoe Wagon Road, several county roads had been conveyed to the State, and by various legislative acts commissions had been appointed to survey and reconstruct these roads; some bridges also were constructed by the State under the authority of similar legislation, but in all instances each project was an entity in itself.

In 1907 the Department of Engineering was established, consisting of an advisory board composed of the Governor, the State Engineer, the Superintendent of State Hospitals, and the chairman of the State Board of Harbor Commissioners in San Francisco. Mr. Nathaniel Ellery, who, in 1903, had succeeded Mr. Maude to the position of Highway Commissioner, was appointed to the position of State Engineer by Governor James N. Gillette at the time of the formation of the Department of Engineering. However, lack of funds prevented any material progress of the Department of Engineering in road construction.

Same section of road improved after Sacramento's successful bond issue campaign



SAVINGS FROM GOOD ROADS

In January, 1915, the Secretary of the Sonoma County Good Roads Club wrote to Col. S. H. Finley, County Highway Engineer of Orange County, regarding savings effected by good roads. Col. Finley replied in part as follows:

"In your county the saving on depreciation, repairs and fuel for automobiles will average at least $110 each per year. Assuming that you have 2,000 motor vehicles of all kinds in the county, the savings to the owners of these will annually amount to $220,000.

"Assuming that you have 5,000 horses and mules in your county, the good roads will save at least:

"For shoes and harness annually, $1.50 each	$7,500
"For each animal for feed, 50 cents per month	30,000
"Increase useful life of each animal, 10 percent	75,000
"Wear and tear on wagons and carriages, 2,000 at $5 each	10,000
Total	$122,500."

This picture with title was used in early bond issue campaign

Good Roads Favored

During these preliminary years of the participation of the State in road development, favorable public sentiment for "good roads" programs was spreading throughout the Nation and with the rapid rise in the manufacture and sale of motor cars during the first decade of the century this public sentiment crystallized into action.

First Bond Issue

In 1909 the Legislature passed and the Governor approved an act providing for a bond issue of $18,000,000 for the purpose of acquiring and constructing a State Highway System. The act was submitted to the people at the general election in 1910 and upon their approval became effective December 31, 1910.

The Act of 1909 providing for the First State Highway Bond Issue made possible the real beginning of a unified system of state highways. It provided that the system should be acquired and constructed by the Department of Engineering, and the routes selected and laid out so as to constitute a continuous and connected State Highway System running north and south, traversing the Sacramento and San Joaquin Valleys and along the coast, by the most direct and practicable routes connecting the several county seats and joining centers of population, together with such lateral roads as might be necessary to connect the north and south arterials with the county seats lying east and west of such highways, and also to connect with the chief transcontinental routes entering California.

First Highway Commission

In 1911 the Legislature passed an act which added three appointive members to the Advisory Board of the Department of Engineering to serve, with salary, at the pleasure of the Governor. At a meeting of the advisory board in August, 1911, an enabling resolution was adopted which designated the three appointed members as an executive committee, to be known as the California Highway Commission, and which vested in the Commission the actual handling of the work of acquiring and constructing the State Highway System as provided under the bond issue of 1909.

As the three appointive members, Governor Hiram W. Johnson named Burton A. Towne of Lodi, Charles D. Blaney of Saratoga and N. D. Darlington of Los Angeles to serve as California's first active Highway Commission. Mr. Towne served as chairman of the commission.

Funds Limited

Governor Johnson warned the commission, at the first meeting held in his office, that they faced "a tough job." "You are expected," he said, "to build, with $18,000,000, a highway system that some of the best engineers have estimated will cost from thirty-five to fifty millions."

Chairman Towne and his colleagues assumed their responsibilities without hesitation and together with Mr. Austin B. Fletcher, whom Governor Johnson appointed State Highway Engineer, began the task of making surveys and plans and

of beginning construction of the California State Highway System. That the work of these pioneers was well done is evidenced by the world-wide renown of the system for which they built the foundation.

This first commission and Mr. Fletcher toured the State from the Oregon line to the Mexican border, traveling 6,800 miles and making an intensive study of the highway needs of the State as a whole, but bearing in mind the stipulations of the bond act for the system.

Seven Districts Established

The physical features of California laid down certain obvious controls for highway route selections, so, on the basis of the earlier studies, their own observations and these geographical controls, a system was adopted and the work of surveys begun in preparation for construction. The State was divided into seven districts, each in charge of competent and experienced engineers, who carried out the commission's policies and pushed the work ahead.

First Contract Started

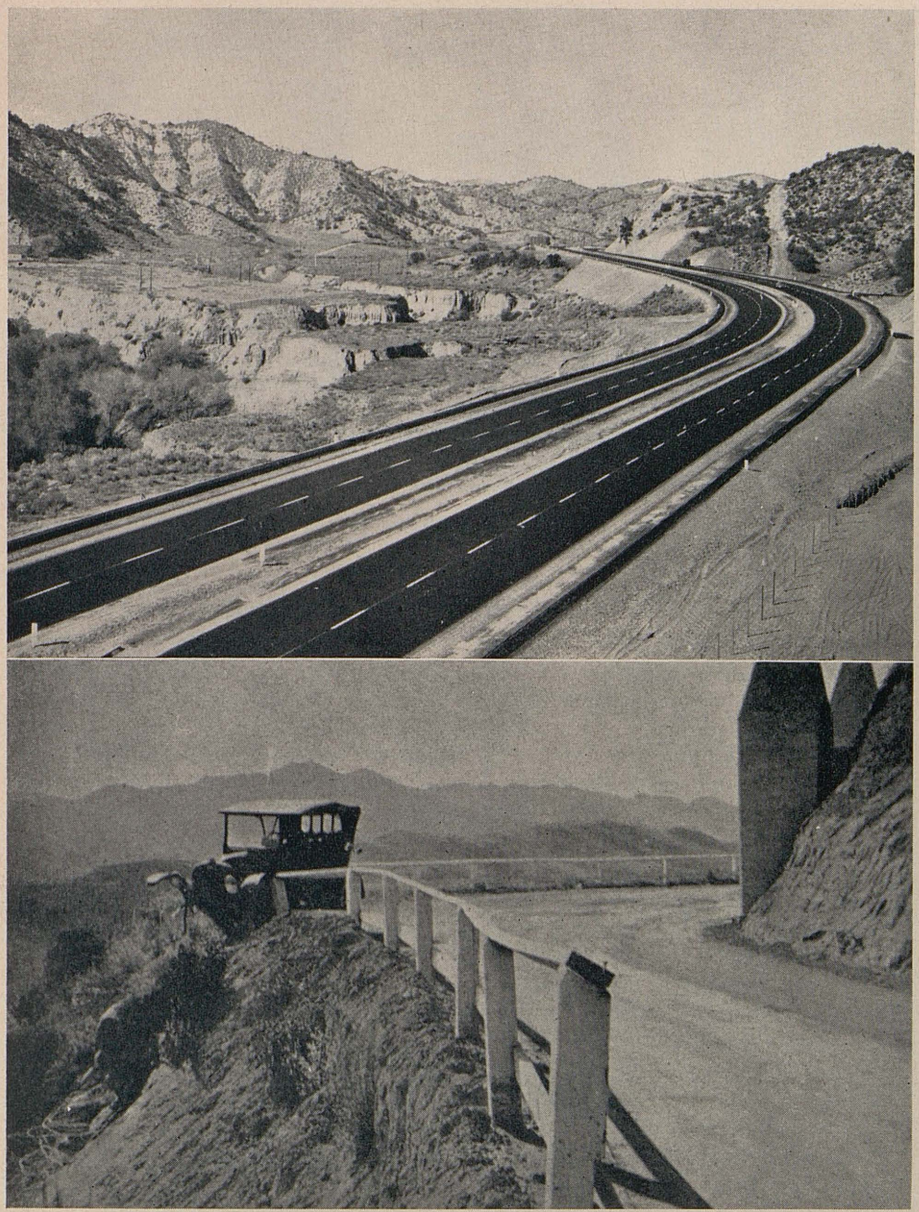
In less than one year after the beginning of work more than 1,000 miles of state highway had been surveyed. On August 7, 1912, Mr. Towne turned the first shovel of earth on California State Highway Contract No. 1, to start construction of an asphalt concrete pavement on a section of the Coast Route between South San Francisco and Burlingame, in San Mateo County. Since that date highway construction, reconstruction, improvement and maintenance have been continuous on the State Highway System.

Of that first commission, Mr. Towne resigned on January 14, 1914, because of the press of private business, Mr.

ROLLER SKATING ON STATE HIGHWAY

Press dispatches report that "skating rinks in San Mateo County are doomed to a natural death, judging from the avidity with which the young folk of the peninsula towns have taken up the fad of utilizing the new state highway for roller recreation. Moonlight skating parties are quite the common thing on the new smooth surface of El Camino Real. A party of young people from South San Francisco skated six miles to Easton one evening, built a big bonfire and served coffee and cake."—*From California Highway Bulletin of May, 1913.*

The start of actual construction work on the State Highway was made in San Mateo County on August 7, 1912. In the group are Chairman Towne of the Highway Commission with shovel; W. J. Martin, South San Francisco; L. E. Aubury, Ex-State Mineralogist; Judge P. E. Lamb, Burlingame; Ex-County Recorder of San Mateo County, H. O. Heiner; Dr. F. C. McGovern; A. E. Ritchie, Fred Cunningham and Supervisor W. H. Brown, San Mateo County



In the lower picture is shown a section of the Ridge Route, U. S. 99, before gas tax funds modernized this mountain highway as shown above

Blaney resigned in March of 1917 on his physician's orders, but Mr. Darlington served until January 8, 1923, a period of more than 11 years and five months. Succeeding commissioners have held to the high standards of public service which these pioneers in state highway development inaugurated.

Maintenance Funds Provided

In 1913 the State Legislature passed an act requiring the registration of all motor vehicles and the payment of a fee for such registration. The act provided for the equal division of the net revenue from such fees between the State and the counties, apportionment to each of the 58 counties to be made in the proportion of the motor vehicle registration in the county to the total registration. From these funds the Highway Commission derived the first money which was available for maintenance activities, as the act provided that the State's half should be devoted to this purpose.

The 1915 Legislature passed an act providing for a second bond issue of $15,000,000. This act, known as the "State Highway Act of 1915" was ratified by the people at the election in 1916 and became effective December 31, 1916. That California had become highway-conscious is attested by the fact that not a single county voted against this issue.

The expenditure of the proceeds from this second bond issue was placed in the hands of the commission for the further development of the State Highway System. The act providing for the second bond issue also added additional mileage to the system.

Funds from the sale of the first $18,000,000 bond issue were exhausted by January, 1917, and funds from the second issue were not available until after July 1, 1917. However, in order that there be no interruption in the work of the Highway Commission, state officials agreed to borrow from the Motor Vehicle Fund sufficient money to tide over the interim.

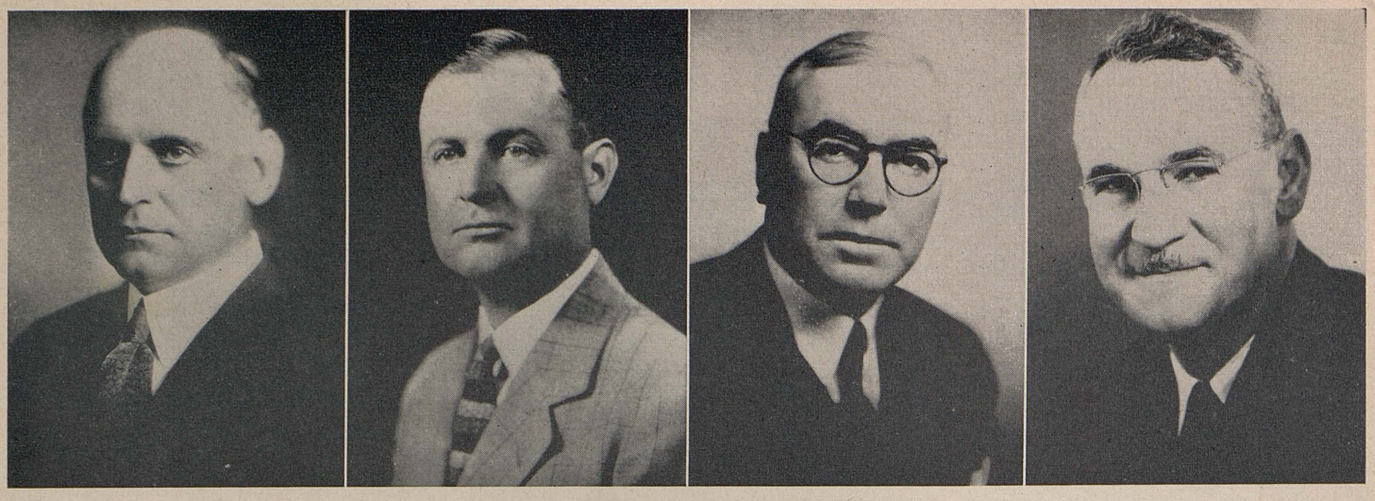
Commission Statutory Body

The 1917 Legislature gave the California Highway Commission statutory recognition and a legal entity by amending the Department of Engineering Law to provide that the three appointed members of the advisory board should compose a subdivision of the Department of Engineering designated as the California Highway Commission and expressly prescribing its powers and duties. This amendatory act also transferred all state roads which had been constructed under special appropriations and which until 1917 had remained in charge of the State Engineer to the jurisdiction of the Highway Commission.

Thus the California Highway Commission ceased to be an executive committee of the advisory board created for greater convenience in the conduct of the state highway work under the first bond issue and became a statutory body in immediate control and supervision of all state road and highway activities.

Last Highway Bond Issue

At a special election July 1, 1919, the people of California approved a third highway bond issue for $40,000,000. These funds became effective immediately and provided for continued construction of the highways designated by the two previous bond issues. Under this third bond issue additional roads were



In more ways than one, California has established highway records. Since 1911, the State has had only four state highway engineers. Left to right: A. B. Fletcher, 1911-1923; R. M. Morton, 1923-1927; C. H. Purcell, 1927-1943; George T. McCoy, 1943 to present

made a part of the State Highway System.

This was to be the last of the bond issues. In its biennial report for 1919-20, the Highway Commission recommended the imposition of a gasoline tax, the proceeds of which should be devoted solely to highway purposes; however, the gas tax did not come into existence until 1923, but it came to stay.

The Highway Commission in its biennial report for 1921-22 warned that the depletion of the $40,000,000 bond issue rapidly was approaching, that California was faced with the future expenditure of millions of dollars for highways and that the time had come when a new method of financing was necessary. Sentiment was crystallizing in favor of a gas tax as a "pay as you go" method.

Two-Cent Gas Tax Passed

The Legislature of 1921 did not act upon the gas tax proposal, but two years later, at the 1923 Session, a bill for a 2-cent gasoline tax was submitted, passed, and approved by the Governor. This new law provided that 1 cent of the tax was to be used for maintenance and reconstruction of state highways and 1 cent to be distributed among the counties for improvement of county roads.

The 1921 Legislature created the Department of Public Works composed of the Division of Highways, Division of Water Rights, Division of Engineering and Irrigation, Division of Land Settlement and the Division of Architecture.

The act creating this new state department designated the State Highway Engineer as the Director of Public Works and created a Board of Public Works consisting of the director and the California Highway Commission.

Commission Separate Agency

With the advent of Governor Richardson into office in 1923 the Highway Commission was taken out of the Department of Public Works, becoming a separate state department and taking over all the duties relative to highway work previously performed by it under the Department of Public Works. The State Engineer became the Director of Public Works, relieving the State Highway Engineer who became the executive officer of the commission and handled only highway work.

The Governor on January 9, 1923, appointed a new Highway Commission, with Harvey M. Toy as Chairman and Louis Everding and Nelson T. Edwards as members. Mr. Fletcher having resigned the position of State Highway Engineer to accept a position with the United States Bureau of Public Roads in Washington, Mr. R. M. Morton was named to succeed him.

Under the new commission the mileage of the State Highway System was redistributed and three districts were added to the original seven into which the State had been divided in 1911.

Additional Revenue

During the period from 1923 to 1927 while revenues from the gas tax and vehicle registrations increased rapidly and reconstruction and maintenance activities advanced it became evident that some provision must be made for financing new construction on roads which were state highways but for which no provision had been made in the bond acts. This very apparent need was met by the 1927 Session of the State Legislature by the passage of an act providing for an additional 1 cent tax on gasoline, the proceeds to be placed in the State Highway Construction Fund and used exclusively for new construction projects. A similar bill had been defeated in 1925.

CALIFORNIA HIGHWAYS MOST NOTABLE IN U. S.

I have just returned from a 1,000-mile tour of California highways, more than 600 miles of which traversed the state system of trunk lines. With due regard for the great work already completed and under way in the Eastern states, I predict that the California Highway System, now in the making, will be, when completed, the most notable system of highways in America, if not in the world.— ***J. E. Pennybaker, Chief of Road Economics, United States Office of Public Roads, in California Highway Bulletin, June, 1916.***

Austin B. Fletcher...Highway Builder

By C. C. Carleton, *Chief of the Division of Contracts and Rights of Way, State Department of Public Works* *

Eastern dispatches on March 8th announced the passing of one of the most notable highway engineers of our time—Austin Bradstreet Fletcher, first State Highway Engineer of California.

Perhaps no modern road builder has a more impressive record of achievement than he. Certainly none has more greatly influenced the thoughts and methods of his associates and contemporaries.

Mr. Fletcher was born at Cambridge, Massachusetts, 56 years ago. He was educated at Harvard University. From 1893 to 1910 he was secretary and executive officer of the Massachusetts Highway Commission which was considered a model in highway practices in the United States. In 1910 he was chosen as secretary-engineer for the San Diego County, California, Highway Commission after a careful consideration of the outstanding road engineers of America. In 1911 he was selected by Governor Hiram W. Johnson to head the first State Highway Department of the State of California, in which capacity he also served as Director of Public Works and President of the State Reclamation Board. Since 1923 he has occupied a responsible position as Consulting Engineer for the United States Bureau of Public Roads at Washington, D. C., which was his official residence at the time of his death.

Great Organizer

Mr. Fletcher was particularly recognized as a great organizer and an adept in the selection of personnel. He had extraordinary discernment in his analyses of the character, qualifications and integrity of applicants for positions at his disposal.

It became his duty to assemble the initial engineering field forces at the commencement of state highway activities in California in 1911, and from the outset he endowed it with an esprit de corps which has probably been unequaled in any similar organization.

It is a remarkable fact that today, in 1928, every district engineer and practically every department head of the California Highway Commission has been brought into the organization and trained and developed by him. A host of others in public employment everywhere have been the beneficiaries of his tutelage.

Loyal Staff

It may be safely stated that no public executive in California ever had a more loyal and devoted staff than he during his long tenure of the position of State Highway Engineer of California. His co-workers prized it as a privilege and a distinction to labor under so precise, systematic and cultured a friend and leader as Mr. Fletcher; indeed, from him they received a liberal education in the proper forms, niceties and methods of business management and engineering practice.

Mr. Fletcher was called to California because of his widespread reputation as a road builder and because he was considered big enough to establish precedents rather than to follow in the footsteps of other men. So well did he install system in California that few changes have been made or perhaps can be made in the engineering principles and standards devised by this far-seeing pioneer of highway development. His ideas and ideals will ever remain foundation stones of the organization structure of the State Highway Department of California.

Strict But Kindly

He was a strict disciplinarian but tempered his discipline with such kindness and consideration that few stings were ever left and but few subordinates took umbrage at his endeavor, as he humorously expressed it, "to keep them in their own corrals."

To many who did not truly know him Mr. Fletcher was considered somewhat austere and aristocratic. He was a man of quiet dignity, worthy ancestry and scholarly accomplishments, and by some he was misjudged and by others misrepresented.

But to those who really knew him his human and engaging qualities were predominant and they feel a profound personal grief at his taking.

The writer first met Mr. Fletcher when he arrived in San Diego to undertake the construction of the first county highway system of San Diego County nearly two-score years ago.

He was then spoken of as a "typical" New Englander personifying the manners, culture and traditions of the East.

But he was to become a pathfinder in road building in the West. Western ways were new to him at first, but in the years to follow he adjusted himself to his surroundings and the closing statement may be safely ventured that could he now express himself he would prefer to be borne in mind by his friends in the West as a gentleman and a Californian.—*From California Highways and Public Works of April, 1928.*

* Mr. Carleton retired March 1, 1949, after 37 years of state service. He wrote this tribute to Mr. Fletcher for California Highways and Public Works in April, 1928.

Roads Classified

An additional act also was passed classifying the various highways into primary and secondary roads, and grouping the counties into 13 southern and 45 northern counties. Funds were allocated 75 percent to primary roads and 25 percent to secondary roads. Funds for primary roads were further divided in accordance with the mileage of such roads in each county group, and the secondary road funds were apportioned equally to each county group. The 1 cent additional tax was the first definite fund provided for the various roads taken into the State Highway System by the several acts of the Legislature. These roads had been added at various times, in many cases without provision of funds for their construction.

In 1927 the Legislature also passed an act providing for the collection of a stage line franchise tax on motor stage lines

operating in California. The net revenue derived from this tax was apportioned one-half to the counties of California and one-half for use in construction of state highways. This act was repealed in 1933.

Engineering Departments Reorganized

In July, 1927, the Department of Public Works was recreated. A new act, passed by the 1927 Legislature and approved by Governor C. C. Young, provided for at least four divisions, consisting of the Division of Engineering and Irrigation, the Division of Water Rights, the Division of Architecture and the Division of Highways. The State Highway Engineer became Chief of the Division of Highways. To these, the Division of Contracts and Rights of Way and the Division of Motor Vehicles were subsequently added, but by the act of the 1931 Legislature the Division of Motor Vehicles was taken out of the Department of Public Works and made a separate state department. The act of 1927 also provided for a Highway Commission consisting of five members appointed by the Governor, serving without remuneration, and who were given the power to alter the routes of any state highway, abandon portions no longer required, authorize the condemnation of rights of way, and allocate money for the construction and repair of the various state roads.

Commission Duties Transferred

All other duties of the previous commission were transferred to the Director of Public Works as head of the Department of Public Works; the director and the State Highway Engineer both being appointed by, and serving at the pleasure of the Governor.

B. B. Meek of Oroville was appointed Director of Public Works, C. H. Purcell was named State Highway Engineer and Chief of the Division of Highways, and the following were made members of the California Highway Commission: Ralph W. Bull, Chairman, Eureka; J. P. Baumgartner, Santa Ana; M. B. Harris, Fresno; Joseph M. Schenck, Los Angeles; Fred S. Moody, San Francisco. E. Forrest Mitchell of Belvedere was made secretary.

Toll Bridge Authority Created

In 1881 an act of the Legislature provided for the granting of franchises by the State for constructing bridges across navigable streams, estuaries and arms of bays, requiring approval by the State Engineer of the width of draw and the length of span of such bridges. This statute was in force until its repeal in 1929 by the approval of an act regulating the construction, maintenance and operation of toll bridges and toll roads, and an act declaring the policy of the State of California relative to toll bridges, and creating the California Toll Bridge Authority.

During the Forty-seventh Session of the California State Legislature in 1927, an act was passed and approved by the Governor authorizing the California Highway Commission to investigate the operation of toll bridges within the State, and to submit a report of its findings with recommendations to the Forty-eighth Session of the Legislature in 1929.

Based upon this report and the accompanying recommendations, the act above referred to, declaring the policy of the State of California relative to toll bridges and creating the California Toll Bridge Authority, was approved.

Toll Bridge Policy

Briefly, it was declared to be the policy of the State to acquire and own all toll bridges situated along or upon any part of the highways of the State, with the end in view of ultimately eliminating all tolls thereon.

The California Toll Bridge Authority, created by the same act, is a body empowered to authorize and direct the Department of Public Works to acquire, construct and operate toll bridges across navigable or unnavigable streams, estuaries, or bays, which are either wholly or in part within the State of California.

The Toll Bridge Authority was also authorized to issue bonds for the acquisition or construction of such toll bridges secured only by the revenue derived from the tolls to be collected, the bonds to be retired and the interest to be paid upon them by the collected tolls.

Toll Bridge Jurisdiction

The act regulating the construction, operation and maintenance of toll bridges, approved at the same time as the one creating the Toll Bridge Authority, vested exclusive jurisdiction of such bridges in the Department of Public Works. It empowered the Department of Public Works with the acquisition, construction and operation of all toll bridges, as well as fixing tolls to be charged.

Also in 1929 the Hoover-Young San Francisco Bay Bridge Commission was appointed by President Hoover and Governor Young and the Division of Highways was entrusted with the preparation of a detailed report embodying plans for the great San Francisco-Oakland Bay Bridge. The report was presented in August, 1930.

San Francisco-Oakland Bay Bridge

The 8¼-mile bridge across San Francisco Bay, which connects San Francisco with Oakland, Berkeley and the East Bay area was constructed by the San Francisco-Oakland Bay Bridge Division of the Department of Public Works. Construction of the bridge was planned and supervised by the then State Highway Engineer C. H. Purcell, who was appointed Chief Engineer in charge of the project. Its cost was financed from the proceeds of revenue bonds issued under the California Toll Bridge Authority Act. The bonds were secured by anticipated tolls.

The bridge, which is one of the largest and most costly in the world, is a double-deck structure with six lanes for automobile traffic on the upper deck and three lanes for truck and bus traffic plus two interurban railroad tracks on the lower deck. The western portion of the bridge is in reality two complete suspension bridges, each with a center span length of 2,310 feet, secured to a central anchorage midway between San Francisco and Yerba Buena Island.

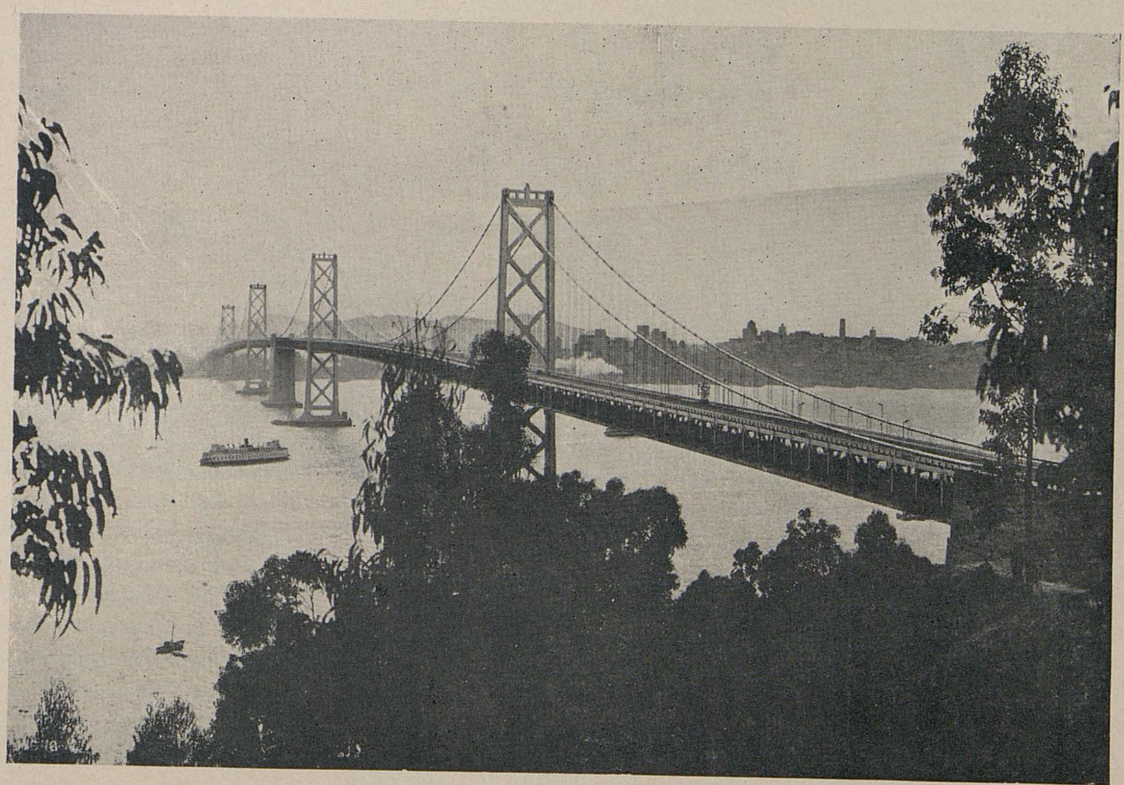
Towers of the suspension bridge are from 474 to 519 feet high, and the piers range from 100 to 235 feet in depth.

The two cables are 28¾ inches in diameter, each cable containing 17,464 wires, and the total length of cable wire used was 70,815 miles—nearly three times the circumference of the earth. Total length of the 2¼-inch suspender ropes is 43 miles. East of the island the bridge is composed of a steel cantilever with a main span 1,400 feet in length, two 510-foot anchor arms, and 22 steel truss spans with lengths of from 300 to 500 feet. The west and east portions connect through a double deck tunnel on Yerba Buena Island.

The bridge was constructed at a cost of approximately $70,000,000 and is maintained and operated with gas tax funds. All toll revenue is used for the reduction of bonded indebtedness which had been reduced to $19,840,000 on June 30, 1950.

The bridge was opened to vehicular traffic on November 12, 1936, and interurban trains began travel on January 14, 1939. As of June 30, 1950, approximately 263,510,174 vehicles had crossed the bay on the bridge.

Title to the Carquinez and Antioch bridges on the upper reaches of San Francisco Bay was acquired by the California Toll Bridge Authority on September 16, 1940, and these two structures were operated as toll bridges until August 1, 1945, when they became toll free. The purchase cost to the State was $5,593,000 and retirement of the indebtedness was accomplished from tolls collected over the five-year period.



This photo of San Francisco-Oakland Bay Bridge was taken day before opening of span on November 12, 1936

Rolph Appointments

James Rolph, Jr., of San Francisco, was elected Governor in 1930, and upon taking office in 1931 he appointed a new California Highway Commission, naming Earl Lee Kelly, Redding, Chairman; Harry A. Hopkins, Taft; Timothy A. Reardon, San Francisco; Philip A. Stanton, Anaheim, and Frank A. Tetley, Riverside. John W. Howe of Los Angeles became secretary. State Highway Engineer C. H. Purcell was retained by Governor Rolph.

Colonel Walter E. Garrison, Lodi, was appointed Director of Public Works and served from January, 1931, to October, 1932, at which time he resigned. For a period of four days, October 10th to October 14th, California's Department of Public Works for the first and only time in its history had a woman as its head. In recognition of 20 years of service to the State, Governor Rolph appointed Miss Myrtle V. Murray, the department's secretary, to be interim Director of Public Works. Miss Murray entered the employ of the Division of Highways in 1911, served in the offices of Governors Hiram W. Johnson and William D. Stephens and in 1921 was named Secretary of the newly created Department of Public Works.

Earl Lee Kelly succeeded Miss Murray on October 14, 1932, and Mr. Hopkins became chairman of the commission, and Dr. W. W. Barham of Yreka took Mr. Kelly's place on the commission.

City Highway Funds

In 1933 the legislation establishing the gasoline tax was amended to provide that an amount equal to one-fourth cent of the State's share of the 3-cent tax should be apportioned to incorporated cities in proportion to their population for construction and maintenance of state highway routes through the cities or on other city streets. The administration of these one-fourth cent funds was entrusted to the Department of Public Works which apportioned the amounts to the various cities and required that the local authorities submit project statements of proposed improvements for approval in accordance with the legal provisions of the Statutes as amended in 1935 requiring this one-fourth cent be used on state highway routes within cities. By this method smaller cities were given the advantage of the Division of Highways' organization and experience and in all

cases improvements were kept to uniform standards.

One Highway Fund

This 1933 amendment also lifted the restriction stipulating that the State's share of the 1923 gasoline tax could not be used for new construction and provided that all funds accruing to the State for highway purposes be placed in a single fund. Provision was made that allocations to construction, reconstruction and maintenance be left in the hands of the California Highway Commission in the adoption of biennial budgets with the restriction that an amount equal to not more than the revenue from 1-cent tax per gallon of gasoline be budgeted for maintenance and that administration charges should not exceed 2 percent of the revenue.

More Mileage Added

The 1933 Legislature likewise amended the State Highway Classification Act of 1927. By this amendment approximately 6,700 miles of county roads and city streets were added to the State Highway System, thereby more nearly equalizing the secondary mileage between the northern and southern groups of counties. Under this 1933 legislation all funds budgeted for construction and improvement were allocated equally between the primary and secondary road systems. The half apportioned to work on primary roads being divided in the ratio of the primary mileage in the 45 northern counties to the primary mileage in the 13 southern counties.

To meet the changed conditions due to rapid growth it was found advisable by the Division of Highways to make certain adjustments within the organization. The 10 districts into which the State had been divided for purposes of administration were increased to 11. Changes in some boundary lines between other districts were effected to equalize mileage and two district offices were moved to more central locations. The new District XI, comprising San Diego, Imperial and part of Riverside Counties, was established with headquarters at San Diego. The offices of District III and District X were moved from Sacramento to Marysville and Stockton, respectively.

Merriam Becomes Governor

On June 2, 1934, Governor Rolph died and Lieutenant-Governor Frank F. Merriam became Acting Governor. He was at the time a candidate for Governor in the campaign of that year and in November was elected chief executive of the State, taking office in January, 1935.

Governor Merriam retained both Mr. Kelly as Director of the Department of Public Works and C. H. Purcell as State Highway Engineer; Edward J. Neron of San Diego was named Deputy Director of Public Works in August, 1934, and in February, 1935, Julien D. Roussel, Long Beach, was chosen secretary of the Highway Commission. The following month, Justus F. Craemer, Orange County newspaper man, who had served as Governor Merriam's private secretary, was appointed Assistant Director of the Department of Public Works, with headquarters in Los Angeles.

New Commissioners Appointed

On May 21, 1935, Governor Merriam appointed Ray Ingels of Mendocino County, former Assemblyman and State Senator, a member of the Highway Commission, succeeding Dr. W. W. Barham of Yreka. Mr. Ingels became Director of the Department of Motor Vehicles in August, 1935, thereby creating a vacancy on the commission. On July 24, 1935, Charles D. Hamilton of Banning succeeded Frank A. Tetley on the commission. Mr. Hamilton died suddenly April 24, 1936. W. T. Hart of Carlsbad succeeded Mr. Hamilton.

Governor Merriam made two more appointments on May 6, 1936, naming as members of the Highway Commission H. Ray Judah, of Santa Cruz, to succeed Timothy A. Reardon, San Francisco, and Paul A. Jasper, Fortuna, to fill the vacancy caused by the resignation of Mr. Ingels.

Appointment of Justus F. Craemer to be Building and Loan Commissioner October 4, 1937, resulted in the elevation of Harry A. Hopkins, to the post vacated by Mr. Craemer and the appointment of Robert S. Redington of Los Angeles to succeed Mr. Hopkins on the Highway Commission.

In January, 1939, Culbert L. Olson became Governor and appointed Frank W. Clark Director of Public Works. In March of that year, the Governor named a new California Highway Commission with the following members: Larry Barrett, Chairman, San Francisco; Iener W. Nielsen, Fresno; Amerigo Bozzani, Los Angeles; and Bert L. Vaughn, Jacumba. Director Clark served as a member of the commission until April, 1939, when L. G. Hitchcock of Santa Rosa was appointed to make up the full membership of the commission. State Highway Engineer Purcell was retained in his position throughout the Olson regime.

Warren Assumes Office

Earl Warren assumed office as Governor in January, 1943. He immediately appointed State Highway Engineer Purcell to the post of Director of Public Works and George T. McCoy moved into Purcell's position as State Highway Engineer. For a period of several months the functions of the Highway Commission were carried on by a temporary body consisting of Gordon H. Garland, Chairman; Mrs. Dora Shaw Heffner, Miss Helen MacGregor, Verne Scoggins, and William T. Sweigert, the last three being secretaries on the staff of Governor Warren.

In September, 1943, the Governor named a permanent commission of which Director Purcell, under a new law, became chairman. The members were Harrison R. Baker, Pasadena, Homer P. Brown, Placerville, James A. Guthrie, San Bernardino, F. Walter Sandelin, Ukiah, Chester H. Warlow, Fresno, and C. Arnholt Smith of San Diego, who resigned in January, 1949. He was succeeded by Charles T. Leigh of San Diego. The original members of this commission with the exception of Smith still are serving Governor Warren, all having been reappointed when their staggered terms of office expired.

Funds Reallocated

At the 1935 Session of the Legislature an act was voted and approved providing for the allocation to cities of an additional one-fourth cent gas tax to be used for construction and maintenance of major streets other than state highway routes. For this work, submission to and approval by the Division of Highways was

required of the annual proposed budget of expenditures by each city from this additional one-fourth cent fund.

Thus, under that legislation the Division of Highways received for use on the rural state highway system one-half the net revenue of the motor vehicle registration fees and 1½ cents of the 3-cent gasoline tax. Had it not been for the increased federal appropriations for aid to states on state highway construction as a means of unemployment relief, the Division of Highways progressive construction program would have been greatly restricted.

The 1935 Legislature also provided for the collection of a state vehicle license tax on motor cars in lieu of the local personal property taxes levied by cities and counties. Net revenue from this tax was divided 25 percent to cities, 12½ percent to counties and the remainder to be used for the retirement of the three highway bond issues.

The 1937 Legislature placed a 3-cent tax on diesel oil used for highway transportation purposes, and the special legislative session of 1938 enacted that this revenue be used for reconstruction of bridges on the State Highway System which are posted for less than legal loads or speed.

The Collier-Burns Highway Act of 1947 was passed by a special session of the Legislature called by Governor Warren for the purpose of considering highway financing. The act revised the entire tax and fee structure pertaining to such financing and made substantial changes in the distribution of highway funds. *This act is fully discussed elsewhere in this issue, by Richard H. Wilson, Assistant State Highway Engineer.*

Governor Warren signs Collier-Burns Highway Act. From left to right, standing: Assemblyman Albert C. Wollenberg, Richard M. Zettel, Assemblyman Marvin Sherwin, Senator T. H. DeLap, Assemblymen Michael J. Burns, Thomas A. Maloney, Randolph Collier, Jr., Senator James J. McBride, Assemblyman M. Philip Davis, Senator Randolph Collier, Assemblymen Thomas M. Erwin, Thomas W. Caldecott, Senators Chris N. Jespersen, Oliver J. Carter, Thomas McCormack, President pro Tempore Harold J. Powers, Assemblymen George Miller, Jr., Stewart L. Hinckley, Senators Charles Brown, Arthur H. Breed, Jr., Assemblyman Robert C. Kirkwood. Senator Jesse M. Mayo, Assemblyman John L. E. Collier, Senators Ben Hulse and and George J. Hatfield. Seated—Governor Earl Warren

Chapter XIV

California Highways

By J. D. Gallagher, Assistant Office Engineer

The ink was little more than dry on Mexican documents ceding California to the Union when the news of Marshall's discovery of gold in the tail race at Coloma struck off the fevered rush for the yellow metal.

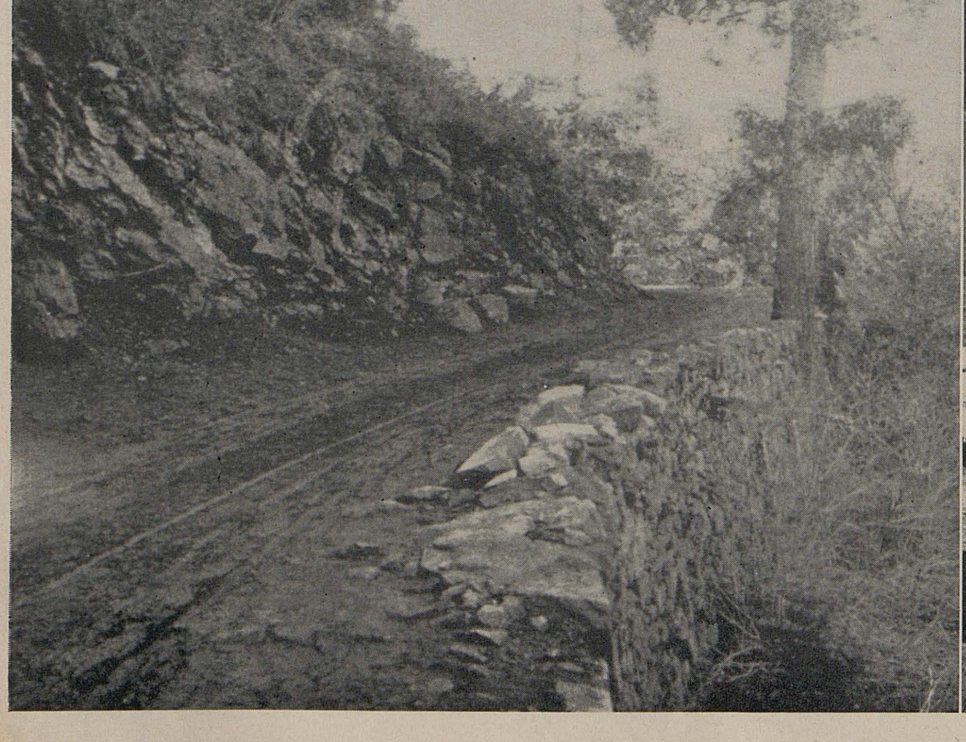
Throughout the hundred years since the news of that find spread throughout the world the trek of immigrants into California has been continuous. The incessant flow of travel, back and forth, up and down, which resulted from the ever-increasing population, has always outdistanced the development of the State's roads and highways. The need for more adequate highway development to meet the demands of traffic has been omnipresent throughout California's history.

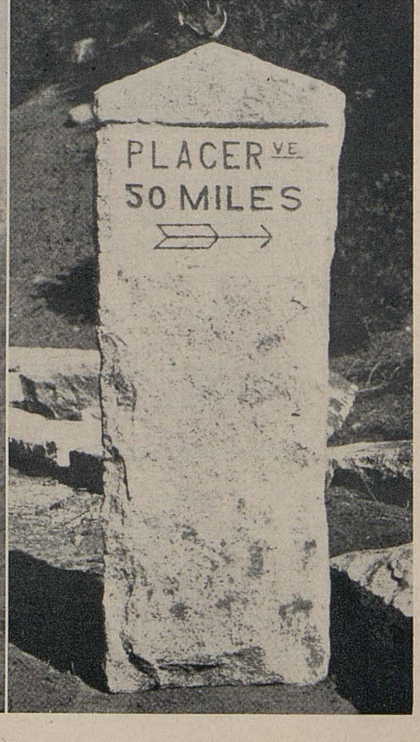
Footpaths and Trails

As has been the case in development of all new lands, the early roads of California began with footpaths and ox-cart trails along the easiest routes between scattered settlements and villages. Here, in California, the control of topographic features and climatic conditions was such that many lines of travel were held to more or less definite routes. The Franciscan Fathers established their chain of 21 missions a day's journey apart in the protected valleys behind the rugged coast range; the crossings of the jagged backbone of the Sierra could be made only at the few natural passes provided between the towering peaks; and in the two great central valleys of Sacramento and San Joaquin the early travelers followed routes which were just high enough to miss the spreading flood waters of the two great rivers and yet avoid the rolling foothills. The vast desert wastelands of the southeastern portion of the State presented a barrier to travel which was only overcome by the relative high-speed of mechanical transportation.

From 1849 to the late sixties, all travel was over the nondescript roads which almost grew of themselves. Franchises were granted by various counties for toll roads, but few of these provided satisfactory highways and roads where more than the barest minimum of collections went into maintenance and improvement of the traveled way were exceptions. County road funds and taxes were largely exhausted in construction of bridges and

LEFT—Rubble retaining wall built by State on Lake Tahoe Wagon Road. RIGHT—Granite mile post erected by State on Lake Tahoe Wagon Road





Lake Tahoe Wagon Road showing remains of old corduroy road

primitive culverts with little left over for any development of adequate road surfaces.

Coming of Railroads

Points of the navigable Sacramento and San Joaquin Rivers became the freight terminals and trade centers. The coming of railroads in the sixties completely changed the picture and made possible a wider spread of economic development. Rail expansion likewise threw into the discard most of the established stage and freighting routes with the result that road and highway development dropped to new lows for nearly 40 years. Roads became completely local affairs and it was next to impossible to arouse sufficient interest in their improvement to raise funds for needed work.

By the nineties California, as a State, was growing up. The hectic days of the gold rush and the excitement of the Comstock boom had become history. San Francisco was one of the most cosmopolitan cities of the world. An empire based upon agriculture, mining, lumber, and export had been firmly established. Because of its great distance from ore, coal, or milled iron and steel, the basis of manufacturing, industrial development alone remained an infant.

Legislature Acts

It was then that the State Legislature became aware that a complete economic development required the tapping of all sections and the building of a system of state roads. Beginning with the problem of crossing the Sierra that body in its 1895 Session established as the first state highway the Lake Tahoe Wagon Road, from Smith's Flat near Placerville over Echo Summit to the Nevada state line at the southerly end of Lake Tahoe. The same Legislature created a State Bureau of Highways.

This first highway bureau was composed of three commissioners: R. C. Irvine, Marsden Manson and J. L. Maude. Let it be said to the lasting credit of the State's administrative officers that the commissioners appointed were selected not for their political standing but for their engineering abilities, interest and knowledge of road location and construction.

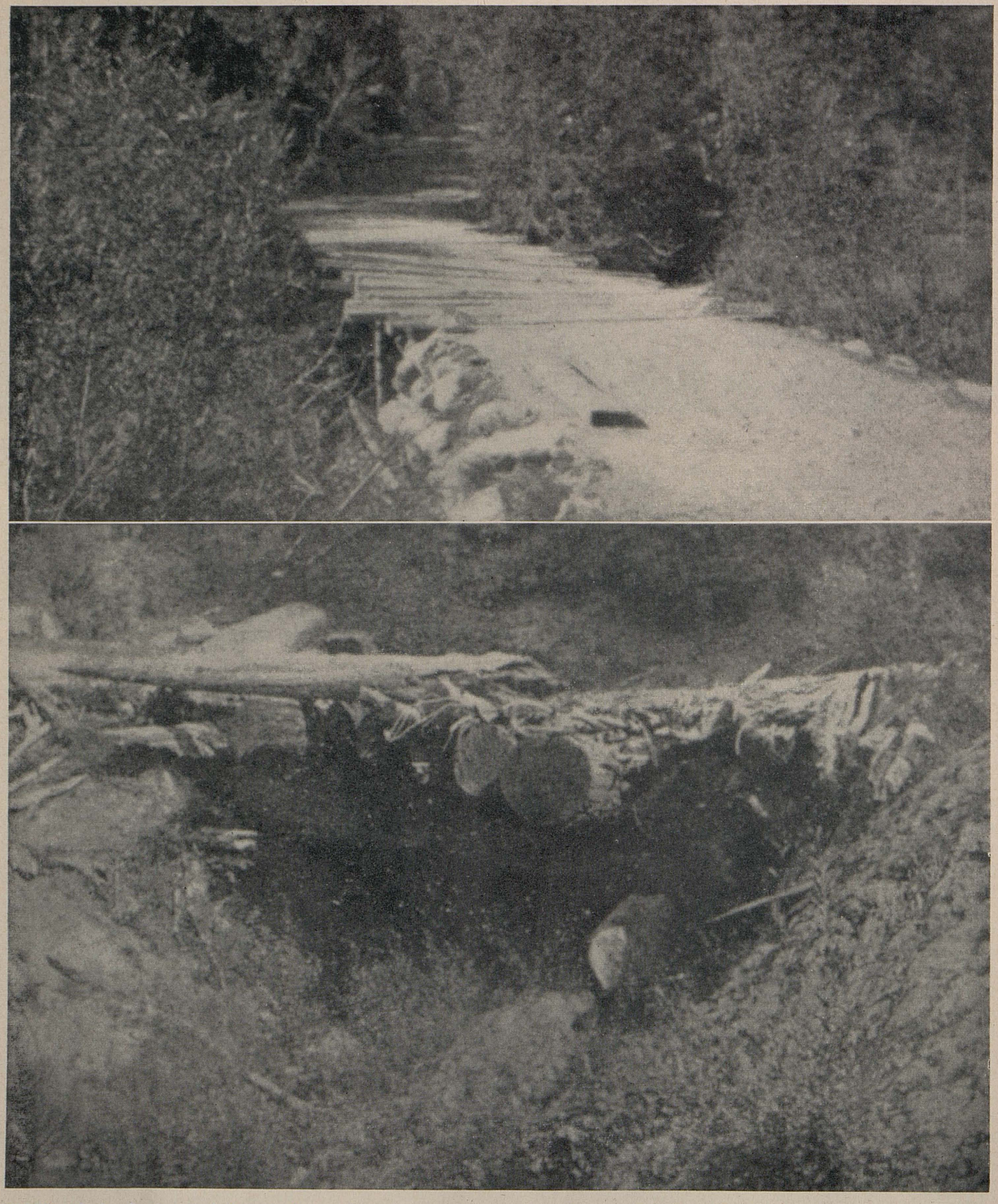
The story of their work is told elsewhere in this Centennial Issue of *California Highways and Public Works,* and it must suffice here to state that their thorough study and survey of the State, resulting in a map of a proposed state highway system and their recommendations for necessary highway legislation, were the foundations upon which was based the First State Highway Bond Act of 1909 some 12 years later.

Firm Foundations

It took this 12-year period to crystalize the recommendations of the first Bureau of Highways into action. Solid foundations are not built overnight and the foundations for California's present-day network of highways were made firm.

During this period the Legislature played around with various means of establishing an administrative set up for state roads. In 1897 the bureau was changed to a full state department with three commissioners and in 1899 the number of commissioners was reduced to one. Then in 1907 the administration of state highways was moved under the jurisdiction of the State Engineer and simultaneously with the passage of the 1909 Bond Act, the Chandler Act gave administration to a three-man Highway Commission as an advisory board to the Department of Engineering.

The personalities who guided state highway administration during the 15 years between 1895 and 1910 were, the three commissioners already mentioned, Irvine, Manson and Maude, then the successors of Irvine and Maude were W. L. Ashe and J. R. Price who, together with the ubiquitous Marsden Manson, composed the three-man commission of the Department of Highways; in 1900 J. R. Maude returned to the field as the single commissioner to direct state road activities and he was succeeded by Nat Ellery who held first the office of commissioner and then that of State Engineer. Mr. Ellery was followed as State Engineer by W. F. McClure.



UPPER—Plank culvert, typical of standards on early roads assumed as state routes between 1895-1912. LOWER—Inadequate log culvert on Lake Tahoe Wagon Road

First State Highways

During the years between the creation of the Lake Tahoe Wagon Road as the first state highway and the adoption of the integrated State Highway System under the 1909 Bond Act the Legislature designated nine other highways as state roads. In 1912, when construction began on the bond act highways these 10 state roads aggregated 550 miles in length and traversed portions of 11 counties. They were all mountain roads where development was beyond the means of the counties in which they were located. The official names and the counties traversed are as follows:

Alpine State Highway—El Dorado, Alpine, Mono, Calaveras, and Amador.

Emigrant Gap State Road—Placer.

Kings River Canyon State Road—Fresno.

Lake Tahoe Wagon Road—El Dorado.

Lassen State Highway—Lassen.

Myers' Station-McKinney State Road — El Dorado and Placer.

Mono Lake Basin State Road—Mono.

Sierra State Highway—Sierra.

Sonora-Mono State Road — Tuolumne, Alpine and Mono.

Trinity-Humboldt State Highway — Trinity.

State Highway System Expanded

For some years after the establishment of the State Highway System under the bond act, administration of which rested with the Highway Commission, these prior legislative state roads were administered by the State Engineer. In 1917, however, the inconsistency of two sets of state highways was eliminated by the transfer of the legislative roads into the State Highway System under the act which gave statutory recognition to the Highway Commission.

In the light of present-day highway activities the work performed on these early roads seems pitifully meager, as it was, but considering the inertia of public sentiment against expenditure of public funds in amounts sufficient for adequate development, the pioneering state highway officials of 1895 to 1911 did very well.

Most of the small sums appropriated by each Legislature were consumed in clearing up each spring the debris left by winter storms and in constructing culverts, rubble retaining walls and bridges, so that little money was left for the building of adequate road bases and satisfactory surfacing.

Early Methods Improved

These highway engineers learned early that surface preservation required a binder to prevent the fine rock dust from being whipped away by traffic. Considerable sums were spent for sprinkling, but at the same time investigations were instigated for more permanent binders. In his report to the Governor in 1902, Nat Ellery noted the satisfactory results from the use of oil in Southern California and by the time of his 1906 report he had come to the following conclusion:

"No material is quite so important to our road improvement as crude asphaltic oil. It may be used as a dust preventive, a roof to shed the rain water from the foundation, and as a lubricant to reduce the rate of wear to the road surface. While these improvements are of vast importance when properly handled, it must be borne in mind that only partial results, and in many cases no results, are obtained with improper application, selection and treatment of oil."

Mr. Ellery was on the right track of an important phase to highway development and undoubtedly he would have marveled at a section of present-day plant-mixed surfacing, but it is wondered if had he seen such a highway he could have realized that still, after 45 years of experience, highway engineers continue the search in perfecting new techniques for asphalt application as the binder in road surfaces.

Early Road Expenditures

In the year 1895-96 the 57 counties (there was no Imperial County then) of the State expended a total of $1,877,000 for road construction and maintenance and in 1896-97 the total was $1,789,000.

In 1899 when work on the Lake Tahoe Wagon Road began, the Legislature provided $5,000 for surveys and the salary of the commissioner and $20,000 for construction on that road. The Legislature also appropriated $25,000 for survey and construction of the Mono Lake Basin or Tioga Road.

Each year saw appropriation and expenditure of small amounts, the work performed being limited by the available funds even as it is today. As the number of state roads increased the total appropriations increased but not sufficiently to even keep up the pace which had been started on the two originals—the Lake Tahoe Wagon Road and the Mono Lake Basin Road.

Expenditures in 1907 and 1908 were typical and these, together with the balances at the end of the fiscal year on June 30, 1908, present a neat idea of just what the boys had to work with:

State Road, 1907-1908	Expenditures	Balance
Sonora-Mono Road		
Maintenance	$12,042.02	$644.41
Bridges	11,200.43	2,139.02
Mono Lake Basin Road		
Maintenance	2,278.05	262.69
Bridges	------	------
Lake Tahoe Wagon Road		
Maintenance	9,227.63	772.37
Surveys	3,593.92	1,001.43
Bridges	850.26	0.09
Alturas-Cedarville Road		
Surveys only	2,199.65	4,872.68
Trinity-Tehama-Shasta Road		
Surveys only	9,299.35	40,700.65
Downieville-Sierra Road		
All expenses	11,123.33	876.67
Kings River Canyon Road		
All expenses	28,301.66*	4,825.13*

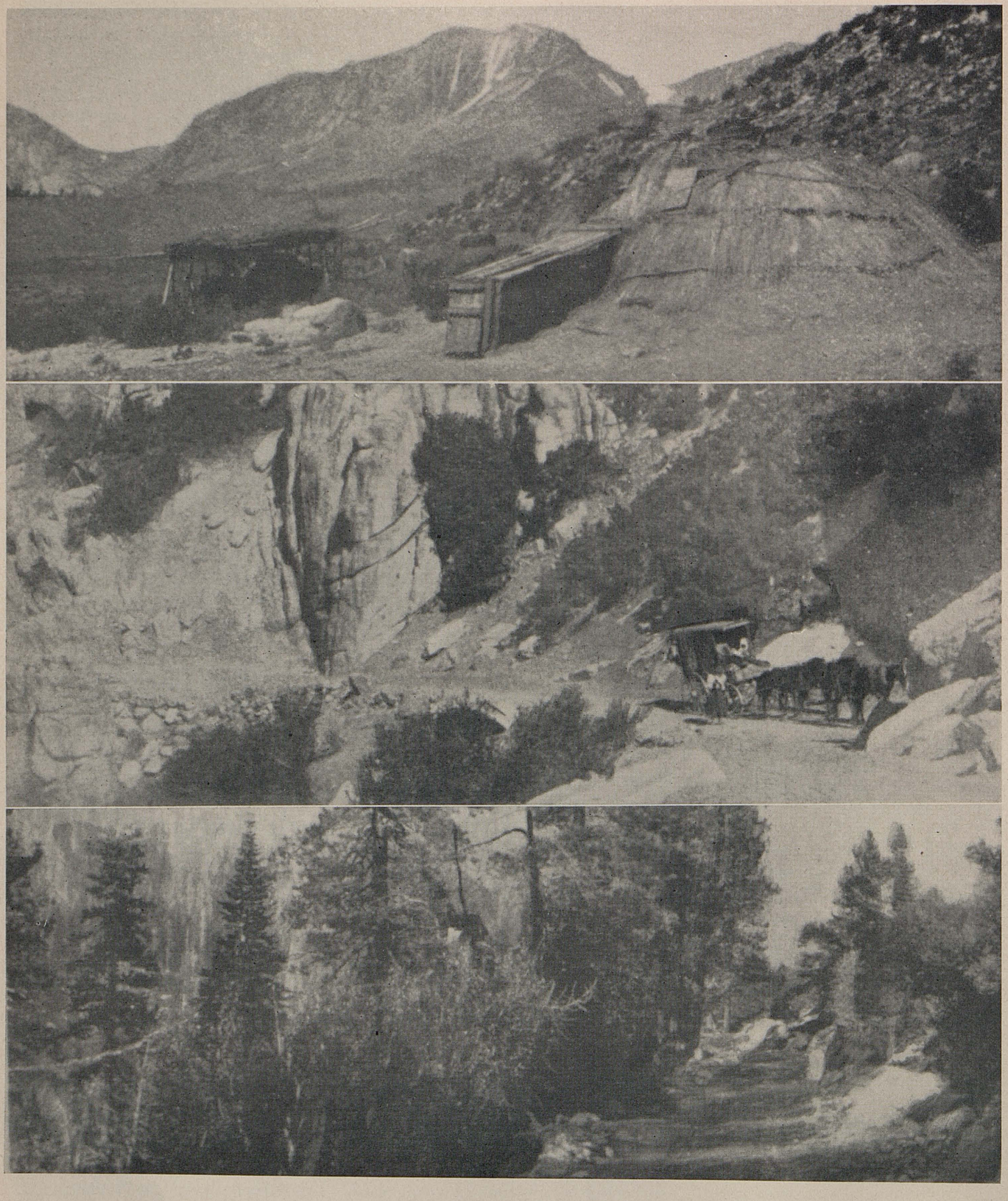
* Two-thirds by State, one-third by Fresno County.

Careful Planning

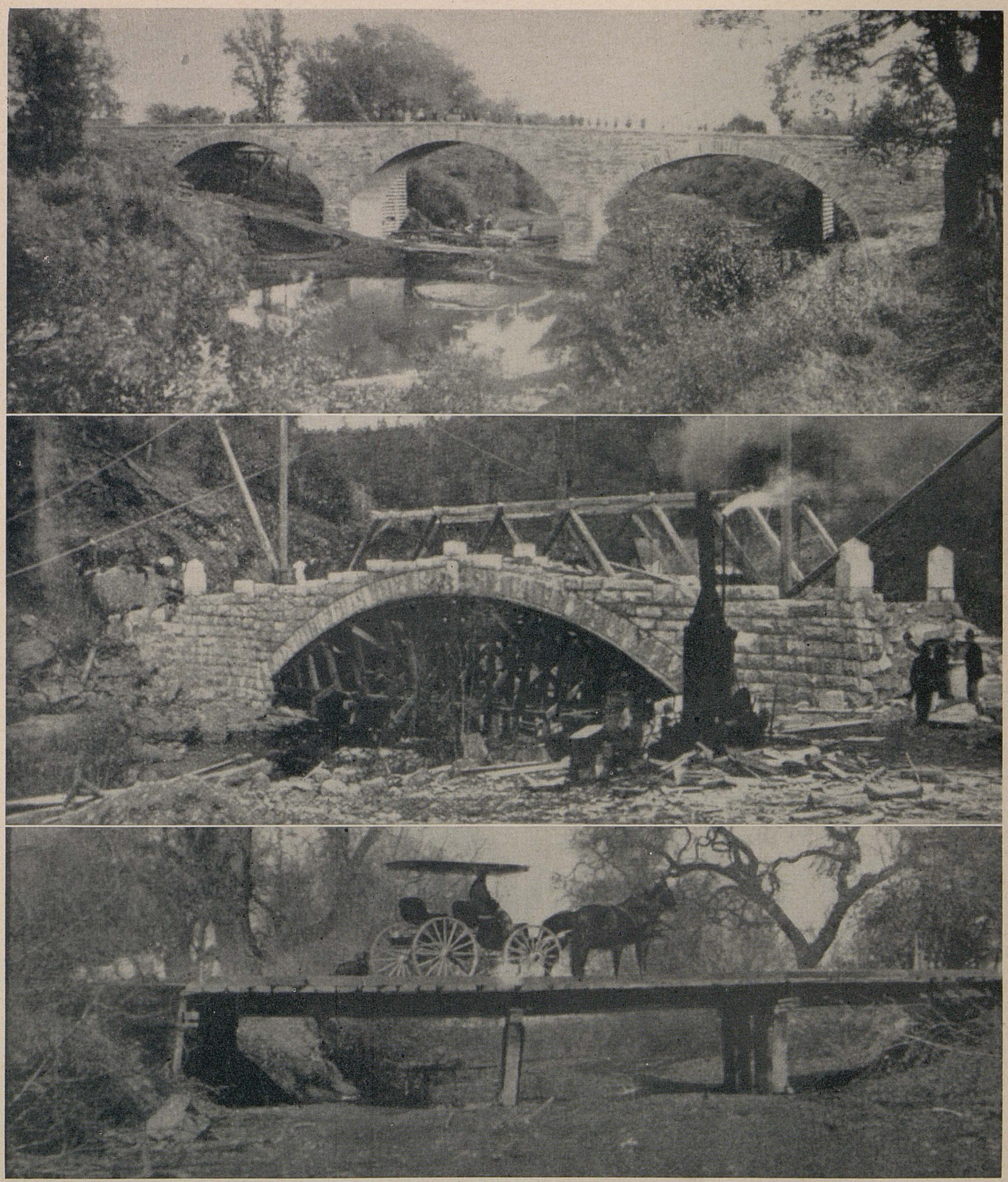
In the light of present-day financing the figures appear ridiculously small, but they represent most careful planning to secure the greatest possible return. The 9-cent balance on the bridge allotment for the Lake Tahoe Wagon Road is certainly the height of careful engineering budgetary control.

With legislative appropriations for state road development on the limited scale indicated by the figures given above for 1908 it seems quite incredible that at the 1909 session of California's legislative body a bond issue for $18,000,000 would be voted and approved and then ratified by the electorate at the 1910 general election. The reason, of course, was the rapid development of the automobile in the first decade of the century and the impetus which that gave to "good roads" movements all over the Nation.

In the nineties and first years of the new century the "Wheelmen's Associa-



UPPER—Early Indian "Wickiup" at Mono Pass. Mt. Gibbs in background. CENTER—Sonora-Mono Road on Grade to Summit, about 1904. BOTTOM—Patterson Grade, Sonora-Mono Toll Road—1897



UPPER—High type of cut-stone arch bridge built by Yolo County for crossing of Putah Creek near Monticello. CENTER—Construction of Stone Arch Bridge on Lake Tahoe Wagon Road crossing of South Fork of American River at Riverton. First major state contract on the first state highway. BOTTOM—Inadequate bridge of type built in eighties and nineties

tions" had attempted, and with some success, to stir up sentiment in favor of road and highway development, but their campaigns had been "a voice crying in the wilderness" as compared to the pressure exerted by the production of what seemed mechanically perfect motor cars. Practically every male under 50 years of age became suddenly aware that here was something he wanted, in fact it took a minimum of rationalization to convince him he needed a car, and he set his eyes on the day when that goal would be attained. If he was going to have a car, and he certainly was ("look at Joe Doakes, if he can afford to drive an automobile certainly I can"), he wanted good all-weather roads to travel on. As the story of automotive production in the United States reveals the greatest and most rapid change in the history of industrial progress, so the expansion of the "Good roads movement" from a slogan yesterday to a network of expressways and freeways today reveals the propensity of the American public to get something if they really want it and to provide the money necessary to purchase it.

Stories of Highways

The development of state highway administration after the First Highway Bond Act of 1909 is covered in another article and the fascinating stories of bridges and the development of road design and construction are given on other pages, leaving the questions "What is the net result today of the efforts of those early road builders and planners?", "What is the net result of the engineering, research, study and their trials and errors?". The answer is "The California State Highway System, 1950," or more concisely: "California Highways."

And what are some of the stories behind the individual highways which comprise the State Highway System? and what is the status of the routes included in the system? We cannot review them all but a few may be of interest.

At the risk of being slightly repetitious may we take another look at California.

Varied Terrain

Of the 48 states none holds greater variety in terrain and climate than may be found in the 159,000 square miles of California. Extending about 200 miles inland from the Pacific along some 800 miles from Mexico to Oregon, the State encompasses almost all that there is in the way of temperate climate and geologic formation.

The coast line varies from wide beaches to rocky bluffs and headlands. The broad valleys of the Sacramento and San Joaquin present typical midwestern agricultural land, hemmed in by the semibarren Coast Range on the west and the towering snow-capped Sierra on the east. The drifting sand dunes of the great Mojave Desert are arid in the extreme, while in the redwood country adjacent to the north coast the annual rainfall is 70 inches and more. The rugged terrain of southern portions of the State is broken with fertile valleys, green with citrus groves. The Imperial Valley, in the extreme southern portion of the State, consists of a millenium of silt deposits upon an ancient ocean floor made productive by water from the Rockies 1,000 miles away.

Joining these diverse sections into a unit are the 14,000 miles of road in the California State Highway System. Spreading over the State, this network of highways is composed of main arteries running north and south with major laterals to the east and west. Stemming from these principal routes are the secondary roads acting as traffic feeders.

Engineers Challenged

Development and maintenance of these state highways, traversing desert, mountains, valleys and coast of California, present problems of such variety as to challenge engineering ability and practice.

By the average motorist, modern highways are taken for granted. Travel over bridges and mountains, through tunnels and passes is accomplished with little or no thought of obstacles overcome in their construction and maintenance. A few moments over a bridge that was many months in erection; a few seconds through a tunnel which took a year or more to bore; a few hours, and an entire mountain range is crossed, the same range which took "49'ers" weeks to overcome—all are traveled with such speed and comfort that it would seem their construction must have been simple.

The factual data behind the stories of the development of the various routes in the California State Highway System are many and varied. Some reveal victory over seemingly insurmountable obstacles of nature; others are interwoven with the romance which was early California, and still others are the prosaic story of just keeping everlastingly at it. It might be that motorists could more appreciate their travels along California's highways if they were familiar with the stories behind them.

Redwood Highway

Between the Oregon boundary and San Francisco, highway U. S. 101 on its way through the wet and mountainous north coast counties passes through heavy stands of California's coastal redwoods. These trees, many of which are two to three thousand years old, rise to heights well over 300 feet and stand in dense, dank groves, with heavy undergrowth of ferns, rhododendrons and azaleas. The route is a well-paved two-lane highway with the more heavily traveled southerly portions constructed to multiple-lane standards.

For many years construction and maintenance operations on the Redwood Highway have been complicated by numerous frequent slides and slipouts through the mountainous areas of heavy rainfall along the northern coast country. The same extreme in moisture, which during the past 2,000 years has produced the famous groves of towering redwoods, has made provision of stable foundations most difficult and unique methods of engineering practice are frequently necessary to meet the problems of saturated subsoils.

Unusual Practice

An example of unusual construction practice on this route occurred in 1934 on the relocation of nine miles between Last Chance Slide and Flannigan's just south of Crescent City in Del Norte County. This revised alignment followed a line back from the ocean shore and through relatively dense redwood growth. While every effort was made to preserve the groves it was necessary to fell a few large trees ranging to 17 feet in diameter and rising to from 250 to 300 feet into the sky. At that time, commercial disposition of the trees in the vicinity was impractical, so with the knowledge that redwoods, even though buried, will remain for decades in a remarkable state

UPPER—Excavation through lava rock formation on Alturas-Cedarville State Road. CENTER—Beginnings of hauling damage before track-laying tractors were ruled off the highways. BOTTOM—Poorly drained highway in Kern County

UPPER—Main Street in the then village of Vacaville in the nineties. LOWER—Winters-Davisville Road in early 1900's. A high type of county road surfacing. Davisville, Yolo County, is now Davis

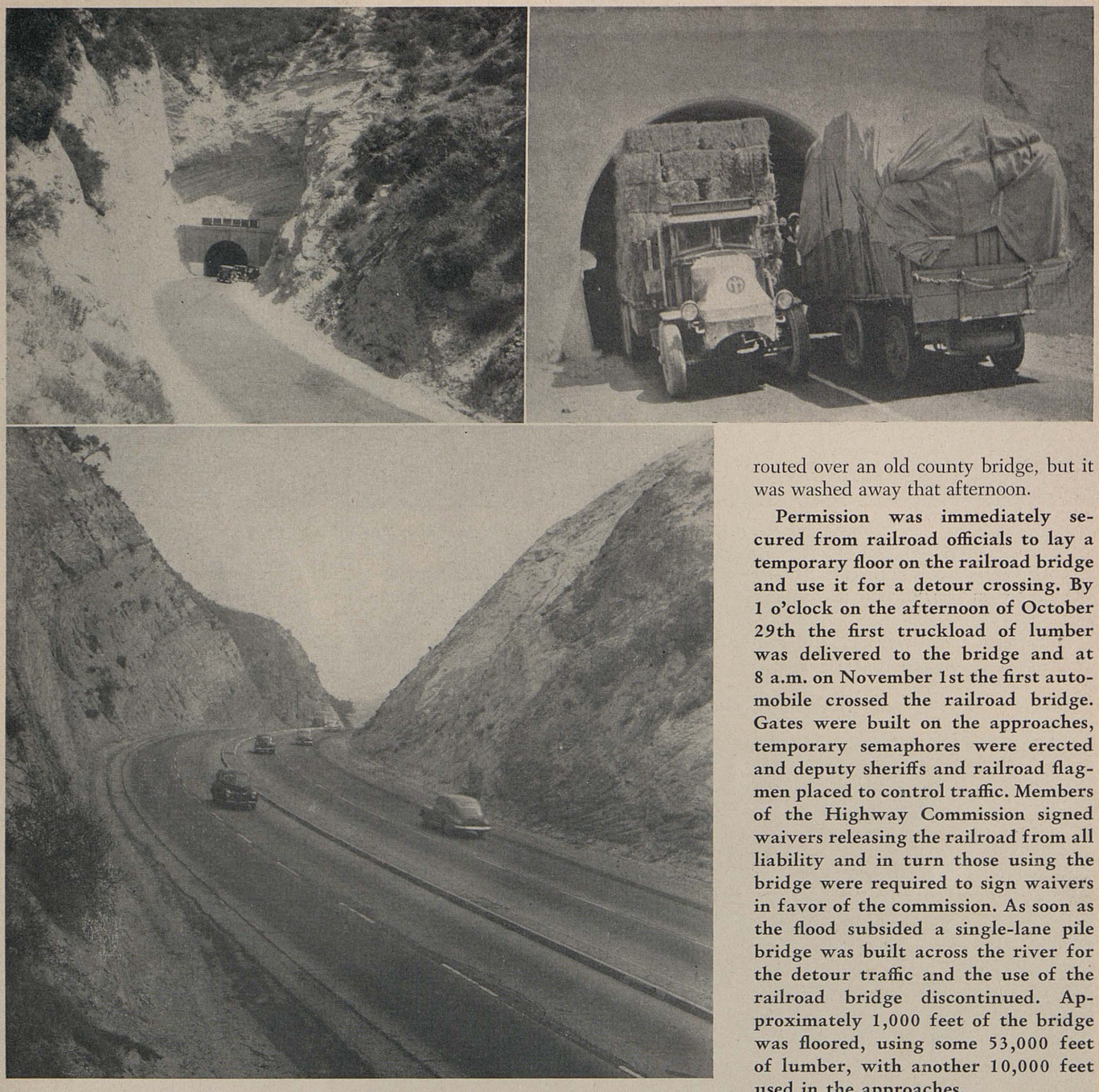
Wilshire Boulevard in Los Angeles, now world-famous, as it looked in 1910

of preservation, decision was made to use the timber in construction of roadway fills.

The felled trees were cut into convenient sizes and nearly 10,000,000 board feet of timber were used in fill construction providing the equivalent of more than 30,000 cubic yards of earth embankment. By elimination of long shallow fills adjacent to the redwood embankments the area occupied by them was much less in extent than would have been required by a conventional earth fill.

The appellation of "Redwood High-

This photo shows start of early construction on Ridge Route, U. S. 99, now modernized



The two upper photos show the old Newhall Tunnel on U. S. 6, which was eliminated by excavating deep cut for present highway shown below

way" to this route is doubly applicable to this section in Del Norte County.

Flood Damage

Back in 1922, the State was constructing a triple reinforced concrete arch bridge on the Redwood Highway across the Van Duzen River in Humboldt County, paralleling a bridge of the Northwestern Pacific Railroad. The river was practically dry and traffic was being routed over a small temporary timber structure. On October 25th it started to rain and in a few days Humboldt County experienced the heaviest storm of 76 years. On the morning of October 28th the flooded river carried out the temporary detour bridge. Traffic was then routed over an old county bridge, but it was washed away that afternoon.

Permission was immediately secured from railroad officials to lay a temporary floor on the railroad bridge and use it for a detour crossing. By 1 o'clock on the afternoon of October 29th the first truckload of lumber was delivered to the bridge and at 8 a.m. on November 1st the first automobile crossed the railroad bridge. Gates were built on the approaches, temporary semaphores were erected and deputy sheriffs and railroad flagmen placed to control traffic. Members of the Highway Commission signed waivers releasing the railroad from all liability and in turn those using the bridge were required to sign waivers in favor of the commission. As soon as the flood subsided a single-lane pile bridge was built across the river for the detour traffic and the use of the railroad bridge discontinued. Approximately 1,000 feet of the bridge was floored, using some 53,000 feet of lumber, with another 10,000 feet used in the approaches.

Golden Gate Bridge

The Redwood Highway has its southerly terminus at San Francisco, crossing the historical Golden Gate on the longest single suspension span bridge in the world. This monumental structure across the entrance to San Francisco Bay was constructed by the Golden Gate Bridge and Highway District between 1932 and 1937. The total length of the bridge and

This photo of the California Highway Commission, 1923-1927, and engineers of the Division of Highways was taken on top of the Forum Building in Sacramento in 1924, which then housed the commission

FRONT ROW, LEFT TO RIGHT—John H. Skeggs, Division Engineer, Division IV, San Francisco (now Assistant State Highway Engineer); Fred J. Grumm, Engineer of Surveys and Plans, Headquarters, Sacramento (now Deputy State Highway Engineer); R. M. Morton, former State Highway Engineer, Sacramento; Louis Everding (deceased), Arcata, Member of California Highway Commission; Harvey M. Toy (deceased), Sacramento, Chairman, California Highway Commission; Nelson T. Edwards, Orange, Member, California Highway Commission; J. B. Woodson, Division Engineer, Division VI, Fresno; Frank G. Sumner (deceased), Division Engineer, Division IX, Bishop; C. S. Pope (deceased), Headquarters Construction Engineer, Sacramento; W. S. Crauthers (deceased), Assistant Engineer, Headquarters, Sacramento. BACK ROW, LEFT TO RIGHT—Frank B. Durkee, Editor, California Highway Bulletin (now Deputy Director of Public Works), Sacramento; W. F. Mixon (deceased), Woodland, Secretary, California Highway Commission; A. J. Wagner, Headquarters Maintenance Engineer, Sacramento; George R. Winslow, Division Engineer, Division III, Sacramento; Lester Gibson, Division Engineer, Division V, San Luis Obispo; J. C. McCloud, Division Engineer, Division X, Sacramento; H. S. Comly (deceased), Division Engineer, Division II, Dunsmuir; E. Q. Sullivan, Division Engineer, Division VIII, San Bernardino; T. E. Stanton, Assistant State Highway Engineer, Sacramento; S. V. Cortelyou, Division Engineer, Division VII, Los Angeles; T. A. Bedford, Division Engineer, Division I, Willits.

approach structure is 8,981 feet, the length of the suspended structure is 6,450 feet, and the length of the main span is 4,200 feet. The towers which support the two 36-inch cables rise 746 feet above the water.

Building the Marin County approach to the Golden Gate Bridge presented some unusual construction problems. This section of the Redwood Highway traverses coastal mountain slopes for the greater portion of the 3.6 miles from Waldo to the bridge. While the terrain is rough and construction involved cuts and fills up to 200 feet in vertical depths, the usual attendant difficulties of such work were increased by the lack of even average mountain stability. The excavation and slides which developed required the moving of more than 2½ million cubic yards of material. The project required a tunnel near the crest with a length of 1,000 feet and a bore 29 feet in height and 46 feet in width. Construction of this four-lane approach to the Golden Gate Bridge cost approximately $2,000,000.

Shasta Dam Relocation

U. S. 99 is the central arterial of the California State Highway System, from the Oregon line to the Tehachapi it practically bisects the State. Its development to standards adequate for the large volume of traffic using the route has been a continuing process in the State's highway program since 1912. The portion of the route through the Siskiyous and Sacramento Canyon is built to good two-lane standards.

The construction of Shasta Dam, the largest unit of the great Central Valley water and power project, required relocation of 19.5 miles as well as many miles of railroad, through rough, forbidding mountainous terrain over which earlier locators did not have the temerity, nor the need, to build.

Here was a situation of concurrent construction almost unique in highway-railroad relations. The more lenient and elastic limitations permitted by the motor vehicle required that the highway bow to the more stringent railroad standards, wherever the two conflicted. In relocation of the two transportation facilities,

highway and railroad cross and recross five times, with only one a conventional grade separation structure. Three occur over tunnels deep in the mountain side, and the fifth takes place at the common crossing of the Pit River, where the highway uses the upper deck and the railroad the lower of a $5,000,000 steel bridge.

Heavy Grading

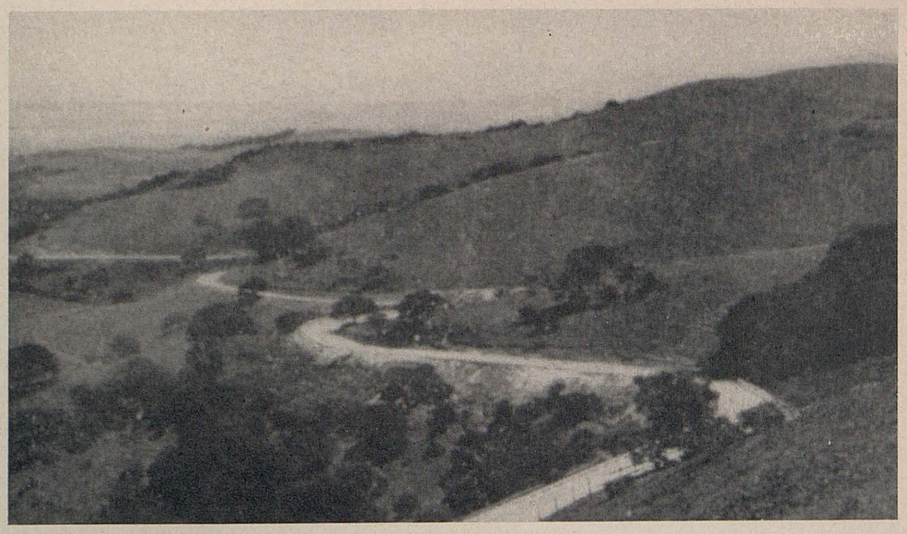
The highway portion of this project contains some of the heaviest grading ever undertaken on two-lane construction in Northern California: With a total of 2,850,000 cubic yards of excavation; 726,000 cubic yards in one mile, with cuts up to 275 feet and fills as high as 289 feet.

Notwithstanding more difficult topography, the new route, opened to traffic in 1943, is safer, faster, and almost four miles shorter than the old road. Its most outstanding unit is the massive Pit River Bridge, a 3,588-foot, eight-span, double-deck steel structure. This bridge, built by the Bureau of Reclamation which supervised construction of the dam, provides a four-lane crossing for the highway on its upper deck 530 feet above the river bed; and on the lower deck, a double track for the railroad. While two of its massive concrete piers are among the highest in the world, more than 350 feet, they barely emerge from the high level of the lake formed by the dam.

Dwarfed only by comparison with its bigger sister is the 1,330-foot, seven-span bridge across the Sacramento River at Antler, near the northern end of the new location. This structure, designed and built by the Division of Highways, is interesting because of its complicated design on both vertical and horizontal curves.

In the Sacramento Valley U. S. 99 divides at Red Bluff to reach Sacramento on routes both easterly and westerly of the Sacramento River. On the east side one of the most prominent features is the 2,700-foot steel girder bridge across the Feather River bridge between Marysville and Yuba City.

North of Sacramento this interstate route is built to two-lane standards over most of its length, with short sections of four-lane divided highway at a few locations of traffic congestion. Construction under way at this time will complete a four-lane divided highway between Anderson and Redding.



State highway in San Benito County. Typical of highways made possible by first bond issue

Feather River Highway

Carved out of solid rock, hewn through granite cliffs, criss-crossing mountain streams, the Feather River Highway is another thrill for the sight-seeing motorist, as well as a joy and comfort to the Plumas County highlanders. But more than this, the road stands as a monument to the intrepidity of the locating engineer, the skill of contractors and the dogged effort of labor.

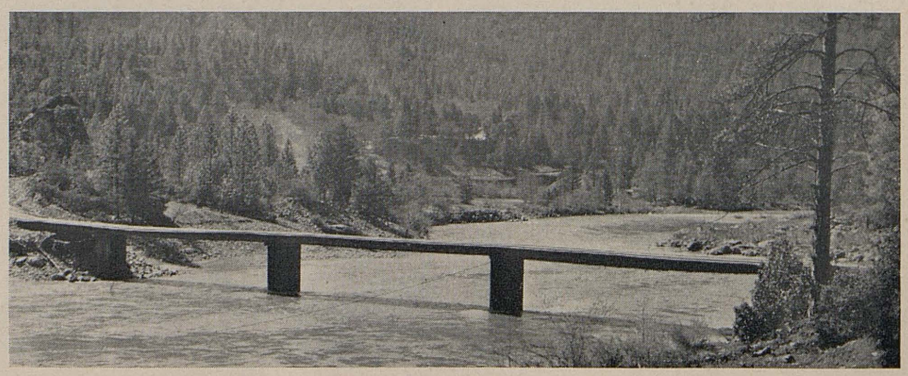
The Feather River Highway is the only road over the Sierra that avoids the heavy snow area of the higher altitudes. Throughout most of its length it follows easy river gradients. Such a road has many advantages, but easy construction and low initial cost are not among them. It took more than nine years to build and cost well over $7,000,000, almost $100,000 per mile, and nearly 8,000,000 cubic yards of material, 85 percent of which was solid rock, were moved in its making.

Natural Obstacles

Natural obstacles to the location of a highway through this rugged country of steep canyon walls and glacier-polished precipices were as formidable as ever confronted the locating engineer. These were complicated by man-made barriers; a transcontinental railroad, powerhouses, transmission lines, and future power reserves. The railroad, built over 40 years ago, naturally had taken the easiest route, and the highway had to make the best of what was left, leaping across the canyon as the railroad crossed oppositely below or playing hide-and-seek around and over tunnels.

For 10 of the most difficult miles, the road follows a niche cut in the solid wall of the canyon. Three tunnels pierce the

Modern log-stringer spans over Trinity River on private road near Douglas City; built in 1945



most precipitous projections under Arch Rock and through Grizzly Dome, a huge, bowl-shaped mass of bare granite which rises starkly for 1,000 feet above the river.

At Pulga, a 350-foot steel arch joins rocky cliffs of the canyon 200 feet above the river straddling and dwarfing the railroad bridge that crosses at right angles 170 feet below.

The entire route along the Feather River between Oroville and Quincy is one of natural beauty—pine-covered mountain sides punctuated with masses of granite—a section in the California State Highway System which creates an everlasting impression.

U. S. 40

Probably the most important interstate highway in California is U. S. 40. This heavily traveled route enters California a few miles west of Reno, crosses the high Sierra over Donner Summit at an elevation of 7,000 feet, passes through Sacramento on its way across the valley, reaches the Bay area over the Carquinez Straits Bridge near Vallejo, and ends in San Francisco via the San Francisco-Oakland Bay Bridge.

While the El Camino Real along the coastal sections of the State is much older, the U. S. 40 route is of considerable historical importance in that it crosses the Sierra over the trace traveled by the ill-fated Donner Party and followed by thousands of forty-niners in their cross-country journey to California. Since that time, development of portions of the route has been relatively continuous. Since establishment of the State Highway System in 1912, work on this development has been carried on with no appreciable interruption.

Donner Summit

In the period during which California was first experimenting with road construction on the state level, that is between 1895 and 1912, the Donner Summit crossing of the Sierra was made a state highway. While it had been built originally as a freight route in the sixties, when taken over by the State this highway, known as the "Emigrant Gap Road," consisted of a rocky wagon track with only those boulders removed which were too large to permit passage of high-wheeled wagons. By dint of continual labor it was gradually improved with state highway funds but it was not until the twenties that it could be really classed as a highway.

This is realigned U. S. 40 on freeway design through Auburn, Placer County, to a connection with the existing route east of Auburn

Today, the road is considered one of the best mountain highways in the Nation, with a section of typical metropolitan freeway development through Auburn and its extension underway between Auburn and Applegate.

U. S. 40 enters Sacramento from the east over the full freeway through North Sacramento and funds are budgeted and earmarked for continuation of this freeway to Roseville.

Between Sacramento and San Francisco all but 10 miles of the 90-mile total is now four-lane highway and contracts now in progress will bring nearly seven of the 10 miles to four-lane divided standards. Structure projects are also under contract as the first units in development of the remaining mileage to freeway standards. Thus with completion of projects now started the entire 90-mile portion will be four-lane highway, all divided but the section between Richmond and the Carquinez Bridge.

Since the end of World War II, the Division of Highways has expended $16,120,000 on improvement to U. S. 40 which has involved 111 miles of construction.

San Francisco-Oakland Bay Bridge

The $70,000,000 San Francisco-Oakland Bay Bridge is by far the biggest single project ever undertaken by the Department of Public Works, and rightfully is the most renowned. Spanning 4½ miles of navigable water between the two metropolitan areas, its spectacular construction progressed in full view of thousands of city dwellers and com-

Freeway on coastal road between Rob Roy Junction and Santa Cruz

muters who gained thereby an appreciation of the immensity of the task. But after twelve years even the former "ferry-rail superintendents" who now travel the bridge, secure in fog and storm, seldom recollect that this mighty structure took six years to complete or that it holds many world-wide records, foremost among them: the greatest length, the deepest piers, and the largest vehicular tunnel bore.

The west crossing between San Francisco and Yerba Buena Island, is unique for its twin suspension spans, held by a common anchorage in midchannel. The wire in the 28¾-inch suspension cables would encircle the earth nearly three times. Its towers reaching as high as 519 feet above water and its piers as much as 242 feet below the surface would overtop a 60-story skyscraper. The 540-foot tunnel through Yerba Buena Island was bored 76 feet wide and 58 feet high to provide for the double-deck construction. The east crossing, between Yerba Buena Island and Oakland, is a steel bridge, the main cantilever span 1,400 feet long. The total length of the bridge from the San Francisco terminal, to the toll plaza at the Oakland end is 8¼ miles.

Huge Quantities of Materials

Building the bridge required materials in quantities rarely encountered in a single structure. Over 152,000 tons of structural steel were erected, 30,000 tons of reinforcing steel were placed and the suspension cables required 18,500 tons of wire; the concrete amounted to 1,000,000 cubic yards which required 1,300,000 barrels of cement; 30,000,000 board feet of timber and lumber were used and it took 200,000 gallons of paint to cover the bridge.

To the construction of the bridge even prehistoric animals contributed their bit —or rather their all—yielding their final resting place to make room for the piers; dredges reached into prehistoric time in excavating for their foundations, pulling a mastodon's tooth and an ancient bison's bones from the ooze 180 feet below the bottom of the bay.

Along with the Golden Gate Bridge, Hoover, Shasta, and Grand Coulee dams, the San Francisco-Oakland Bay Bridge stands out as one of the foremost structures in the West.

Santa Cruz Lateral

Modernization of the scenic route across the redwood-covered Santa Cruz Mountains between Los Gatos and the shore line at Santa Cruz has been another undertaking of the first magnitude. The original highway, one of the old "county seat laterals" provided in the State bond issue of 1909, was considered a bold location for its time but, typical of mountain roads of the early days, its tortuous alignment and narrow width became more and more obsolete with the years as traffic speed and volume increased.

Connecting the densely populated San Francisco Bay area with attractions of the Santa Cruz and Monterey coast lines, this is one of the most heavily traveled recreational highways in the State. Those who remember the congestion and dangers on the old two-lane route, when holiday motorists crawled at a snail's pace or risked their lives in passing other cars, can best appreciate the modern four-lane highway through the heavy mountain sections and three lanes through the valleys and flats. Through the heart of the mountains traffic now travels 13 miles of modern alignment with but 42 easy curves instead of 16½ miles of dizzy serpentine of 284 sharp curves, a difference in total curvature equivalent to 36 full circles.

The 20.6 miles of new construction (five miles shorter than the old road)

progressed by stage construction over a period of 9½ years from 1931 to 1940. It involved 11 road and bridge contracts totaling approximately $3,000,000, one of them the largest grading contract ever undertaken by the Division of Highways —more than 2,500,000 cubic yards in 6½ miles.

Unusual construction problems in this development and their solution commanded the interest of highway circles throughout the Nation. Treacherous ground conditions and proximity to the San Andreas fault, which the highway crosses, required rigorous foundation treatment in construction of heavy fills. This work involved such practices as stripping the earth blanket to bedrock and replacing with imported rock base; constructing heavy rock tow-walls for fills; and most extensive trenching and sub-drains. At one section, through narrow Los Gatos Creek Canyon, the highway was squeezed between the steep slope of the mountain and a railroad at the bottom. In this location, two of the four lanes are carried on a reinforced concrete and steel pile sidehill viaduct for a distance of about 1,000 feet.

To thousands of motorists this route provides easy access from the Santa Clara Valley at the southerly end of San Francisco Bay to mountain resorts among the redwoods or on to the beaches at Santa Cruz and its neighboring Capitola, as well as a pleasant way of reaching Carmel and the Monterey Bay area, by way of the recently constructed Santa Cruz-Rob Roy freeway along the coast.

Carmel-San Simeon Highway

Along the California Coast, the Shoreline Highway offers 450 miles of most beautiful scenery. However, the very topographic features which make the charm of this rugged coast line presented survey parties and construction crews with some of the most dangerous and difficult work ever experienced by Division of Highway forces. From the redwood country of Mendocino County, this route follows the ocean shore, past settlements founded by the Russians early in the Nineteenth Century, to San Francisco, and on to the south through historic Monterey to one of the Franciscan Fathers' earliest missions in San Luis Obispo.

Much of the present state highway is a relocation of earlier routes which have led a precarious existence, literally "between the devil and deep, blue sea"—the devil of slides and erosion on one side, and the menace of the ocean's fury on the other. A short portion in San Mateo County, was built upon the bed of the abandoned Ocean Shore Railroad; but 68 miles of the southerly portion, from beautiful Carmel to sinister Morro Rock, represent pioneer construction through one of the wildest and most precipitous sections of the entire coast.

Sixteen Years to Build

This latter portion was 16 years in building (1921-1937) and cost $9,000,000. It required the removal of 13,000,000 cubic yards of material; one massive promontory alone, Limekiln Bluff, yielded 163,000 yards —97,000 in a single blast. The lack of stability of the rock formations of these coastal ridges was a source of much difficulty in the highway's construction. Severe and sudden slides threw tons of material into the ocean at the foot of the bluffs. One such slide carried a contractor's large power shovel with it into the pounding surf.

Thirty-two bridges were required to span the numerous gorges which empty into the ocean along this coastal country, five of them being graceful arches. Bixby Creek Bridge, 18 miles south of Carmel, is the west's longest reinforced concrete arch—342 feet. In stately grandeur, it crosses one of the most precipitous gorges, a breath-taking 270 feet above the tide. Big Creek Arch is another unusual structure. It consists of two 177-foot 6-inch arches and two hinged half-arches, all of reinforced concrete. This bridge is unique for two floating end-spans which allow for settlement of unstable ground at the abutments.

Despite the hazards and difficulties of construction, the Division of Highways has provided an interesting and scenic road benched into the bluffs of the Monterey Coast with the blue Pacific breaking in white-foamed surf below and stretching off to the western horizon.

Mother Lode Highway

From an historical point of view, one of the most interesting state routes is the Mother Lode Highway which traverses the heart of California's early gold mining country. The northerly terminus of this route is the City of Auburn, in Placer County; from this point the highway extends southerly through the Sierra foothills to Mariposa, a distance of 169 miles. The route is well surfaced throughout its entire length. The country touched by this route was the setting for much of California's gold rush, when many an early-day miner searched these hills for the fabulous Mother Lode, mythical source of the yellow wealth. A list of towns and place-names in the region through which this highway passes would furnish a good index for Bret Harte stories or the early writings of Mark Twain.

Between Auburn and Placerville the route passes through the old settlement of Coloma on the South Fork of the American River, where in 1848 the millwright, James W. Marshall, touched off the California gold rush by discovery of gold in the tailrace of a sawmill he was operating for Captain John Sutter. From here the highway then moves down into old Placerville, referred to by forty-niners as "Hangtown," because of its speedy and final system of frontier justice to malefactors against the pioneer code.

Picturesque Towns

From Placerville, the Mother Lode Highway traverses oak-covered rolling foothills dotted with towns bearing those picturesque names so reminiscent of the free and easy days of the gold rush: El Dorado, Fiddletown, Fair Play, Grizzly Flat, and Dry Town. From Dry Town, the oldest community in Amador County, the name of which was a misnomer in the early days as far as liquid refreshment was concerned, the highway, crossing through a saddle in the ridge south of Rancheria Creek, follows up Amador Creek to the sleepy village of Amador City where crumbing buildings are the chief evidence of the one-time activity around the old Keystone mine. The road crosses the next ridge at the same point as the old "Amador Trail" of the fifties, evidence of which may be seen in the old stone walls and grass-covered roadway. In the valley below this summit lies the attractive town of Sutter Creek, with neat lawns and houses settled beneath large shade trees. While many of the buildings here date back to the roaring gold days, most have had facial treatments, concealing their age

behind modern fronts which to some degree detract from the old-time atmosphere of the vicinity.

Hetty Green Mine

Leaving Plymouth, the motorist may see the old so-called Hetty Green mine, formerly the Eureka, which is now owned by the Central Eureka Company. In 1859, Alving A. Hayward bought this property and between 1852 and 1881 it had produced $13,000,000. Hetty Green, who amassed a fabulous fortune, owned the mine for a period and it still is popularly referred to as the Hetty Green mine.

Out of this valley the highway continues southerly to a junction at Martel with the Jackson lateral and continues on down to Jackson, the county seat of Amador County. Adjacent to the highway on the outskirts of Jackson are the properties and workings of the famous Argonaut and Kennedy mines, two of the largest in California. Because of these two mines, there is a large population of hard-rock miners in Jackson and the town retains a typical mining atmosphere in spite of the modernization of many of the buildings. The old courthouse is a point of considerable historic interest, where even as late as 20 years ago, the old town well with its bucket and rope was in general use by the neighborhood. The National Hotel in Jackson witnessed much excitement during the fifties, including the hanging from a tree (which formerly stood in front) of an entire gang of Mexican desperadoes who had murdered all of the adult residents in a rooming house on Rancheria Creek. The only survivor of this tragedy was a small baby who was thrown out a second-story window with her throat cut. She recovered, however, and lived to raise a family.

Carson Pass Lateral

In the center of Jackson, the Carson Pass lateral takes off from the Mother Lode Highway to wind its way up to the top of the Sierra, crossing the summit at elevation 8,650 beyond beautiful Silver Lake and the Carson Spur. This route is along the trail followed by the intrepid Kit Carson, who guided many caravans to California.

South from Jackson, the Mother Lode Highway crosses into Calaveras County and up through the famous old mining town of Mokelumne Hill and down again to historic San Andreas and further on to Angels Camp. Through the writings of Mark Twain and Bret Harte the history of this section of the Mother Lode country is more familiar to the average citizen than that of other locations. San Andreas was the site of the famous old Metropolitan Hotel, featured in some of the writings of these two chroniclers of California's golden days. The hotel, however, was destroyed by fire 25 years ago. It was from San Andreas that the gentlemanly, but much feared, lone bandit Black Bart was sent to the penitentiary after a meteoric career as a stage robber.

Angels Camp

Angels Camp was another center of turbulent activity during the early decades of the State's existence, from which Messrs. Harte and Clemens derived the material for many of their fascinating tales. It was here that the famous "jumping frog" episode, made immortal by Mark Twain, took place. At Carson Hill, a little farther to the south, is located the celebrated Morgan mine, where a $43,000 fortune was found in a single gold nugget.

Beyond Melones and into Tuolumne County the highway moves on to Sonora, surrounded by such historical mining communities as Columbia, Rawhide, Jamestown and Chinese Camp. Between the Calaveras County line and Sonora lies the quaint little village of Tuttletown; here, a short distance off the Mother Lode on Jackass Hill is Mark Twain's cabin. Mark Twain was known as "The Sage of Jackass Hill" and the old store where he made his daily purchases is still in use.

At Sonora the Mother Lode Highway makes a junction with the Sonora Pass highway which crosses the high Sierra at an elevation of 9,624 feet to the east to connect with U. S. 395 between Bridgeport and Coleville in Mono County.

Sonora Pass Lateral

Southwesterly from Sonora the Mother Lode Highway follows the Sonora Pass lateral to a point some six miles beyond Jamestown; there it takes off in a southeasterly direction through Chinese Camp, Moccasin, Coulterville and up into the mountains by way of Bagby and Bear Valley to Mariposa. Between Chinese Camp and Moccasin the Big Oak Flat road leads off toward the east and, traversing the northern half of Yosemite National Park, this lateral becomes the Tioga Pass Route over the Sierra. It crosses the divide at elevation 9,941, the highest crossing of the mountains on the state highways, from which point it twists down to a connection with U. S. 395 near Leevining on Mono Lake. Bret Harte's old cabin is situated near Groveland on the Big Oak Flat Road.

Those familiar with the writings of Bret Harte will readily recall Poker Flat, Poverty Hill, Table Mountain, Whiskey Hill and Jimtown. These historic spots are all accessible from Jamestown.

Kings River Canyon

In highway development, scenic grandeur is usually accompanied by the heaviest of construction. Probably nowhere has this been better illustrated than in the building of the state highway into Kings River Canyon in Fresno County.

The Kings River National Park in eastern Fresno and northeastern Tulare Counties embraces an unrivaled wilderness of rugged granite and forest, and the Kings River Canyon leading to the park presents scenery which closely approaches that of Yosemite Valley in massive majesty.

The most direct state highway connecting this wild mountain fastness of California's high Sierra with the outside world is the road between Fresno and the General Grant Grove by way of Squaw Valley. The route leaves General Grant Grove on its northerly boundary and travels along the valley side of the lower Sierra to Cherry Gap. Passing through the Gap the first view is obtained of the rugged beauty of the lower Middle Fork of the Kings. A little further, at Lookout Point, a splendid panorama is had of the massive rock formations of the country along the South Fork and the relative positions of Ten-Mile Creek, the two forks and the main Kings River Gorge.

Scenic Beauty

Winding farther down the grade the highway rounds Yucca Point, an inspiring point of vantage, from which the view of the glacier-carved gorge justifies

the name given to the river by the Spaniards in 1805: "El Rio de los Santos Reys" (The River of the Holy Kings). On down over gentle grades and easy curves the highway is carved in the granite of the canyon wall finally reaching the river at Windy Cliff, some 18 miles from the General Grant Grove. Here the rock formation suddenly changes as a great limestone dike rises almost vertically to a height of 1,500 feet above the river. This limestone presents striking examples of natural sculpture. About 200 yards above the highway in the face of Windy Cliff is Patt Boyden's Cave, large galleries and grottoes filled with stalactites and stalagmites through which, from unknown sources, flow strong air currents.

Record Explosion

Building the highway around Horseshoe Bend presented the most difficult single problem in the road's construction. At this point the highway grade is some 300 feet above the river and its path was blocked by a rugged point of solid granite jutting over the river. While in all the construction of the Kings River Canyon explosives had played a most important part, the high point in operations was the removal in one blast of over 50,000 cubic yards from the face of this rock mass. A coyote hole four to six feet high was drilled along the gutter line of the roadway for a distance of 570 feet. Nine stub pockets were drilled off this tunnel toward the face to provide more advantageous placement of the powder, in all, a total of 745 feet of tunnel was drilled. The charge consisted of 37 tons (74,450 pounds to be exact) of explosive. After the charge had been placed the entire tunnel was carefully packed and backfilled with rock and earth to insure most effectiveness from the blast. In the one shot, 50,500 cubic yards of rock was moved from the face of the cliff, leaving a solid rock foundation on which to lay the road surface. The westerly 200 feet broke along a vertical seam leaving as clean a bit of construction as could have been desired.

At Windy Cliff, where the highway reaches the river elevation, the road crosses to the northerly side and follows on past Boulder and Grizzly Creeks to Deer Creek Cove where state construction ends. An additional four miles, however, was built by the U. S. Forest Service on to Cedar Grove, where a large area has been cleared among the trees and prepared with camping conveniences.

The State's portion of the Kings River Canyon project covered a distance of 24.5 miles and was built at a cost of $2,300,000, an expenditure which has provided Californians with easy access to some of the Nation's most beautiful mountain country.

U. S. 99

As previously stated, highway U. S. 99 is the central artery of the California State Highway System. As such it carries an unusually large volume of traffic, particularly heavy trucking.

U. S. 99 enters California from Oregon north of Yreka and travels southerly through the mountains and over Shasta Dam Reservoir to the Sacramento Valley at Redding. Between Red Bluff and Sacramento the route divides, following down both sides of the Sacramento River. That portion on the easterly side, designated as U. S. 99-E, passes through Chico, Yuba City, Marysville and Roseville and the westerly route, U. S. 99-W, passes through Corning, Willows, Williams, Woodland and Davis. From Sacramento, the route is laid out down the

Highway Expenditures Exceed Billion Dollars

In its first biennial report to Governor James H. Budd on November 25, 1896, the Bureau of Highways created by the Legislature on March 27, 1895, said:

"Exclusive of the sums expended on the streets of cities, towns, and even of many villages, nearly $2,000,000 were expended on the highways of the State of California during the Fiscal Year 1894-95. During the 11 years, from 1885 to 1895, such data as could be gathered from the records of the various county officials show that, not including private subscriptions of money, labor, material and poll tax paid for generally in labor previous to 1893, and cost of construction of numerous bridges, payment for which was taken in part or in whole out of funds other than those set apart for highway purposes, the highway expenditures of the State reached the enormous sum of $18,000,000."

What was considered in 1896 an "enormous sum" is paled by modern day annual budgets of the California Highway Commission. Almost $100,000,000 now is spent each year for construction of state highways, including right of way and engineering costs.

This is exclusive of highway expenditures made by the counties and the cities.

During the period July 1, 1911, to June 30, 1949, the California Division of Highways expended $1,258,335,603.37.*

For this same period, highway revenues and expenditures were as follows:

Income	
Bond issues	$74,112,243.50
Highway users taxes	938,581,471.63
State General Fund appropriations	27,865,754.71
Federal aid and reimbursements	230,624,849.51
Contributions	16,819,068.24
Miscellaneous	2,790,278.53
Total	$1,290,793,666.12
Expenditures	
Construction and improvements, state highways	
Rural	$628,374,676.30
Incorporated cities	190,319,724.63
Maintenance, state highways	
Rural	217,997,233.31
Incorporated cities	13,591,906.84
Construction and improvements off state system	
Rural	34,867,578.37
Incorporated cities	13,709,498.03
Subventions	
Counties	5,065,996.52
Cities (Section 194, S. and H. Code)	76,706,190.82
Adminstration, special investigations, highway planning	49,842,487.56
Equipment, plants, stores, etc.	25,084,979.33
Supervision of outdoor advertising	530,006.21
Flight strip construction for Federal Government	2,245,325.45
Total	$1,258,335,603.37

* These and other figures are as of June 30, 1949, as this is the last fiscal year for which data has been compiled.

middle of the San Joaquin Valley through Stockton, Modesto, Merced, Fresno and Bakersfield. South of Bakersfield, U. S. 99 crosses the Tehachapi Mountains over the Ridge Route at Fort Tejon and into the Los Angeles Basin via the San Fernando Valley.

From the southerly end of San Fernando Boulevard in downtown Los Angeles the route turns easterly along Ramona Freeway to Redlands where it turns southeasterly through Beaumont and the San Gorgonio Pass to Indio, through the Coachella Valley and along the westerly side of the Salton Sea to El Centro, terminating at Calexico on the Mexican border.

Continuous Development

Development of this central artery of the State Highway System, like all main highways where traffic volumes have increased steadily, has been a continuous operation since the inception of the system. Similar to all highway construction, improvement projects on this route were deferred during the war until the close of hostilities when the Division of Highways put under way its postwar construction program.

The impetus given to development of California highways following the war with state funds accumulated during the years of 1942 to 1945 and federal funds apportioned to the State under provisions of the Federal Aid Highway Acts of 1944 and 1948 has been carried forward during the last five years and under provisions of the Collier-Burns Act it has been possible to accelerate this rate of construction progress.

Heaviest Traffic Volumes

While postwar development of the route has extended over portions of its entire length the greater part of modern improvement has taken place between Sacramento and Los Angeles, where traffic volumes are the heaviest. The aim of present-day construction programs on this highway is for a continuous four-lane divided expressway from Los Angeles to Sacramento, interspersed with four- and six-lane freeway sections through metropolitan areas.

With the exception of the widening of continuous sections of the Ridge Route to four-lane divided standards the method followed in expressway development has been to work out in each direction from the various cities and towns with a series of contracts until the improvements form a complete expressway. This method is now beginning to show satisfactory results in the movement of traffic by elimination of congestion at the approaches to cities. Stockton is completely bypassed by a freeway; Modesto, Merced, Madera and other towns no longer present the bottlenecks of prewar years. The Bakersfield area is completed to expressway standards and development in the Fresno area is about half completed.

Upon completion of contracts now in progress that portion of U. S. 99 from Los Angeles to McFarland, 25 miles north of Bakersfield, will be continuous multilane highway. This is a distance of 135 miles and, with the exception of a three-lane section through Weldon Canyon just north of the San Fernando Valley, it will all be a divided four-lane expressway.

ANTI-ROAD SIGN MOVEMENT

Judging from the general tenor of newspaper comment, public sentiment throughout the State is warmly in sympathy with the movement started by the Civic Section of the California Federation of Women's Clubs of the Northern District for the protection of the State Highway System against the hideous road sign which obliterates the landscape and mars the beauty of the scenery along nearly all of California's highways.

Mrs. Bradford Woodbridge of Roseville, Chairman of the Civic Section, and Mrs. George W. McCoy of Placerville, President of the Northern District of the Federation, are leading in this aggressive campaign.

It is needless to say that the California Highway Commission endorses the movement which these public-spirited ladies represent.—*From California Highway Bulletin, October, 1912.*

The Ridge Route

From an engineering standpoint the widening to four-lane divided standards of the "old" three-lane Ridge Route, where U. S. 99 crosses the mountain ranges of granite wasteland which divide the Los Angeles Basin from the San Joaquin Valley, was the most difficult of all postwar improvements to this central arterial, particularly the section through Piru Gorge which is now underway. Involving movement of large quantities of material from steep mountain sides, construction of high fills and widening of bridges in cramped quarters, while at the same time keeping the heavy traffic moving, this work has more than presented problems to both highway engineers and contractors.

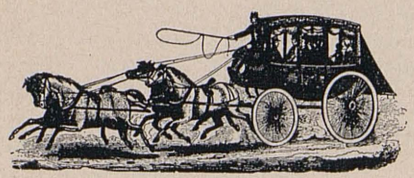
The original Ridge Route, constructed in 1914, was 48 miles of tortuous, narrow mountain road. In 1933 work began on what was called the "Ridge Route Alternative," which reduced this 48 miles to 37 miles. It is on this latter routing that the current widening program has been in progress. The story of the building of the "Alternative" made construction history and while it has been told before, it remains one of the highlights in development of the California State Highway System, therefore the following few paragraphs, taken from an article written some years ago, have been resurrected, dusted off and added to this 1950 story of Highways of California.

Probably nowhere in the State has the hand of the locating engineer been so ruthless in slashing through on modern alignment, as on the relocation of the Ridge Route, U. S. Highway 99, between Los Angeles and Bakersfield. Probably nowhere in the State is there a better example of the evolution of modern highways since the advent of the motor car.

What a Difference!

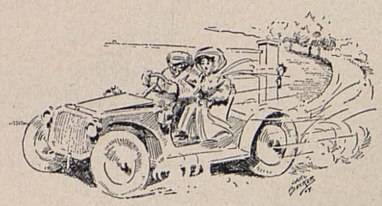
Prior to 1933, the motorist traveling from Castaic northerly to the floor of the San Joaquin Valley labored and fretted through 48 miles of narrow, tortuous mountain grades culminating in the hairpin turn of the infamous "Deadman's Curve" in Grapevine Canyon. Today he travels only 38 miles between the same points, speed-

1849



PAST

1911



PRESENT

1915

FUTURE

?

Appeal for State Highway along the Old Pioneer Route from Sacramento to Placerville via Folsom, Clarksville, Shingle Springs, El Dorado, and Diamond Springs.

OLD PLACERVILLE & SACRAMENTO
PIONEER EMIGRANT ROAD CLUB

Photo at bottom of page is one of the answers to the question mark on this old drawing

ily and safely, unhindered by sharp curvature and unhampered by slow climbing trucks.

The record of this development as shown by comparison of data on the old and the new routes indicates most clearly the great degree of improvement.

	Old Route	New Route
Length, miles	48.36	37.57
Width, lanes	2	3
Maximum grade, percent	6	6
Minimum radius curve, feet	70	1,000
Total curvature, degrees	39,441	3,070
Curvature equivalent in circles	109½	8½
Highest elevation, feet	4,234	3,550
Adverse fall, feet	2,220	1.040

Some Answers

With such improvement possible, the questions naturally arise; why wasn't the latter location chosen in the first place? Why wasn't the earlier road built to better standards? A trite answer might be: Why weren't 1914 cars built like those of today? But the reason is much more complex. Even as far back as 1914 when the original Ridge Route was constructed, the engineers knew that a better road could be built. The degree of perfection of any highway in such mountainous terrain, however, is dependent upon an economical balance between costs, money available, and justifiable expenditure.

Many factors require consideration, such as relative distances, grades, traffic volumes, speeds and types of traffic. For traffic of that day, when there were less than 126,000 cars in the entire State and 35 miles per hour was "wide open," such an investment, as the present road would have entailed, was not justified. Indeed, it would have noticeably depleted money available for improvement elsewhere in the State, at a time when the main objective was to "get out of the mud." So the much more difficult location, later selected for the alternate, was avoided and the original route was built along the ridge to standards typical of mountain highways of that time, following the contours in order to save grading costs.

Steady Traffic Increase

The old highway served for many years. As traffic increased, the sharpest curves were widened and daylighted, but by 1929 the volume had reached such proportions that further improvement of the old route would have been uneconomical. Reconnaissance surveys and economic studies revealed that a complete new three-lane highway would pay for itself in savings to motorists within 2½ years; finances, however, did not permit immediate construction of the entire project.

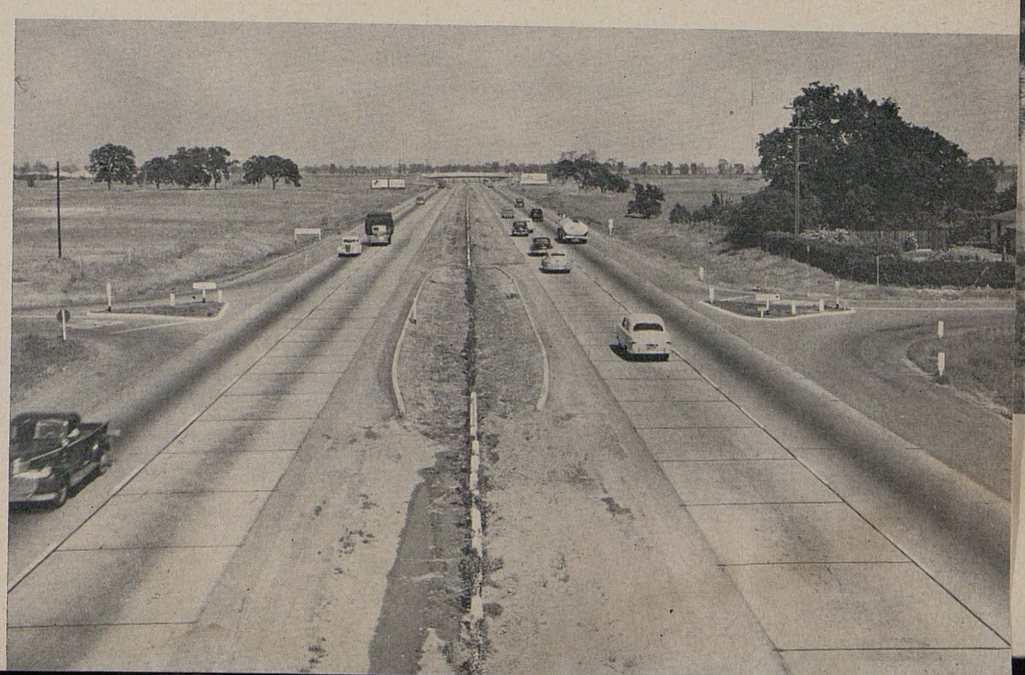
Work on the first unit was begun early in 1930. By late 1933 the 27-mile Ridge Route Alternate between Castaic and Gorman was open to traffic and by 1936 the last unit of the Grapevine relocation was completed.

Some of the new route's features were: Eight major bridges, four across Piru Creek alone; several miles of channel changes; 5,000,000 cubic yards of excavation; and costs totaling more than 5½ million dollars—are answers as to why such a road could not have been considered in 1914.

Earth Moving Problems

While the total of 5,000,000 cubic yards of excavation is an indication of the over-all size of the grading contracts, a better idea of the enormity of some of

North Sacramento Freeway. Approach to state capital on U. S. 40 from east and U. S. 99-E from north



the earth-moving problems encountered may be had from the fact that, within a center line distance of only 400 feet in Piru Gorge, excavation required the removal of 230,000 cubic yards of material. Literally, that was moving a mountain.

Traffic increased prodigiously with the breaking of the old barrier, both in passenger cars and long-haul trucking. From 2,500 cars and trucks daily in 1933, the volume rose to 4,800 in 1936 and to almost 6,000 by 1941.

Most of the new road was fully adequate for this volume and more, but the Grapevine was not. Its nearly six miles of continuous 5½ percent grade, with an abnormal uphill speed differential between fast traffic and heavy trucks (20 percent of the total), and frequent runaway trucks made the Grapevine again one of the most hazardous sections of highway in the State.

Highway Widened

To remedy the condition, this section was widened in 1942 and 1943 to four lanes, divided for nearly four of its six miles by a heavy steel barrier rail, and with 3,000 feet of heavy concrete curb on the downhill shoulder to act as a snub for runaway trucks—this protection may be rough on tire sidewalls, but it is effective.

At the same time a badly saturated hillside, the scene of many slides which threatened to carry the roadway into Grapevine Canyon was corrected in an unusual manner. A buttress consisting of 180,000 cubic yards of fill was placed on the bottom of the canyon to act as a counterweight in balancing earth pressures exerted by the unstable hillside, and numerous perforated pipes were driven as much as 170 feet into the hill above the highway as drains for ground waters.

Such is the history of the Ridge Route.

Freeway Construction

South of Los Angeles to the Mexican border postwar construction on U. S. 99 has been confined almost entirely to expressway and freeway construction: units of Ramona freeway between Los Angeles and Pomona; Colton; Redlands; Beaumont; and down in Imperial County, all improvements to the central artery of the State Highway System.

As a gauge to the size of current development to U. S. 99 in California the following shows construction expenditures and miles of construction on this route between the end of World War II and June 30, 1950.

Oregon to Sacramento—$14,500,000—339 miles of construction.

Sacramento to Los Angeles—$33,700,000—376 miles of construction.

Los Angeles to Mexican Border—$19,200,000—147 miles of construction.

All of which totals $67,400,000 and 862 miles of highway construction.

U. S. 101

Of importance to the economic welfare of California practically equal to that held by U. S. 99 is the coastal north-south artery designated as U. S. 101.

This highway crosses the north state boundary between Gold Beach, Oregon and Crescent City, California, and, as the Redwood Highway, generally follows the coast line to the south end of Humboldt Bay where it turns inland and follows the Eel River for most of its length. Progressing southerly toward San Francisco, it passes through the cities of Willits, Ukiah, Santa Rosa, Petaluma, San Rafael, and Sausalito to the Golden Gate Bridge.

Between San Francisco and San Jose the route is divided into U. S. 101 and U. S. 101 Bypass, the Peninsular Highway and Bayshore Highway respectively. After passing through the Santa Clara Valley, through San Jose and Gilroy it enters the Salinas Valley and roughly parallels the Salinas River through King City to Paso Robles and Atascadero; crossing the Coast Range both north and south of San Luis Obispo it passes through Santa Maria where it heads for the ocean shore through Solomon Canyon and Gaviota Pass from where it follows the shore line through Santa Barbara and San Buenaventura to El Rio Junction.

Again Divided

At El Rio, it is again divided as U. S. 101 and U. S. 101 Alternate, the former turning inland along the westerly side of San Fernando Valley (Ventura Boulevard) to Hollywood and central Los Angeles. In East Los Angeles, the route is further divided into U. S. 101 and U. S. 101 Bypass with 101 following Whittier Boulevard easterly to Fullerton Road where it turns south through Anaheim, Santa Ana and San Juan Capistrano to Doheny Park on the ocean. The Bypass turns off U. S. 101 near the east city limits of Los Angeles and follows along Anaheim-Telegraph Road, Firestone and Manchester Boulevards to join 101 again near Anaheim.

U. S. 101 Alternate turns at El Rio Junction to the coast via Oxnard and follows the shore line through the westerly fringe of Los Angeles and the beach cities to join 101 again at Doheny Park. The larger of these beach cities include Santa Monica, Redondo Beach, Long Beach, Newport Beach and Laguna Beach.

From Doheny Park U. S. 101 follows the coast line to San Diego and the Mexican border at Tiajuana.

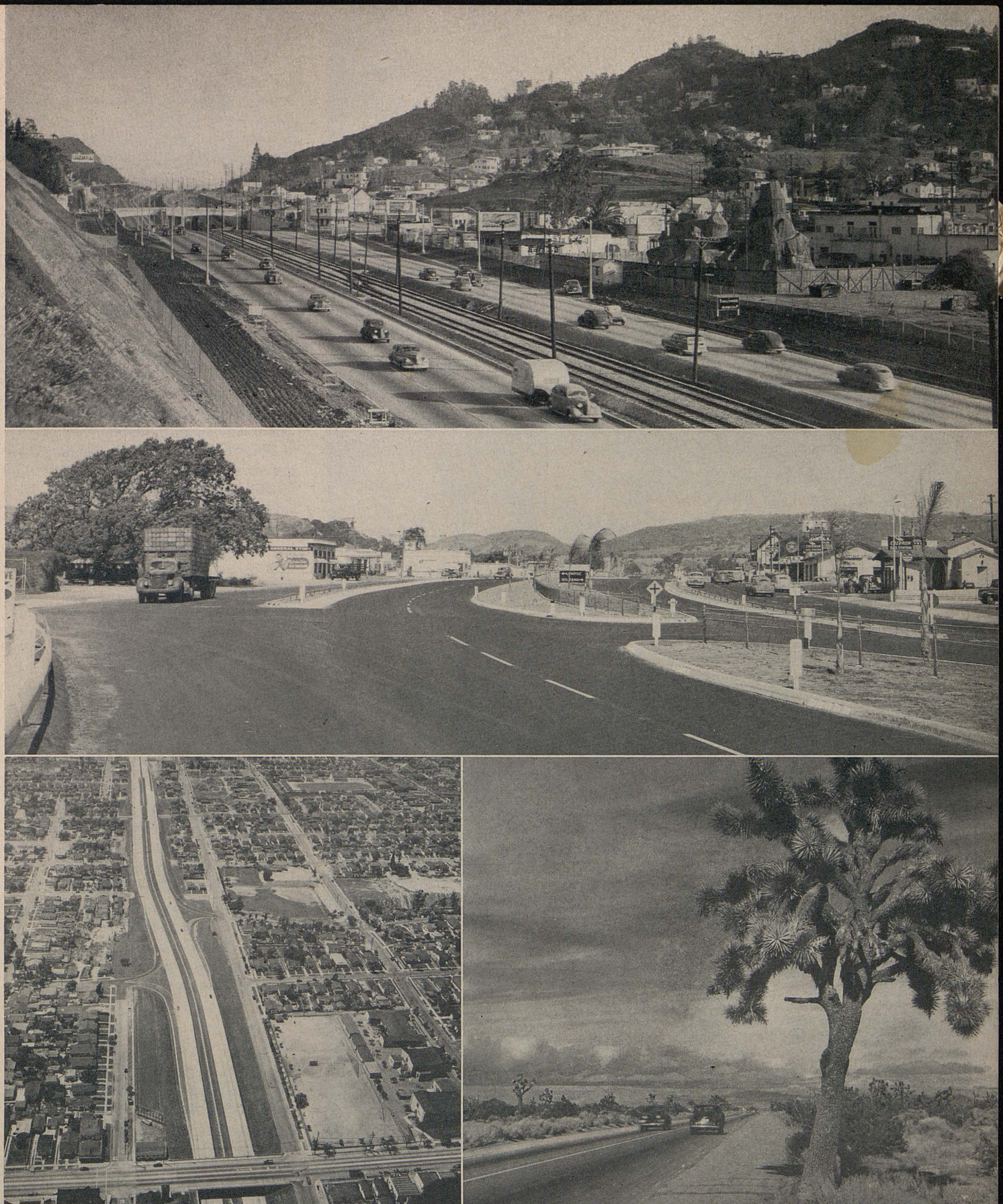
Current Development

Current development of this arterial highway from San Francisco south has been programmed on a pattern similar to the improvements to U. S. 99 between Sacramento and Los Angeles. Again, the goal is construction to expressway standards over the entire distance from the Mexican border to San Francisco, interspersed with freeway development through metropolitan areas.

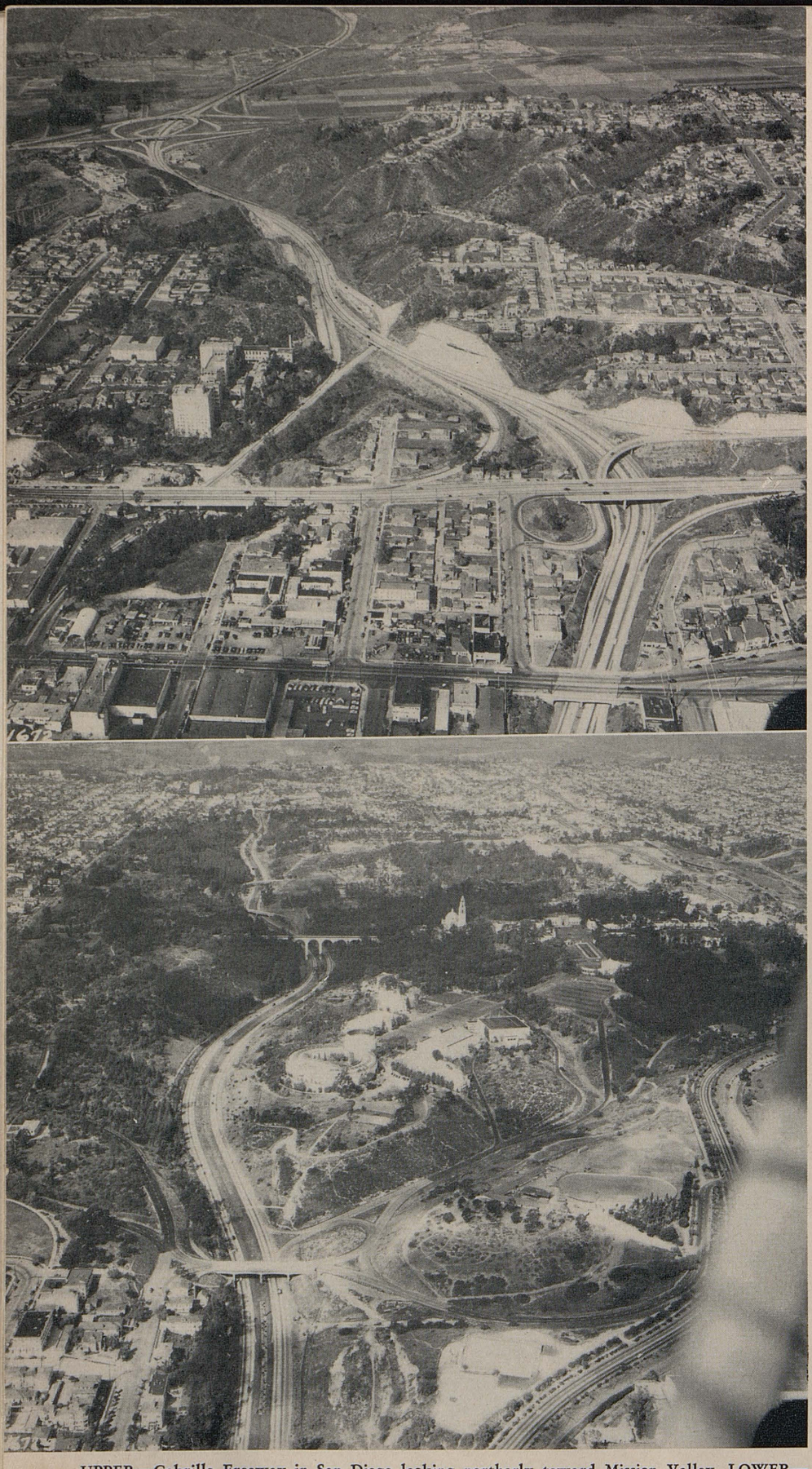
On the peninsula, construction to freeway standards on the Bay Shore Highway (U. S. 101 Bypass) is advancing rapidly. From South San Francisco to San Mateo over 11 miles of six-lane freeway is in use and construction operations are progressing rapidly within the City of San Francisco between Alemany Boulevard and 25th Street.

Hollywood Freeway

In Los Angeles the Hollywood Freeway is in use through Cahuenga Pass from Highland Avenue to Lankershim Boulevard and on the Santa Ana Freeway traffic is moving from Aliso Street to the east city limits. Freeway construction is rapidly advancing towards completion on the Hollywood Freeway from Main Street to Western Avenue with all but one or two structures in place and the six-lane pavement is rolling out block after block.



UPPER—Cahuenga Freeway in Los Angeles. CENTER—New freeway on U. S. 101 in Buellton. LOWER LEFT—Santa Ana Freeway, Los Angeles. LOWER RIGHT—Joshua trees add beauty to U. S. 66 between Cajon Summit and Victorville, San Bernardino County



UPPER—Cabrillo Freeway in San Diego looking northerly toward Mission Valley. LOWER—Cabrillo Freeway looking southerly toward downtown San Diego

Other going contracts and budgeted projects will complete most of the Santa Ana Freeway south to Miraflores.

Freeway construction has been completed at Santa Barbara and Buellton and construction to expressway standards has been completed or is under way in the San Fernando Valley; at Ventura; north of Santa Barbara; at Pismo Beach; both north and south of San Luis Obispo; at Salinas; through San Benito County; and between Gilroy and San Jose.

In San Diego County, similar expressway construction has been completed or is under way, within the City of San Diego, through Chula Vista and from National City to the border.

Most of U. S. 101 Alternate along the coast in both Los Angeles and Orange Counties is built to four-lane divided expressway standards.

Accelerated Program

Complete development of U. S. 101, its Bypasses and the Alternate, to expressway and freeway standards is as monumental a task as is the similar improvement to U. S. 99.

However, under the expanded state highway construction program made possible by the Collier-Burns Highway Act and federal funds from the Federal Aid acts of 1944 and 1948, the Division of Highways has made more than considerable progress in development of this route throughout its length from the Mexican border to the Oregon line.

While it has been impossible in this brief article to list the individual contracts and projects which have gone into this development, the following summary of expenditures since the end of World War II indicates the progress being made under the accelerated construction program.

Section	U. S. 101 Expenditures Oct., 1945, to June 30, 1950	Construction, miles
Oregon Line to San Francisco	$11,600,000	166
San Francisco to Los Angeles	50,800,000	207
Los Angeles to Mexican Border	28,400,000	133
Totals	$90,800,000	506

The latter part of this article started out to be a compilation of intimate stories in connection with construction of various state highways, but the development of main arteries such as U. S.

40, U. S. 99 and U. S. 101 is construction of such magnitude that the intimate yarns seem lost among multitudinous engineering projects. So that the reader may finish with a feeling of closer relationship toward the work of the Division of Highways and its engineers, may we add two brief descriptions of unrelated state construction projects of some years past.

Death Valley

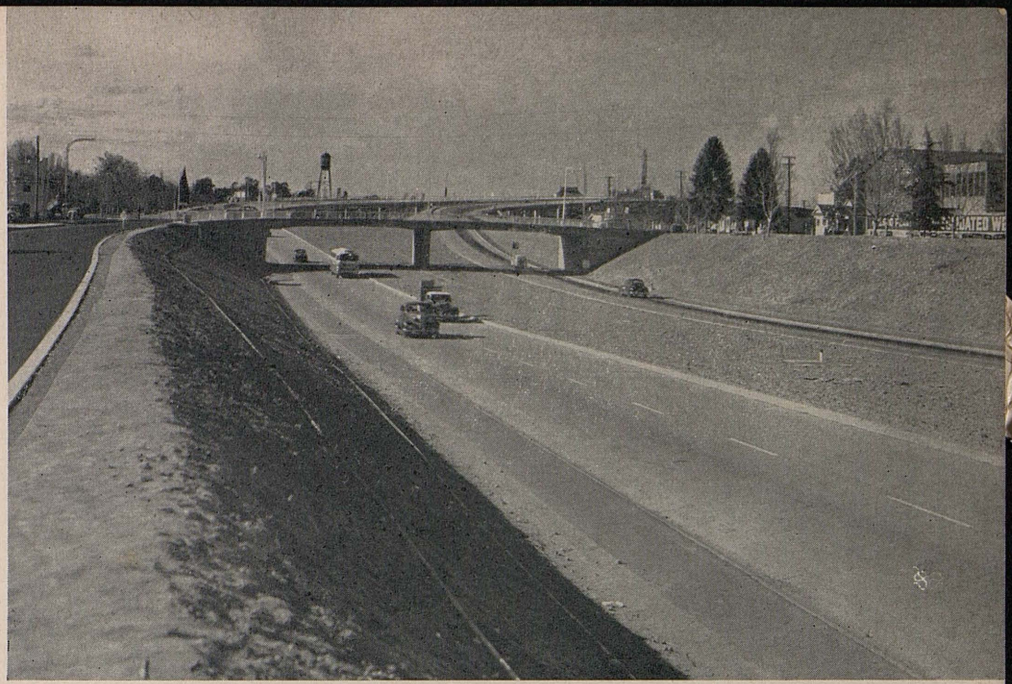
Of all natural attractions within the boundaries of California, the world famous Death Valley in southeastern Inyo County is undoubtedly the most unique. The first recorded story of this ominous wasteland of awesome beauty came from Lewis Manly, who early in 1850 led the remnants of the "Jayhawker" emigrant train over the west side escarpment formed by the towering Panamint Range. The survivors of that ill-fated party from Kansas paused on the summit of the range to look back on the land of their trial, suffering and death, only long enough to bestow upon that desert sink the fitting name of "Death Valley."

By Presidential Proclamation in 1933 some 2,500 square miles of desert mountains and valley were set aside as the Death Valley National Monument. Included within the monument boundaries are the 400 square miles of Death Valley proper, a flat, dry, seabed hemmed in by the 6,000-foot Amargosa Range on the east and on the west by the precipitous Panamint Range, where elevations such as the 11,045 feet of Telescope Peak tower above their base as do no other peaks in the United States.

Valley Below Sea Level

Nearly the whole floor of the valley lies below sea level, with the minus-276 elevation at Bad Water marking the lowest point in the United States. The sea level contour encloses an area more than 70 miles long and from one to six miles wide.

The winter temperature in Death Valley is ideal. The summer climate is something else. Accurate meteorological data in Death Valley has been accumulated only in recent years. A temperature of 134 degrees in the shade has been recorded at Furnace Creek Ranch. It should be noted, however, that, that was the limit of the thermometer. Geological Survey documents indicate that a temperature of 150 degrees has been observed around the stone beds at the mouths of several canyons and out on the salt beds it is estimated the temperature will go 10 degrees higher. The average annual temperature of 75 degrees would indicate a most delightful climate, was it not that the range included in computing this average runs from 15 degrees to 134 degrees.



Freeway construction on U. S. 99 at Fresno showing California Avenue overhead in foreground and Monterey Avenue overhead in background

Discovery of Borax

Following the '49 "Jayhawker" emigrants, prospectors were lured into the ranges surrounding the valley by stories of gold, silver, and lead deposits, the wealth of which would stagger the imagination. These fabled deposits are still missing and still sought. The prospecting, however, did lead to other mineral wealth, such as the discovery of borax, which resulted in the construction of wagon roads, a railroad, and the gradual development of the area to its present status. In this connection, the "Twenty-Mule Team" trademark probably has given Death Valley more widespread publicity than any other single factor.

Because of the highly mineralized nature of the valley, its formations are fantastic and colorful in the extreme, providing most interesting and entertaining scenes.

Prior to its incorporation into the federal system of national parks and monuments, there were several so called roads throughout the valley. These roads which usually followed the bottoms of washes as the most convenient location were quite regularly obliterated by summer cloudbursts.

Highway System Enlarged

At about the time the Death Valley National Monument was created, the 1933 Session of the California State Legislature added to the State Highway System some 6,600 miles of roads. Included in these additions were two highways serving as the main entrances to the valley. One of these extended along the east side of the valley from Baker in San Bernardino County through Death Valley Junction; the other, provided a westerly approach from Lone Pine through Darwin.

Improvement of the entrance via Baker and Death Valley Junction involved only typical desert construction, and aside from usual desert drainage problems presented no serious difficulties. The road in from Lone Pine was quite another matter.

From a connection with U. S. 395 about two miles south of Lone Pine, the old road traveled southeasterly through Keeler on the dry Owens Lake bed, to

Darwin. This road had long served the mining properties in this section.

Toll Road Built

In 1926, H. N. Eichbaum, a pioneer resident of the Death Valley country, secured from Inyo County, a franchise to build and operate a toll road from Darwin to Death Valley. He built his road along an old trail following down Darwin Wash, in the Argus Mountains, across Panamint Sink, over the Panamint Range by way of Towne's Pass and thence down to Stove Pipe Wells in Death Valley.

For the privilege of driving the 31 miles of this narrow dusty road, 20 miles of which was crooked and precipitous with grades of from 15 to 20 percent, the traveler paid a toll of $2 per car and 50 cents per person.

As soon as the Legislature had incorporated in the State Highway System a westerly route into the valley, the Division of Highways began negotiations for acquiring the Eichbaum franchise, which, by way of interest, extended into perpetuity. On December 20, 1934, the deed vesting title in the State was filed and tolls abolished.

Darwin to Zinc Hill Grade

In the meantime, reconnaissance by state highway engineers developed a line connecting with the old route some distance north of Darwin and following northeasterly along the ridges, in lieu of washes, down the side of Rainbow Canyon to a connection with the old toll road at the floor of Panamint Sink where Darwin Canyon debauches into the sink. The routing, while it involved difficult rock construction, eliminated the tortuous descent of the Zinc Hill Grade in Darwin Wash. In former days the road down Zinc Hill was subject to annual obliteration by cloud bursts.

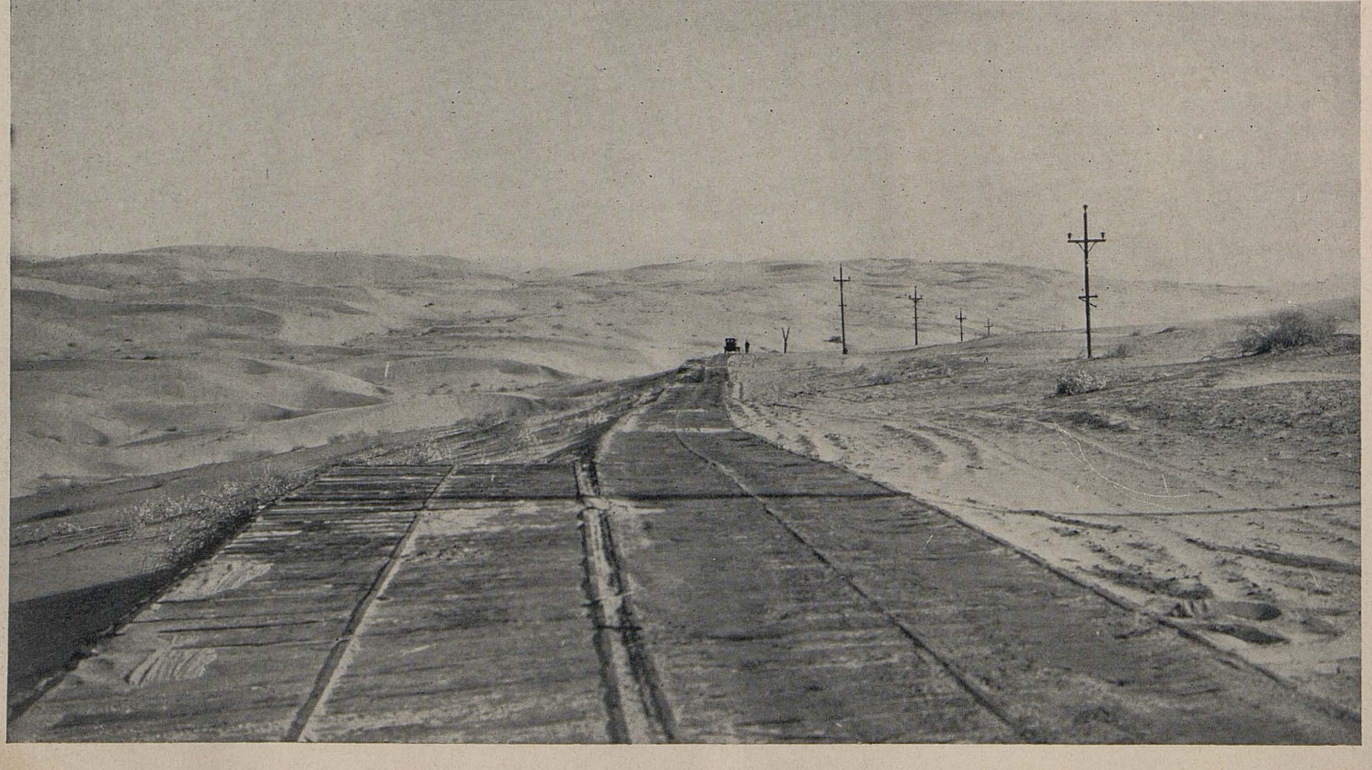
The distance on the old road from the point of connection north of Darwin to that at the foot of Zinc Hill Grade was 19.9 miles and included 245 curves. On the present highway the distance is 17.5 miles with only 72 curves. The total difference in curvature between the 245 and the 72 curves was more than 8,950 degrees or nearly 25 complete circles; the curves on the old road were also much sharper than those on the revised alignment, the minimum radius on the old route being only 30 feet while on the new, the minimum radius is 200 feet. Easterly from the mouth of Darwin Wash, improvement to the route was considerably less difficult. Across the Panamint Sink the going was straight and through Towne's Pass the old alignment was satisfactory. The remainder of this western entrance into the monument to its connection with the Park Road System lies across the flat valley floor and is an excellent highway.

Through regular improvement and maintenance on these two state highway entrances into Death Valley, motorists have been provided with the means of easy access to this awe-inspiring portion of California.

The Yuma Sand Hills

Crossing the southeasterly corner of Imperial Valley and lying to the west of the Yuma Indian Reservation is a ribbon of continually shifting sand dunes usually referred to as the Sand Hills, or to be a little more specific the Yuma Sand Hills. The northeasterly end of these Sand Hills is located near Niland and the southwesterly end is south of the border in Mexico.

This plank road carried vehicular traffic across the Yuma sand dunes west of Open Valley in Imperial County for many years following its construction in 1915-16. Note plank turn-out for traffic on left



Since the earliest days of occupation in Southern California, travel across the Imperial Desert has followed a trail through these Sand Hills. The route has always been popular as a link in the most southerly transcontinental route. At intervals throughout the year, strong winds from the northwest blow across the dunes resulting in a constant movement of the Sand Hills to the southeast.

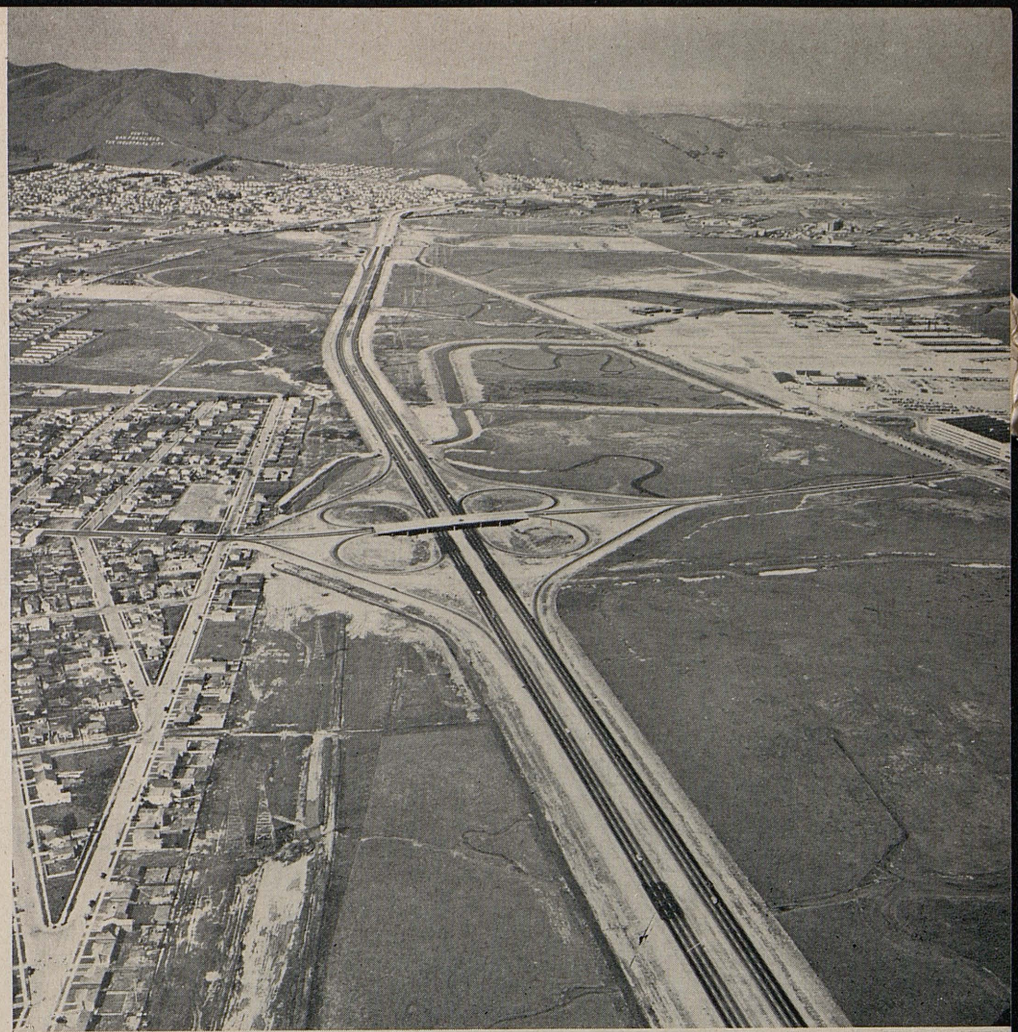
One peculiarity of the Sand Hills country is that in the middle of the dunes is a small level "Open Valley" about one-half mile wide and 1¼ miles long which is free from sand drifts. This valley apparently has remained in the same place for many, many years, for as late as 1924 there were in place in the valley several old telegraph poles which were reportedly placed there in 1857 by General John C. Fremont as a part of a pole line across the desert.

Information is quite vague relative to any improvement of the Sand Hills section of the desert road in the early days when San Diego County extended to the Arizona line or even after the formation of Imperial County in 1907.

Wooden Plank Road

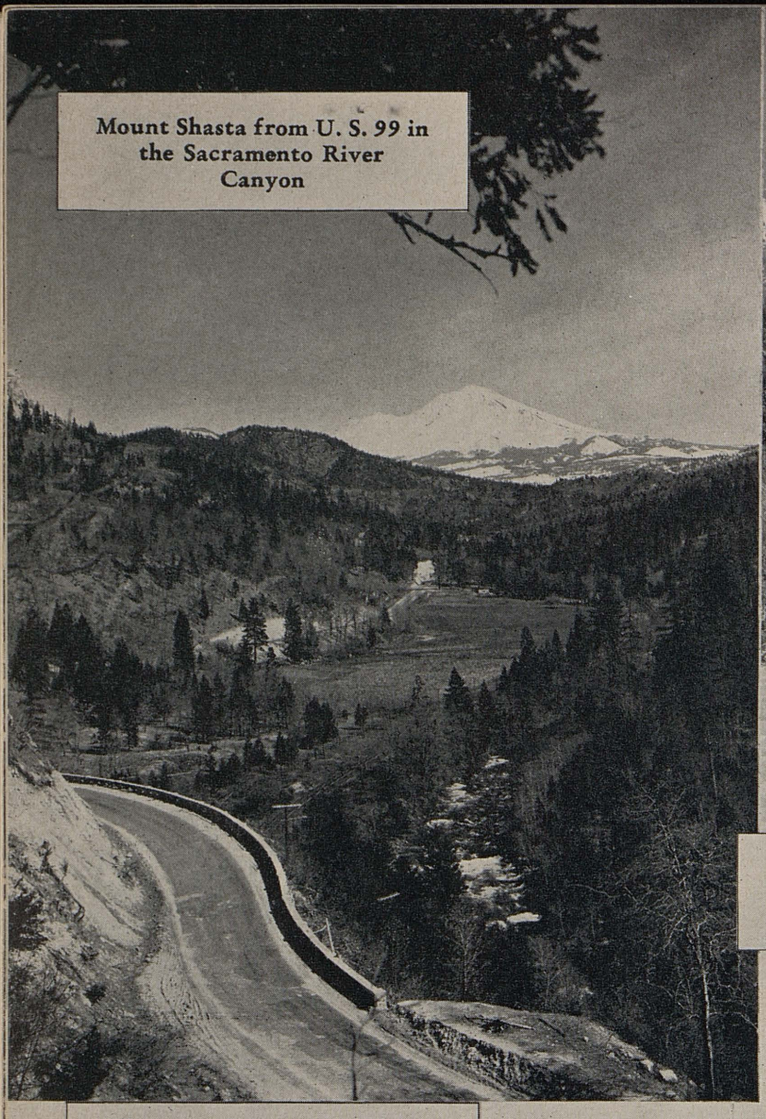
In 1916 the California Highway Commission in building the state highway between Yuma and El Centro constructed about 6.5 miles across the ever-moving Sand Hills. From the old "county well" on the westerly edge of the hills a wooden plank road, eight feet wide, was laid on the shifting sands to the westerly end of Open Valley. Through the 1¼ miles of Open Valley a 10-foot roadway was oiled and from the easterly end of the valley to Ramanda at the east edge of the Sand Hills another three miles of plank road was laid on the sand.

This unusual eight-foot plank highway, with its passing turnouts spaced at convenient intervals, or inconvenient to the motorist who had to back-up, served desert travelers for many years. The chief maintenance operation along the plank road consisted of scraping the drifts to the lee side with a team and fresno.

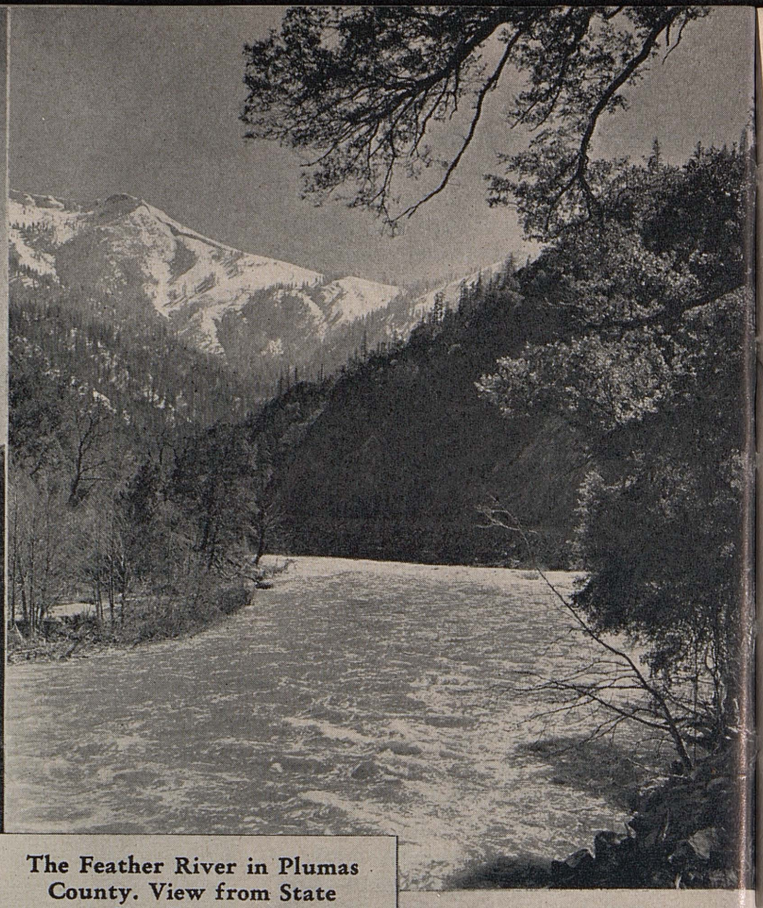


Bayshore Freeway in San Mateo County showing Cloverleaf Overcrossing to San Francisco Airport

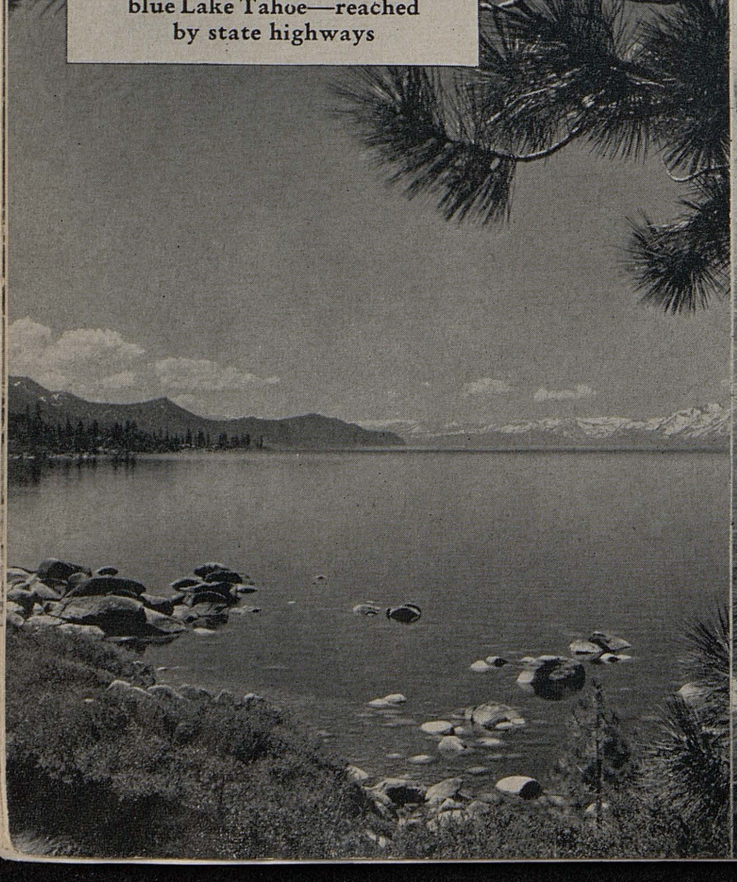
Eastshore Freeway in Oakland—looking easterly—showing 19th Avenue Overcrossing in foreground and 23rd Avenue and 29th Avenue Overcrossings in background



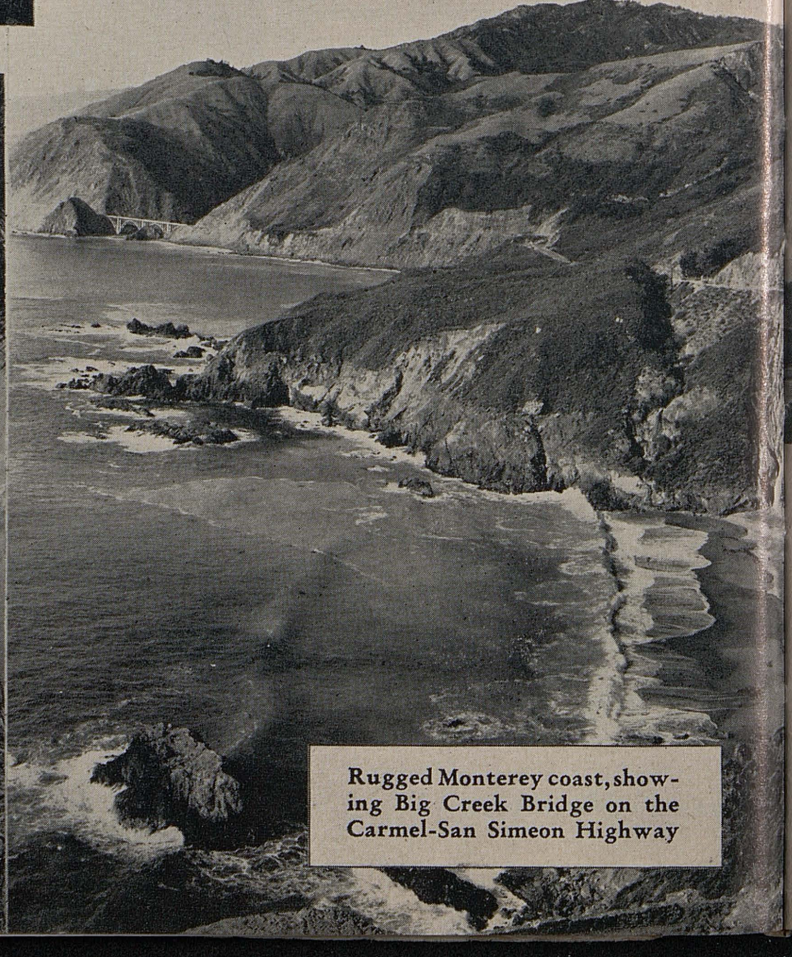
Mount Shasta from U. S. 99 in the Sacramento River Canyon



The Feather River in Plumas County. View from State Sign Route 24



The gem of the High Sierra—blue Lake Tahoe—reached by state highways



Rugged Monterey coast, showing Big Creek Bridge on the Carmel-San Simeon Highway

New Plank Highway

In 1924 a new and improved plank highway was laid on two 1,000-foot sections to replace splintered and weathered portions of the old road. The new design consisted of heavy redwood timbers separated by blocks and fastened together with long bolts. This type was considered better than the old flat plank sections held together along the edges with longitudinal boards and wire.

During the years which the two sections of plank highways were serving desert traffic, the State Highway Department was learning quite a bit about desert road construction. In 1926, in order to provide facilities through the Sand Hills which were comparable with other desert highways, 6.5 miles of asphalt concrete pavement were placed on a new grade line as replacement of the old plank road.

The method adopted consisted of constructing a 30-foot graded roadbed to an elevation which corresponded to the tops of surrounding dunes. The fill was constructed of the only material available: the blowsand of the dunes. While no unusually hard winds were experienced during the contract, the movement of the sand was so continual that it was necessary to take the cross-sections for determination of contract pay-quantities immediately behind the draglines placing the embankment.

Unusual Items

In fact, a review of this contract revealed three unusual items: "First Blow Off," "Blow On" and "Second Blow Off."

"First Blow Off" was material which was placed in the allowable embankment, but which, because it was "Gone with the Wind," had to be replaced once.

"Second Blow Off" was material in the allowable embankment which had to be replaced twice, and

"Blow On" was material which was blown onto the embankment after construction and which had to be removed by the contractor before the embankment slopes were oiled.

How the resident engineer and his assistants kept their quantity records for this "put and take" game with blowing sand and at the same time kept their sanity is difficult to imagine.

As rapidly as possible, subgrade was shaped behind the draglines, header boards lined up and the base course of the 20-foot asphalt concrete placed. This required laying planks on the subgrade for travel of the trucks carrying the hot asphalt concrete. As the planks were removed steel plates were laid to support the trucks while dumping.

No difficulty was encountered in laying the surface course, except that the continual deposit of drifting sand required a small crew with hand brooms steadily sweeping up the base immediately in front of placing the top course.

While these construction operations must have left the boys on the verge of nervous collapse, it was a good pavement and undoubtedly the most stable thing in the Sand Hills—it and General Fremont's telegraph poles.

Such are a few of literally hundreds of intimate and interesting stories connected with one hundred years in development of California highways. From ox-cart trails to metropolitan freeways is as far a cry as from an Indian "Wickiup" to the Ambassador or Biltmore Hotel in Los Angeles and California has seen both during its first century as a State.

Chapter XV

Century of Bridge Progress

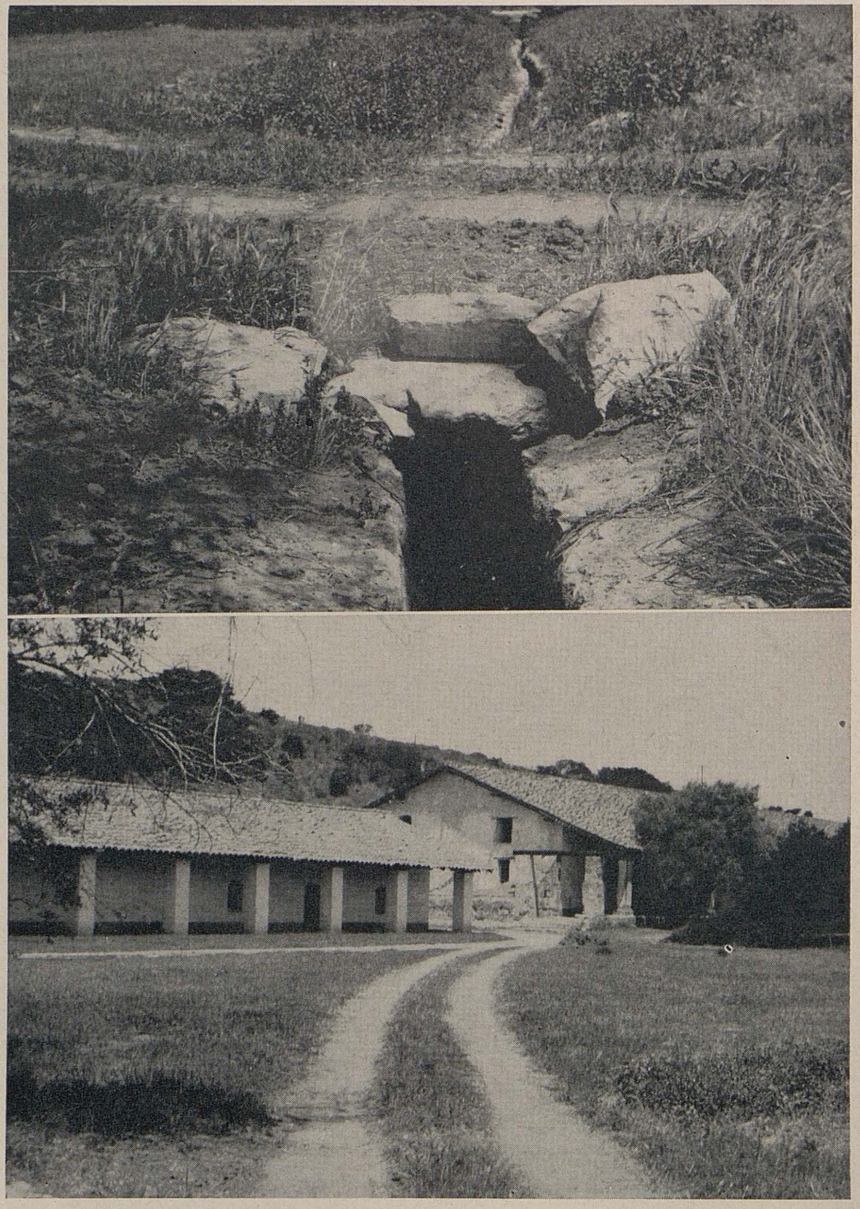
F. W. Panhorst, Assistant State Highway Engineer (Bridges)

California 100 years ago was a pioneer country served primarily by waterways from which primitive roads and trails led to settlements at missions, ranchos and placer mines. Land routes had been located so as to avoid natural obstacles, often detouring many miles to reach the best passes over hills and streams. The channels crossed by El Camino Real were dry most of the year and fordable except after heavy rains. The emigrant roads were little more than trails, such that wagons had to be unlimbered to pass declivities and major streams. Roads to the new placer diggings were developing rapidly, but still following ravines and spurs. So, except for two minor structures, there were no bridges in 1850.

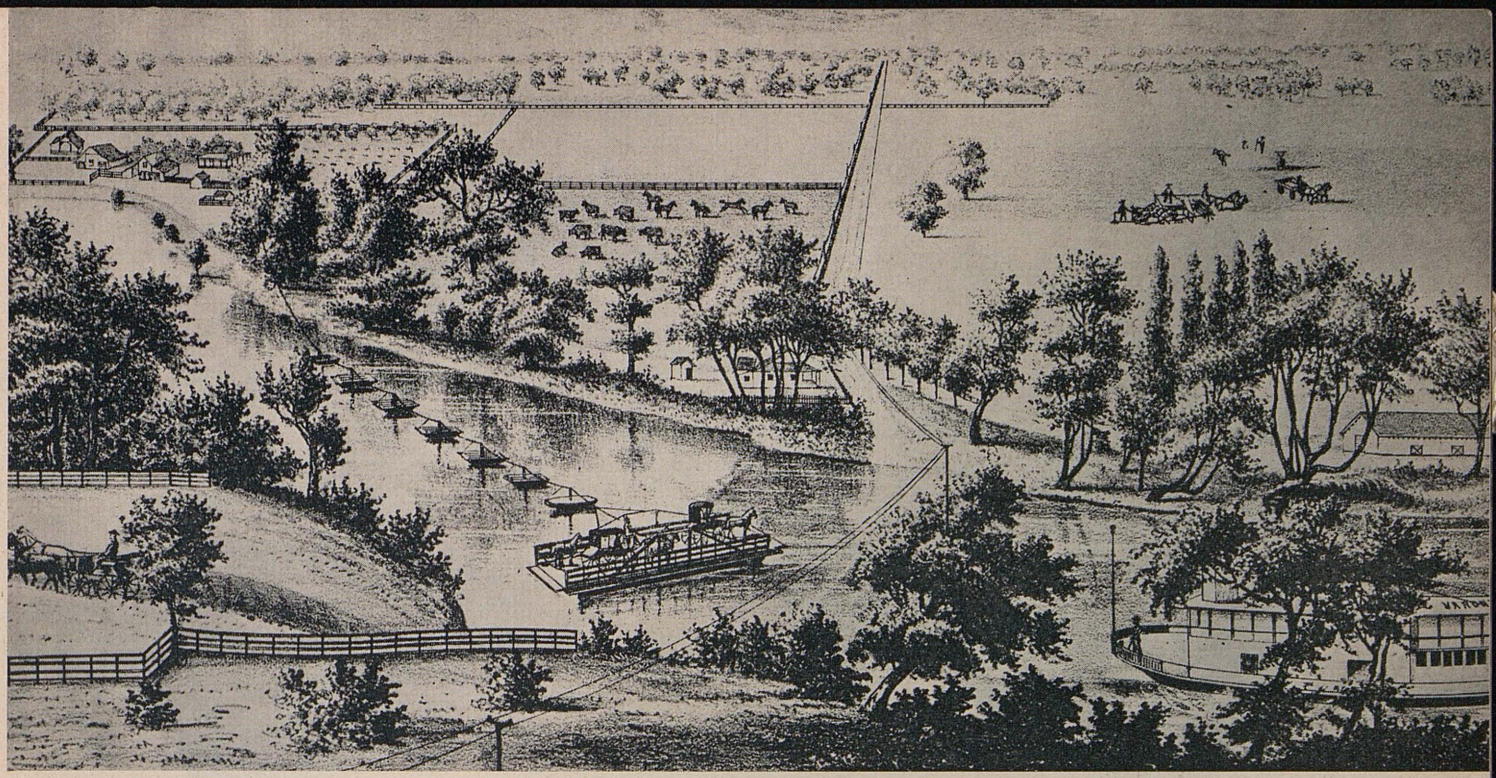
One of the exceptions was a stone slab bridge or culvert built about 1813 on El Camino Real over an aqueduct at Mission La Purisima Concepcion and still standing in La Purisima State Park (*See illustration*). The other was the Hinckley Bridge built in 1844 over the tidal inlet to Laguna Salada in Yerba Buena (now San Francisco), near the present intersection of Montgomery and Jackson Streets. Attesting to the lack of bridges in those days, William Heath Davis reported (Sixty Years in California, p. 208) that "people came from far and near to look at and admire * * * the remarkable structure."

No Bridges in 1842

Davis made it very clear (p. 257) that "There were no bridges in those days," describing his trip to San Jose in 1842 when his horse had to swim Alameda Creek and he waited two days for Coyote Creek to fall. Again in 1847 (p. 435) his horse barely forded Santa Ana River and had to swim the San Gabriel. Fremont came down the American River to Sacra-



CALIFORNIA'S OLDEST BRIDGE—Probably the oldest bridge in the State is that built by the Padres to carry El Camino Real over an aqueduct at Mission La Purisima Concepcion in Santa Barbara County. Ten feet wide and spanning only 1.5 feet, it consists of stone slabs on cemented stone abutments and is now preserved in La Purisima State Park. After destruction of the first mission by earthquake in 1812, work commenced on the new mission in 1813. The aqueduct and this little bridge were built shortly thereafter, 137 years ago



Moon's Ferry across Sacramento River near Colusa, licensed in 1867. It was propelled by the current, using rudder and buoyed anchorage to hold barge obliquely

mento in 1844 and left via Walker Pass, fording with difficulty every Sierra stream from the American to the Kern.

However some streams could not be forded except for short periods of extreme low water and ferries were already being built and operated. The first, in 1843, crossed the Sacramento at what is now Knights Landing, and the Feather at Nicolaus, each being anchored with a long rope so as to utilize the current of the river for propulsion. These were replaced in 1849 by the Fremont-Vernon (now Verona) ferry on the Benicia-Marysville road, by which time there were ferries over the Sacramento and American Rivers at Sacramento City. The type is illustrated by Moon's Ferry of somewhat later date. Many other ferries were established in 1849-50, notably at Jacksonville on the Tuolumne and at Condemned, Murderers and Rattlesnake Bars on the American. Generally these were makeshift flatboats, rafts or even old wagon-beds, but the tolls were just as high.

From this brief summary of stream-crossing facilities in 1850, it will be apparent that practically all bridge construction in California must be included in this "century of progress." There has been progress in number, size, strength, materials, utility, economy and beauty of bridges, and in their safety for traffic and security against flood. Every one of some 30,000 bridges built in 100 years has marked a step in that progress. The story of 30,000 bridges can be told only by discussing them in groups represented by typical structures.

Eras of Bridge Construction

Not by any measure has progress been steady. Bridge building fluctuates with the prosperity of the community, the availability of materials, the traveling habits or desires of the people, and with the political economy of the times. Bridge design progresses with advancement of the arts and sciences generally, and with the education, training and experience of professional engineers specializing in bridges. These factors caused major and minor eras of bridge construction in the century. Some were distinct and some overlapped, but three periods were so outstanding in their impact on bridge progress that they will be treated separately. They will be called:

***The Pioneer Era* (1850-1875), marked by extension of the system of unimproved roads for pack train and wagon, and bridge building by private enterprise, using native materials to carry light loads.**

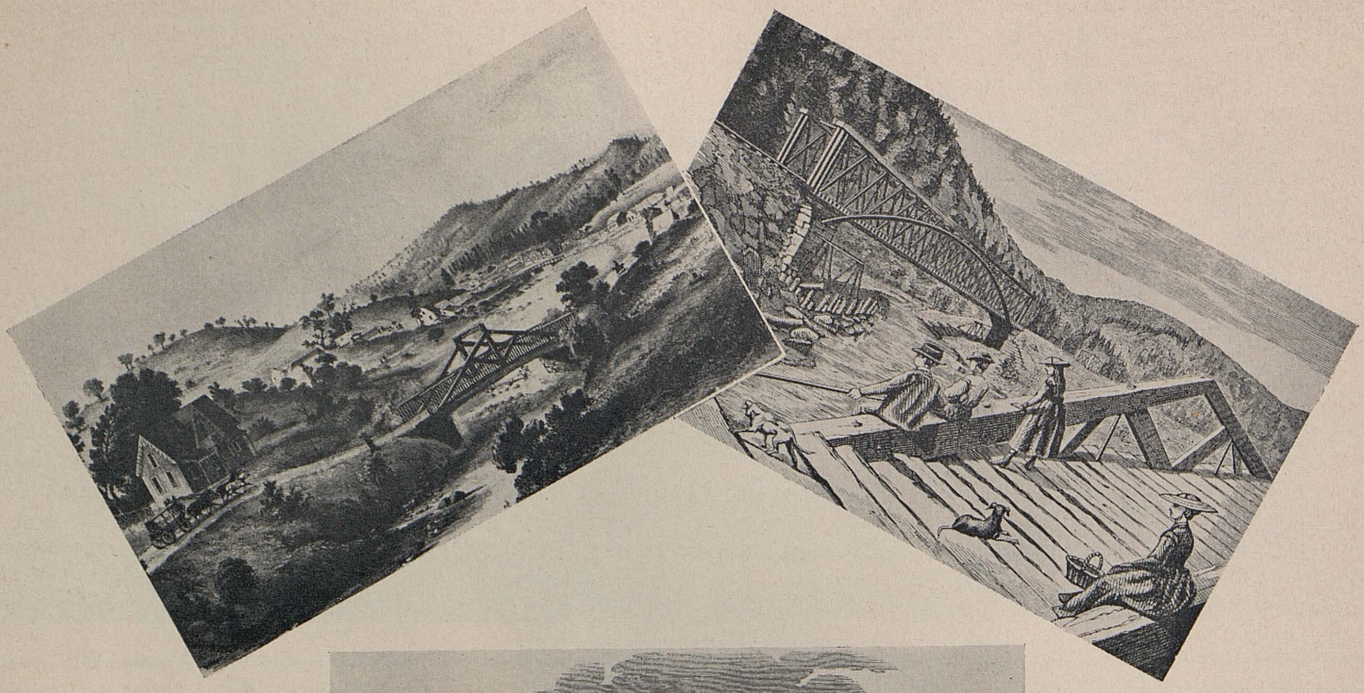
***The Railroad Era* (1875-1915), marked by expansion of the railroads to a position of economic and political dominance; railroads built the major bridges and made eastern steel available.**

***The Highway Era* (1915-1950), marked by construction of highways by public enterprise as the automobile supplanted the horse and the truck challenged rail freight; accelerated by discovery of petroleum, growth of population, two world wars and progressive prosperity.**

The Pioneer Era

As the century began, California had been a pioneer region for 300 years. Even with statehood, it was still "around the Horn" from the other states, establishing its own law and order over a region turbulent with Indian skirmishes, disputed land titles, and conflicting mineral rights. This isolation restricted bridge building to the use of native materials (timber and stone), or to a minimum of metal for tension rods and cables. Much of California is still pioneer country, but for the State as a whole the era ended with the completion of the Central Pacific to the east and Southern Pacific lines to north and south in the 1870's.

In one respect the era should be divided into two equal periods by the great flood of 1862. Few bridges withstood the forces of water and drift logs.



UPPER LEFT—Timber A-frame south of Jacksonville, built about 1850

UPPER RIGHT — Timber A-frame on wagon road (foreground) and timber Burr truss on Central Pacific Railroad over Truckee River six miles east of Boca

LOWER LEFT—Edward's Bridge (timber Fink truss on log cribs) over South Yuba River, built in 1862

LOWER RIGHT — Suspension bridge (built in 1865 and still standing) over American River at Rattlesnake Bar, with timber towers and canceled truss

Lisle's Bridge (timber queen-post and draw spans) built in 1851 over American River at Sacramento, and wagons fording to save tolls.

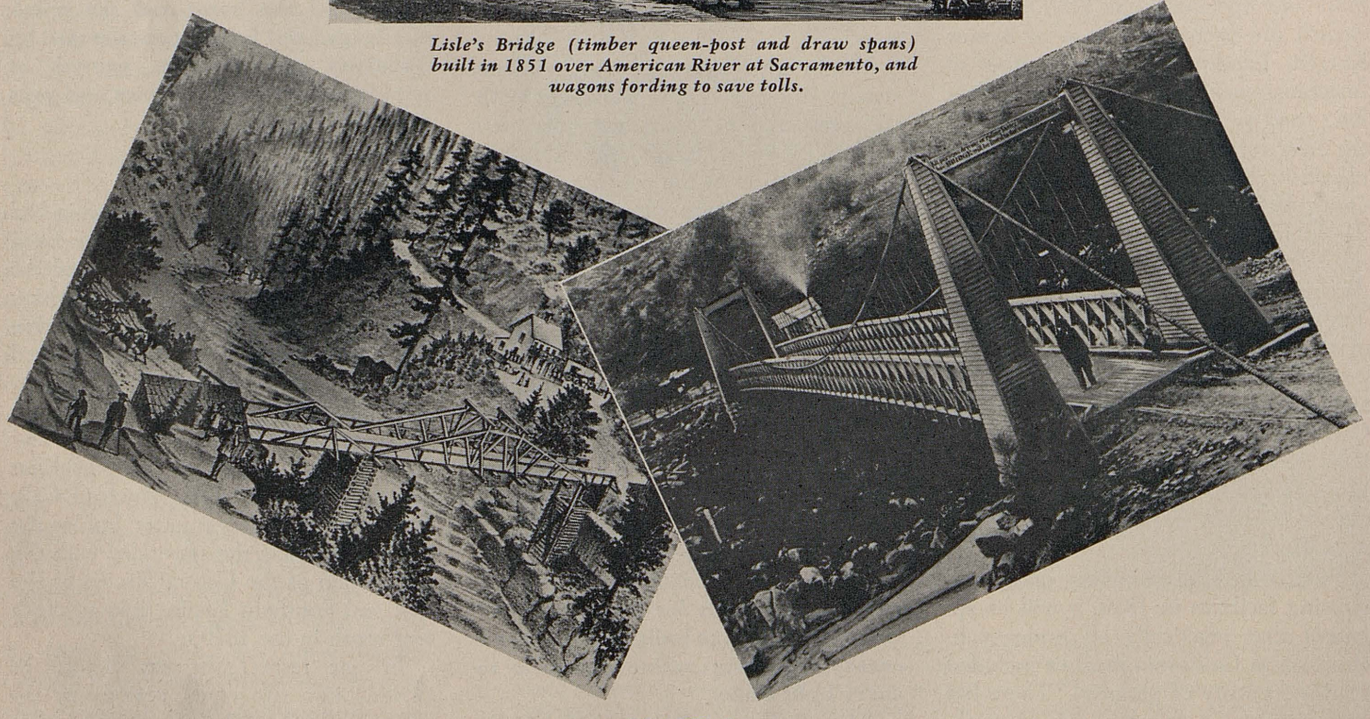


PLATE I
Typical Bridges of the Pioneer Era

Repair and reconstruction provided longer and higher spans, deeper and stronger foundations. But man's memory is short and the lessons learned in 1862 had to be learned again in 1884, 1916 and 1937-8.

Make-shift Bridges

At the beginning of the first period, there was frantic construction along routes to the Mother Lode. More ferries were launched on the larger rivers and makeshift bridges of logs, timber and cable were built over gorge channels. By 1852 timber trusses and cable suspension bridges had been constructed. Practically all were speculative ventures of private enterprise, but the rich returns on the investment led to construction of many more. Typical structures of the day are shown on *Plate I.*

No log bridges are shown, as these were simple structures that did not appeal to artists of the day and none is standing now. From old descriptions, they were usually single spans built from trees felled at the site. Some were single logs for pedestrians and led animals. Others were parallel logs supporting a cobble and gravel road bed. The most elaborate were parallel logs of one or two spans resting on log cribs and supporting a plank or corduroy deck. They were adaptable to pioneer construction using only axe, adze and maul to work materials at hand.

Timber Trestle Type

It was cheaper to haul hewn timbers than logs, so the timber trestle was a popular type in the unforested valleys. These were often jerry-built without adequate foundations or bracing. In 1851 a traveler reported that passengers were forced to disembark from the stage and walk across all the bridges between Sacramento and Marysville, "and then, so frail were these structures, that they trembled and swayed as the empty coach was being drawn over." In 1852 high water floated Stockton's first bridge off its piers and down to the bay, carrying with it a pedestrian who was rescued by townspeople.

Judge Palmer's Bridge over the Mokelumne River built in 1852 at Lancha Plana was just such a flimsy trestle on framed bents. It was variously reported as having failed after the first cart crossed or at the first rain. Another on the Mokelumne was built of lumber so green that it shrunk and dropped into the river the following summer.

First Pile Trestle

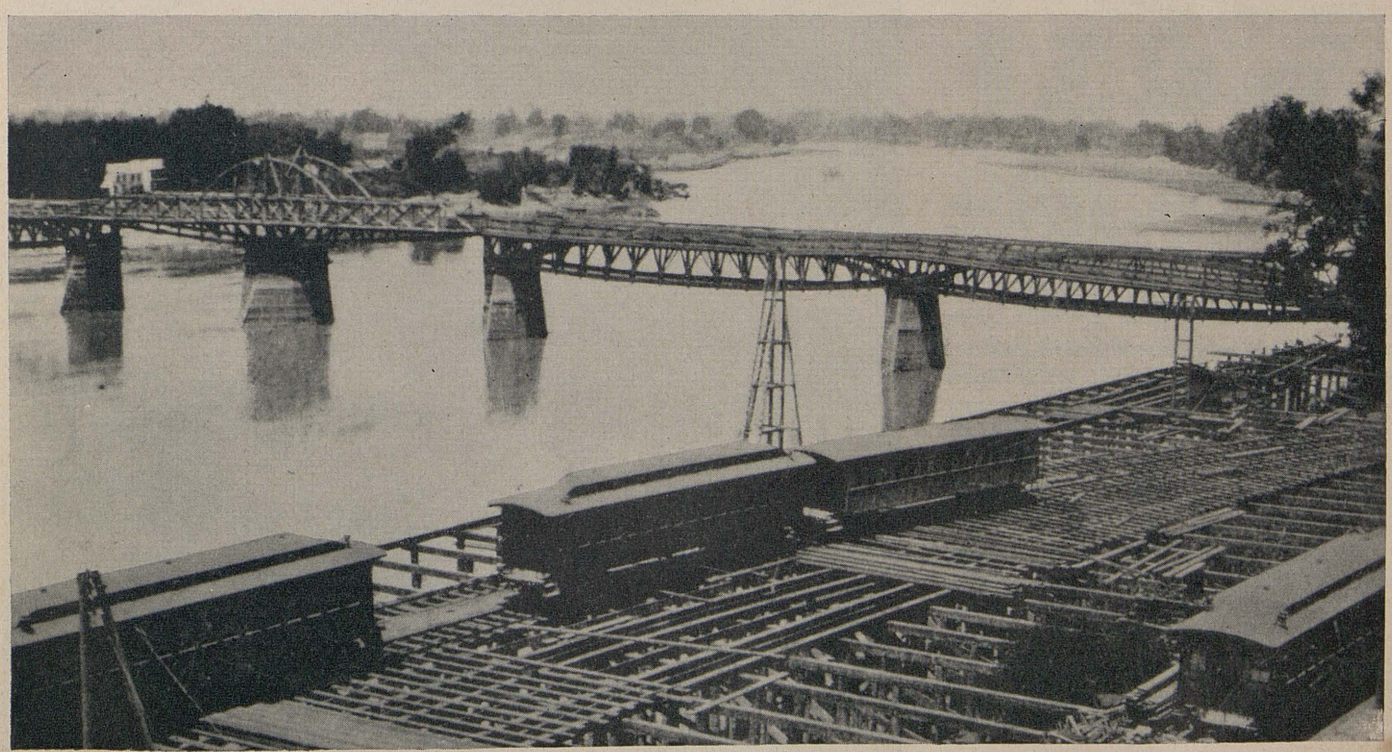
The first pile trestle attempted was the plank toll road built in 1851 on Mission Street in San Francisco. When 20-foot piles and 20-foot followers drove out of sight, log cribs were set on plank mud sills, but even these sank five feet in a few months.

The first timber trusses were king-posts (1850) and queen-posts (1851) like those shown on *Plate I.* Of these, Lisle's Bridge over the American River near the present crossing of U. S. 40 (16th Street) had a continual record of partial and total failures, particularly in the years 1853, 1862, 1864 and 1868. The Sacramento *Union* reported (June 12, 1857) that it sustained a gross load of 19,580 pounds in a wagon drawn by seven yoke of oxen. Apparently it had a lift span, probably the first in California.

Famous Truss Bridge

A famous truss bridge with the first swing span in California was the "Sacramento and Yolo Bridge" over Sacra-

Sacramento-Yolo swing bridge over Sacramento River at Sacramento, built in 1858. Note curved chords of timber truss approach spans, pile driver at dock and early railroad coaches on wharf



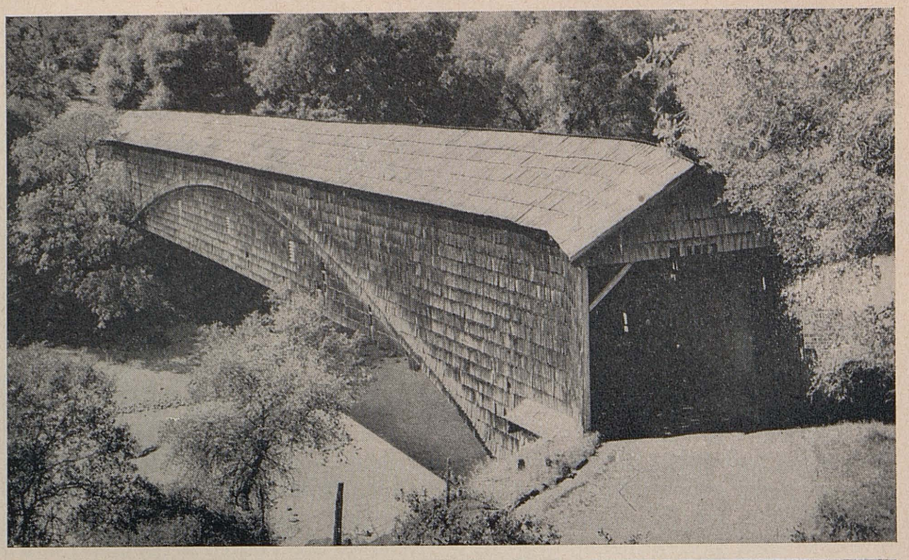
mento River, from Broad Street in Sacramento to Ann Street in Washington (See illustration). It was authorized by the Legislature in 1857, piles were driven that fall and it was completed the following June at a cost of $60,000. Piles and timber came by boat from Puget Sound. The Sacramento *Union* of June 26, 1858, describes it in some detail, particularly that the draw span was supported on 17 rollers and that one man could open it in 1.5 minutes with a 10-foot iron hand spike. Lower chords of the swing span were 75-foot timbers, "the tallest timber, probably, ever used in bridge building." During the test of the draw machinery, one man was crushed to death between fixed and swing spans. The trusses were tested by hauling several loaded drays and 151 head of cattle in a compact mass of 75 tons all the way across the bridge. It was a toll bridge competing with a toll ferry and charging from 5 cents (for commuting foot passengers) to $1.25 for a loaded three-team wagon.

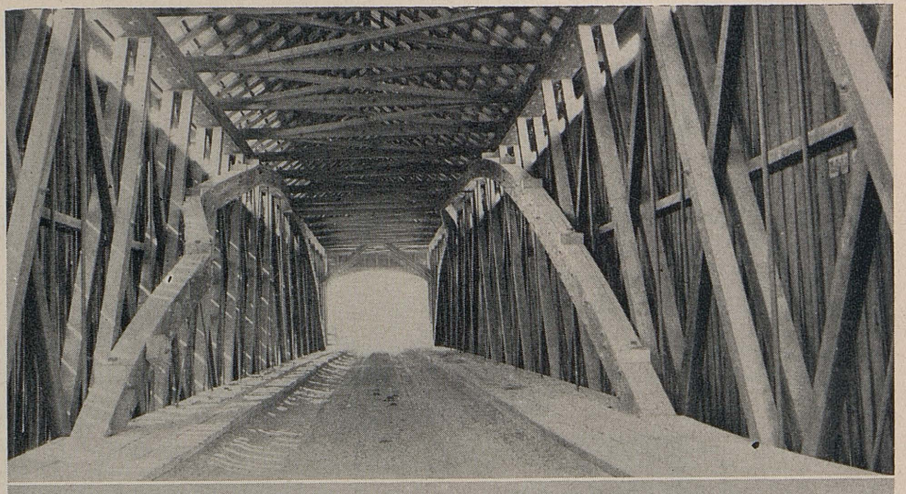
Covered Bridges

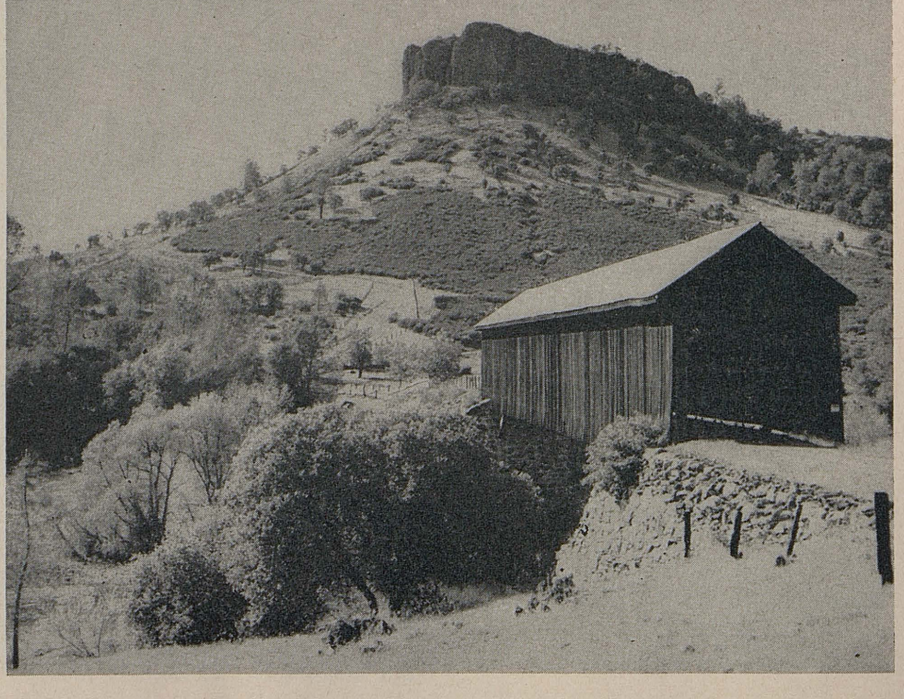
For long life, timber bridges had to be well built and securely roofed. Three notable structures still stand as monuments to the craftmanship that went into covered bridges. These are:

Name	River	Spans	Built
Bridgeport	South Yuba	225	1862
O'Byrne's Ferry	Stanislaus	187	1862
Knight's Ferry	Stanislaus	4 at 136	1864

Of these many covered bridges, perhaps the most remarkable was the structure across the South Fork of the Yuba River at Bridgeport in Nevada County (*See illustration*). This bridge, which still stands, was built in 1862 by J. W. Woods, and consists of a Howe truss upon which was superimposed an auxiliary arch, and to which were added counter struts, making a composite structure somewhat similar to the design first prepared by Mr. Theodore Burr for a bridge constructed in 1804 across the







UPPER—Bridgeport Covered Bridge (timber Burr truss) over South Yuba River; longest timber truss in State; longest covered timber truss in United States. LOWER—O'Byrne's Ferry Bridge over Stanislaus River, built in 1862. CENTER—Interior of O'Byrne's Ferry, showing auxiliary arch which buckled when bridge was completed

Hudson River. The arch ribs consist of four timbers, each 5 inches x 14 inches, between which are sandwiched the two trusses. The span of 225 feet is the longest covered span in the United States. Timber was used for the chords, arch ribs, and diagonals, and iron was employed for the vertical tension members, the bearing shoes, and bolts. For many years this bridge was the property of the Virginia Turnpike Company, and tolls continued to be collected on it as late as 1880.

Relation of Arch to Truss

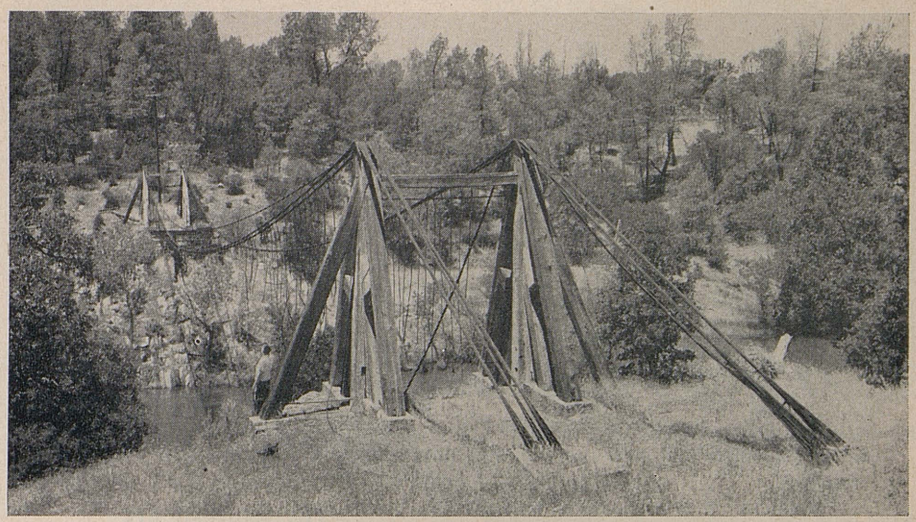
The relation of arch to truss is shown in the picture of the covered bridge over the Stanislaus at O'Byrne's Ferry. In this bridge the arch ribs have buckled but the trusses are intact, showing at once the difficulty of cambering a composite structure so that each system shares the load, and the expensive security of providing two supports for the same burden. It became a free county bridge in 1906 and is still in service.

The suspension bridge was an early competitor of the timber bridge, particularly for locations over deep gorges of the Mother Lode country. One advantage was that erection did not require falsework. Another was that cable wire, which at first was shipped around the Horn, was comparatively light and could be cut into units small enough for transport by pack trains. The pioneer in this field was W. B. Wilson who built a 150-foot wire bridge over the Cosumnes in 1852 to replace a timber trestle destroyed by flood.

Suspension Bridges

Other suspension bridges followed immediately, but not always with equal success. One at O'Byrne's Ferry collapsed under a load of six oxen and two men in November, 1853, after a few months' service and the rebuilt bridge was lost in the 1862 flood, so the covered bridge already described was preceded by a ferry and two suspension bridges. The Whiskey Bar suspension bridge over the North Fork of the American River lasted from 1854 to 1862. This bridge was replaced by the suspension bridge at Rattlesnake Bar (*See Plate I*), which is still standing but doomed by the construction of Folsom Dam.

There were two suspension bridge failures at Nevada City. The first, erected in 1853, had to be taken down. The second was an engineering marvel with its 320-foot span and 14-foot roadway, but it collapsed after two months' service in July, 1862, killing two men and 15 oxen. The third bridge lasted many years. Still longer was the 350-foot suspension bridge at Folsom over the American River, built in 1861 to replace a 387-foot timber bridge. It failed in the 1862 flood and was replaced in kind.



Remains today of Westmoreland's Suspension Bridge over Mokelumne River at Lancha Plana, built in 1856; timber towers standing, but most of deck has fallen

Two suspension bridges built in 1856 survived the 1862 flood and are now standing as historic landmarks. One at Lancha Plana over the Mokelumne River, following the flat-boat ferry, which named the site, and two short-lived trestles, is only a picturesque ruin today (*See illustration*). Known as Westmoreland's Bridge, it spanned 300 feet between timber towers connected with oak dowels. Most of the timber deck has been lost from old age, but the badly rusted cables and suspenders are still hanging across the river.

Bidwell Bar Bridge

Better known is the shorter (245 feet) Bidwell Bar Bridge across the Middle Fork of Feather River, now preserved in Curry-Bidwell State Park (*See photo*). Originally the cables were bright yellow, supporting a timber stiffening truss and deck, but the timber decayed and has been replaced by a steel stiffening truss and new deck. If built, the Oroville dam across the Feather River will submerge this old landmark.

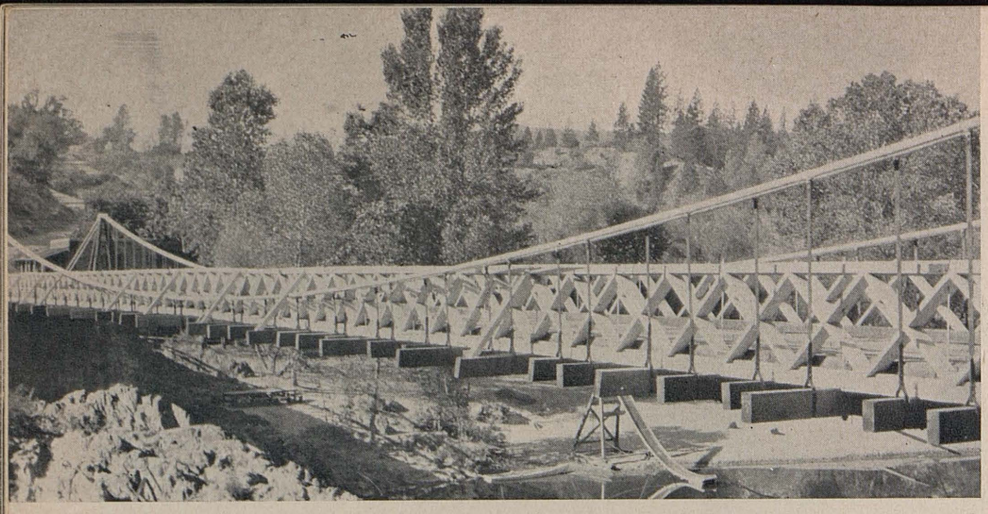
Many others were of this type. There were four on the Cosumnes River, one of which (Lamb's Bridge on the Latrobe-Plymouth Road) killed one man and seven horses when it fell in 1869. At least one was moved, for Lyon's Bridge over the North Fork of American River served at Condemned or Murderer's Bar from 1856 until 1865 when the cables were dragged along the river for re-erection on the Auburn-Coloma Road. Its 258-foot span sagged 22 inches when inspected in 1925, but it served until 1930 when it was replaced by a new suspension bridge that became obsolete in 1948.

Not all were built in the Mother Lode, for Klamath River was bridged in 1861 at Martins Ferry. This was the predecessor of many suspension bridges in the primitive northwest of the State where the Pioneer Era continued long after 1875.

Bridge Building Industry

Bridge building became an industry in 1855 when the A. S. Halladie & Company of San Francisco started furnishing some materials for suspension bridges. The firm patented a design (used at Folsom in 1861 and Nevada City in 1862), and by 1864 was drawing its own wire.

Before leaving this Pioneer Era, the role of private enterprise must be mentioned again. Practically all of the structures built before the 1862 flood were privately owned toll bridges. Most of these had been so profitable that they



Bidwell Bar Suspension Bridge over Middle Fork of Feather River is the oldest still in service in California, although the timber canceled truss shown here has since been replaced with steel

were quickly replaced after destruction by the flood, and this was fortunate because public funds would not have been available for many years. In most cases the enterprise was a single bridge, as at Coloma where Little was reported in 1850 to be collecting $250 per day from a bridge which had cost $20,000. Others were toll roads with one or more bridges, sometimes as the property of a firm operating stage coaches and freight lines.

Competition Develops

Competition developed between rival bridge owners, notably between Yuba City and Marysville over the Feather River. A cheap truss erected in 1853 collapsed in 1854. A second was built while the first was being repaired and the two competed until 1859, when the second one withdrew. An act of the Legislature that year authorized the county to build a competing toll bridge, which it did in 1861. The private bridge was made free temporarily in an attempt to ruin the business of the county toll bridge, but the competition ended in December, 1861, when the private bridge washed away in a flood. The county bridge became free in 1871, its cost having been liquidated in 10 years.

The first notable free bridges were built in 1862 at Nevada City (Deer Creek) and West Point (Mokelumne River). Dissatisfaction with jerry-built structures, monopolistic tolls and unreasonable profits induced a trend toward public enterprise that was nearly universal at the end of the Pioneer Era. As an example, Sonoma County had 629 bridges by 1877, and almost all important crossings on the main wagon roads had free bridges of some kind.

The Railroad Era

With the completion of main line tracks connecting with coast ports and inland waterways in 1876, railroads began to control many features of California's economic and political development. Location of their lines was followed by growth of communities and, as a corollary, towns could not prosper without rail connections. They had become great bridge builders; now they transported foreign bridge materials to new locations. Iron from the east, and later steel, was available in the State and throughout the State.

The first railroad bridges were cheaply built because railroad builders were racing to extend their lines as far and fast as possible. Later these early bridges were reinforced and replaced with more durable structures to carry heavier locomotives at higher speeds.

Small bridges were built in great numbers on the feeder wagon roads leading to railheads. Roads parallel to the railroads developed more slowly because long wagon hauls could not compete with shipments by rail. The reclamation of valley lands by irrigation called for many small bridges, because the canals carried water for much longer periods than the ephemeral streams which were characteristic of the region.

Iron and Steel Bridges

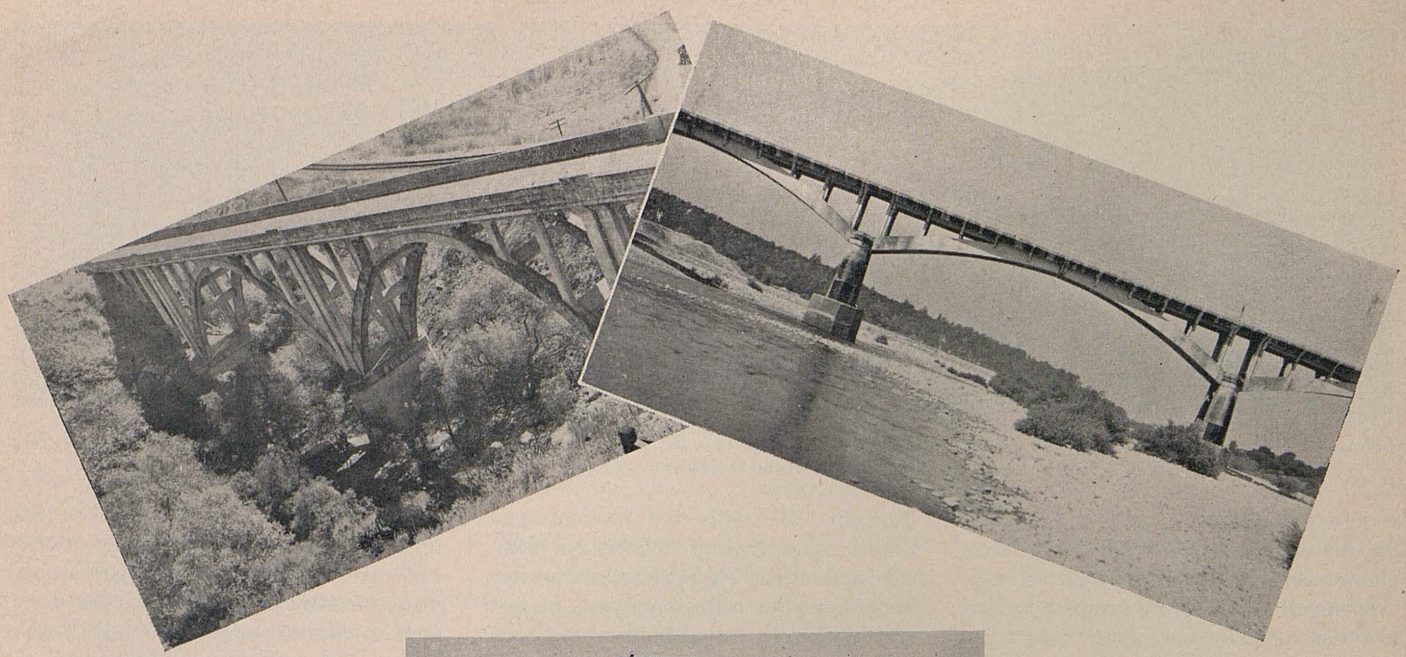
Types of bridges built in the Railroad Era followed more closely the development of the art in other regions. Railroads favored iron and steel for large bridges and timber trestles of standard design for small or low bridges. Road bridges showed preferences of local authorities—timber in one county, stone masonry in the next. Trusses used steel instead of timber, first in tension members and later in all members. Larger and larger concrete structures were being designed at the end of the era. *Plate II* illustrates the trend for the larger highway bridges.

One of the more dramatic sequences of bridges occurred on the Colorado River below Needles. The 35th parallel transcontinental railroad was completed August 13, 1883, when Southern Pacific bridged the river to connect with the Atlantic and Pacific railroad on the Arizona shore. This hastily-built pile trestle was destroyed by flood on May 4, 1884, and replaced by A. & P. with a long series of 80-foot strain-beam trusses on pile foundations. Six years later in the flood of May 9, 1890, this second bridge was destroyed, but its loss had been anticipated and Santa Fe's famous Red Rock Cantilever Bridge was practically ready at Topock, nine miles downstream. Its 660-foot main span made it the longest cantilever in the Americas, but heavier locomotives forced the railroad to build a central pier in 1911 to cut the main span in two.

Recently Santa Fe built a new bridge nearby and gave the Red Rock Bridge to the States of Arizona and California for a highway bridge on U. S. 66, and the states in turn sold its Old Trails Arch Bridge to the Pacific Gas and Electric Company for its interstate gas transmission line. An illustration shows the three Topock bridges (page 124).

First Steel Movable Bridge

The first steel movable bridge was the swing bridge built by Southern Pacific across the estuary from Oakland to Alameda at Webster Street in 1881. Originally it was swung by hand, but power mechanism was added later. Heavy locomotives made it obsolete, so it became a highway bridge and in 1898 was moved to its present site over San Leandro Bay connecting Alameda and Bay Farm Island. In spite of two partial collapses, it is still in service but will be dismantled as soon as a new structure can be built. Its 209-foot swing truss was notable in its day, it being one of the first to use steel instead of wrought iron.



UPPER LEFT — Cast-in-place reinforced-concrete open-spandrel arches (2 @ 109 ft.) over Arroyo Quemada; built in 1917. UPPER RIGHT—Precast (Thomas) reinforced-concrete open-spandrel arches (4 @ 146 ft.) over Yuba River at Parks Bar; built in 1913

Steel-and-timber combination trusses (200-ft. main span) over Santa Ynez River east of Lompoc; built in 1900

LOWER LEFT—Trussed (canticrete) concrete closed-spandrel arches (7 @ 60 ft.) over Pajaro River at Watsonville; built in 1915. LOWER RIGHT—Steel Pratt trusses (5 @ 140 ft.) over San Benito River at Hollister; built in 1912

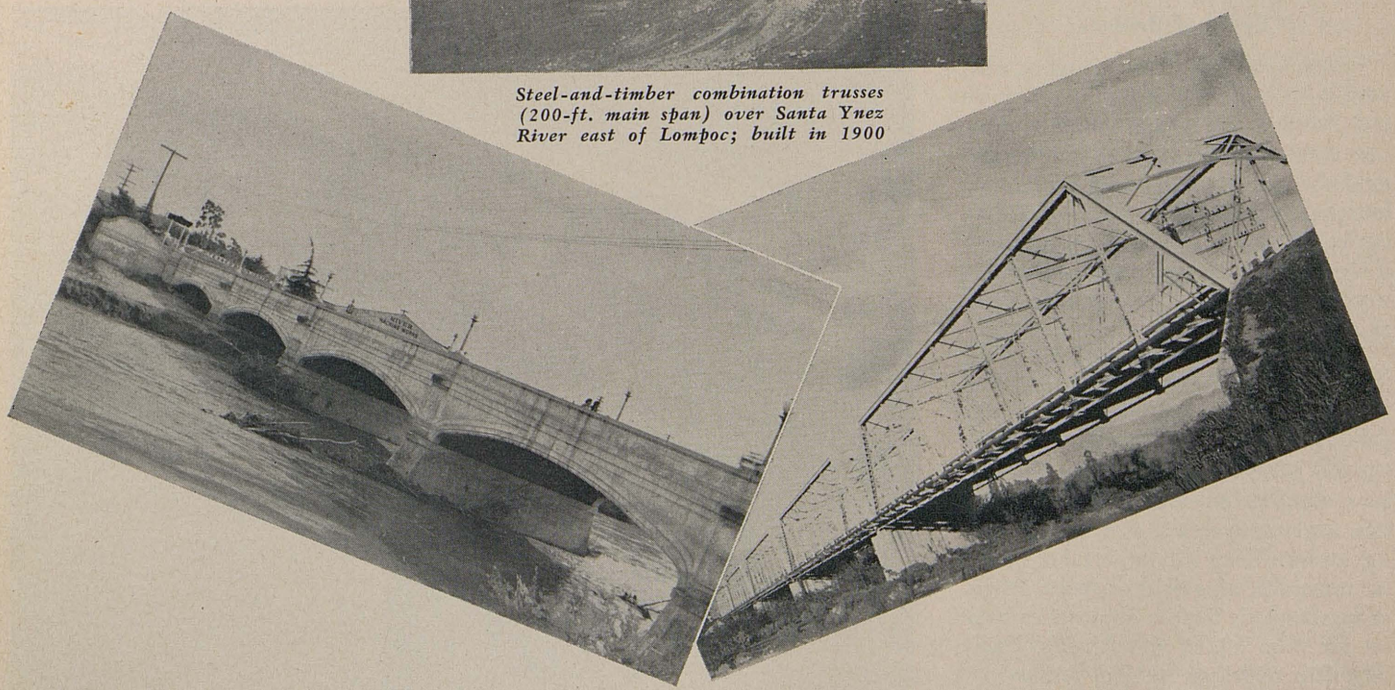
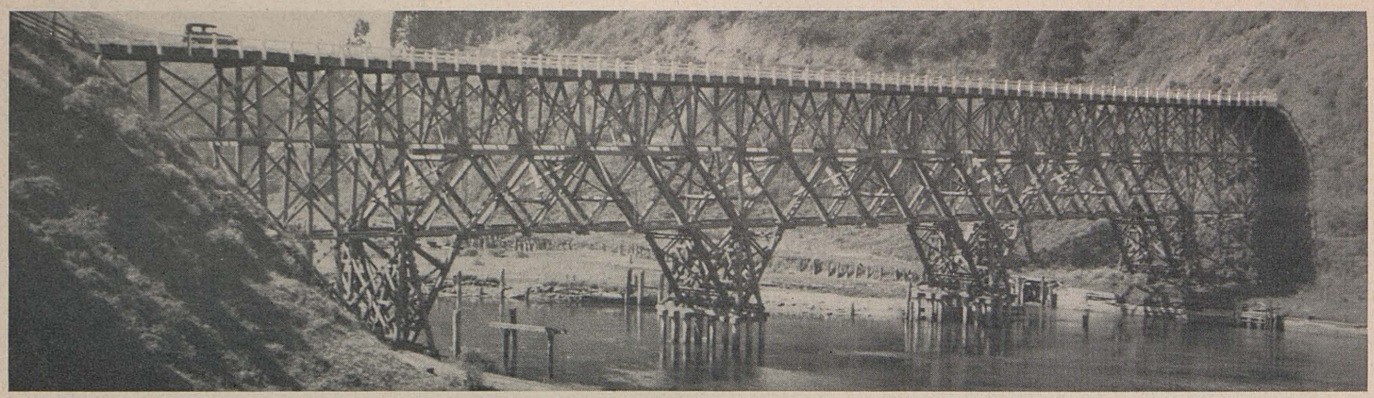


PLATE II
Typical Bridges Built in 1900-1917



Albion River Bridge, built in 1922 and replaced recently, was a three-span timber six-panel Howe truss supporting a trestled deck, but extra bracing has reduced trusses to four panels

Practically all of the steel bridges built in this era on wagon roads and county highways were designed by or for engineering and contracting firms on a competitive basis. Name plates decorating end posts can still be found to prove the activities of the following: American Bridge Company, Berlin Iron Bridge Company, Canton Bridge Company, Clinton Bridge Company, Kansas City Bridge Company, Milwaukee Bridge and Iron Company, Phoenix Bridge Company, Phoenix Iron Company, San Francisco Bridge Company, Toledo Bridge Company, Western Bridge Construction Company, and Youngstown Bridge Company.

Types of Bridges

Specifications for these bridges varied with the competition. If a lump sum price was the basis of comparison, the structure would be very light in weight, particularly as to the bracing, and such bridges today are still known as howlers, rattlers or squealers. On the other hand, if the basis was the price per ton, bridges were much more substantial; if skimped at all, it would be in the connections.

Designs followed the standards of the bridge companies with little variation. Short spans up to 60 feet were usually pony trusses. Longer spans were through trusses, narrow and low at portal clearance compared to modern standards. Design loads were so low that those still in service have been strengthened or posted for restriction of weight or speed. Alignment standards for the approaches were set for team traffic, which could easily negotiate curves of 100-foot radius.

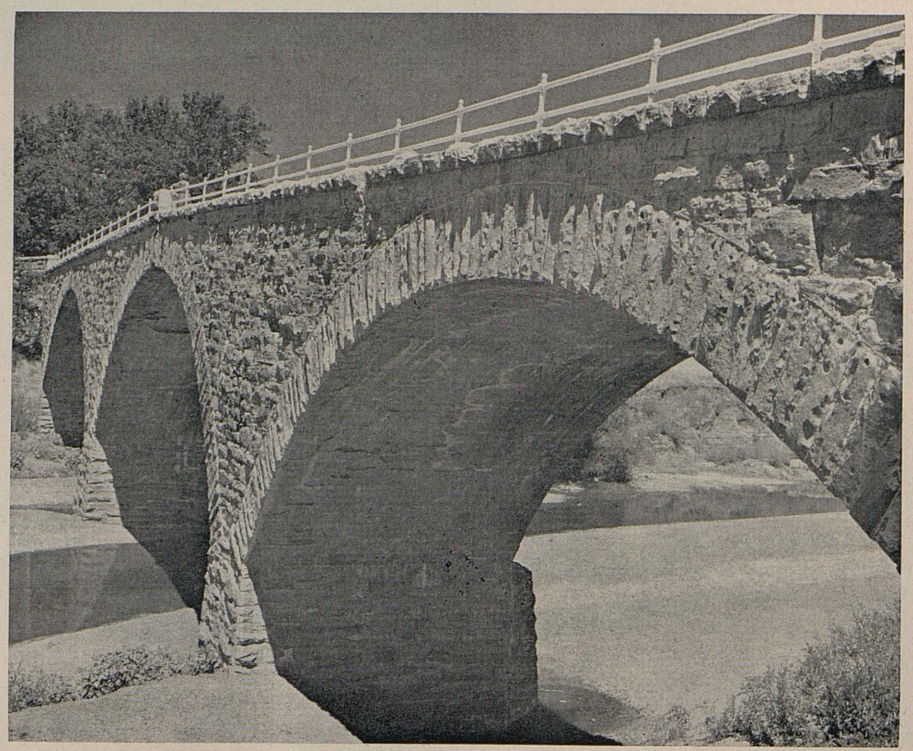
The Hollister Bridge (*Plate II*) over San Benito River is a typical example. Built in 1912 with five 140-foot steel Pratt trusses, the impaired vertical clearance and narrow roadway are responsible for one serious collision a year, on the average. Many truss members have been straightened or replaced.

Stone Masonry Structures

Stone masonry arch bridges were economical for short spans where foundation was good and field stone at hand. Labor for gathering stone was cheap and stone masonry was an ordinary skill. The results were solid and substantial so that many are still in service carrying modern loads without restriction. Napa County made particularly good use of the stone arch, as witness the picture of the Putah Creek Bridge of three 70-foot spans on Sign Route 28 near Monticello, built of cut native sandstone in 1896. Its only threat is the proposal to build Monticello Dam, which would inundate the bridge to a depth of 150 feet.

Portland cement concrete, which had been used for mortar in foundations, took

Monticello Bridge over Putah Creek, built in 1896, has three 70-foot arch spans of local sandstone. It would be inundated if Monticello Dam is built

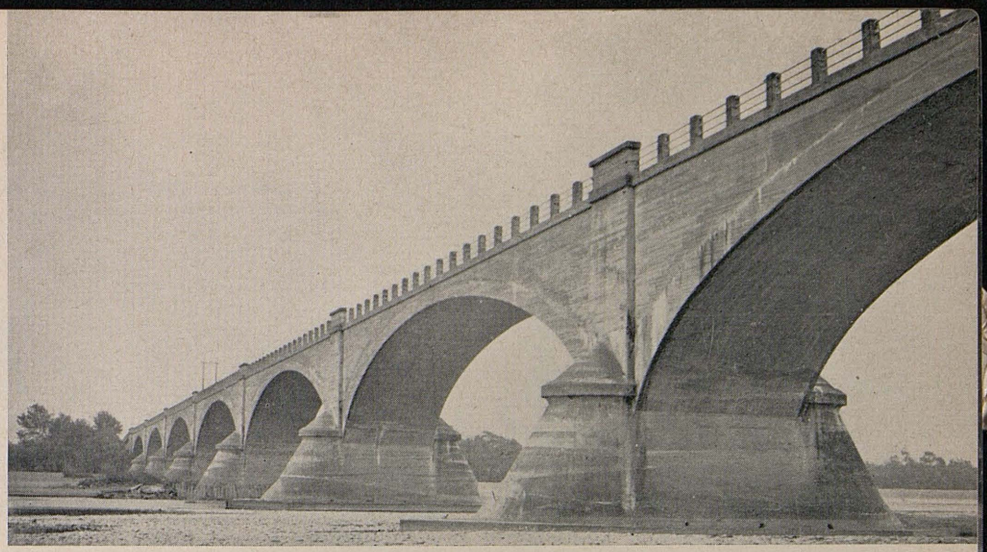


the place of stone masonry in regions devoid of good building stone. At first the use was restricted to plain concrete arches, beginning about 1895. Lengths were gradually increased as reinforcement was added and confidence was gained in design. Small slab and T-beam bridges were being built in 1905, notably the Alford Lake Bridge in Golden Gate Park with its 20-foot soffit decorated with artificial stalactites.

Monumental Structure

Leonard's bridge over Eel River at Singley's Bend (now Fernbridge) was (and still is) a monumental structure that gave a tremendous impetus to the use of reinforced concrete. Built in 1911, its seven 200-foot filled spandrel arch spans (*See illustration*) are still the longest of that type in the State. Thrusts are balanced over deep pile foundations in a shifting sandy bed subject to deep scour. Its heavy cut-waters have withstood ramming by the heaviest drift logs found anywhere. Except for width of roadway and profile of approaches, which were generous in 1911, the bridge is fully adequate today.

No doubt this bridge was the precedent needed for construction of Pasadena's Colorado Street Bridge over the Arroyo Seco in 1913 and San Diego's Cabrillo Bridge in 1914, both of which are show places in proud communities.



Fern Bridge over Eel River, with its seven 200-foot filled-spandrel concrete arches, was the longest of its type in the west when built in 1911

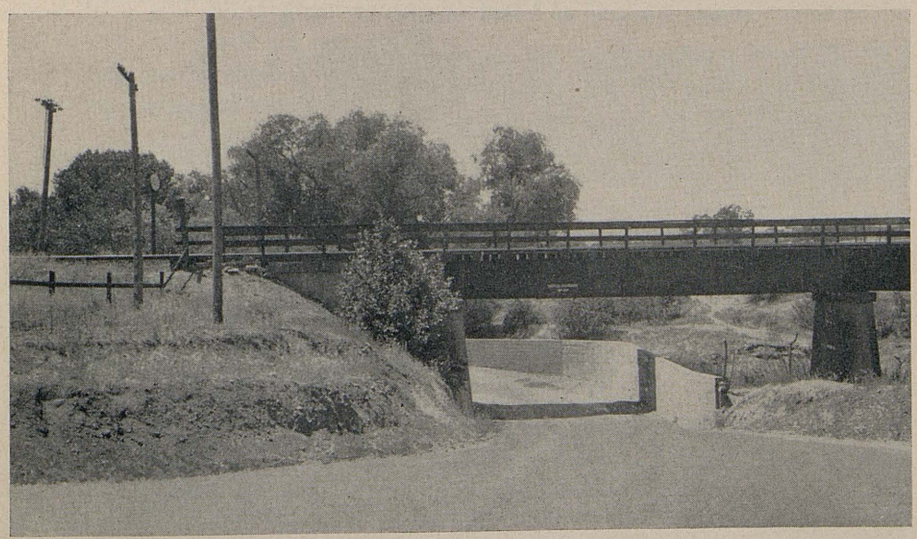
The Cabrillo Freeway on U. S. 395 passes under the Cabrillo Bridge. The proposed Colorado Street Freeway will cross on a new arch bridge beside the old, using it as a connecting link for local traffic.

Concrete Design

Concrete design became a specialty for a few engineers, two of whom patented outstanding types. One was the Thomas Arch by William M. Thomas, who conceived the idea of precasting arch ribs and spandrel columns on the ground and hoisting them into position. *Plate II* shows a fine example of four 146-foot spans erected over Yuba River at Parks Bar in 1913. The site is of interest because mining debris raised the bed of the river 81 feet (elevation 146 to 227) in the 52 years, 1848-1900, and gradual restoration by natural processes of erosion has lowered the bed 24 feet, exposing the foundations under the piers and revealing foundations of an earlier bridge which had been destroyed by the flood of gravel.

The other was the Canticrete patent of Leonard & Day, for which a steel cantilever truss was erected over the piers to support formwork and reinforce the concrete which was cast around it in a shape resembling an arch. A typical example is the Main Street Bridge over Pajaro River at Watsonville (*Plate II*) built in 1915. Although the superstructure was in good condition after 35 years service, it is being replaced with a wider deck at higher clearance over the river.

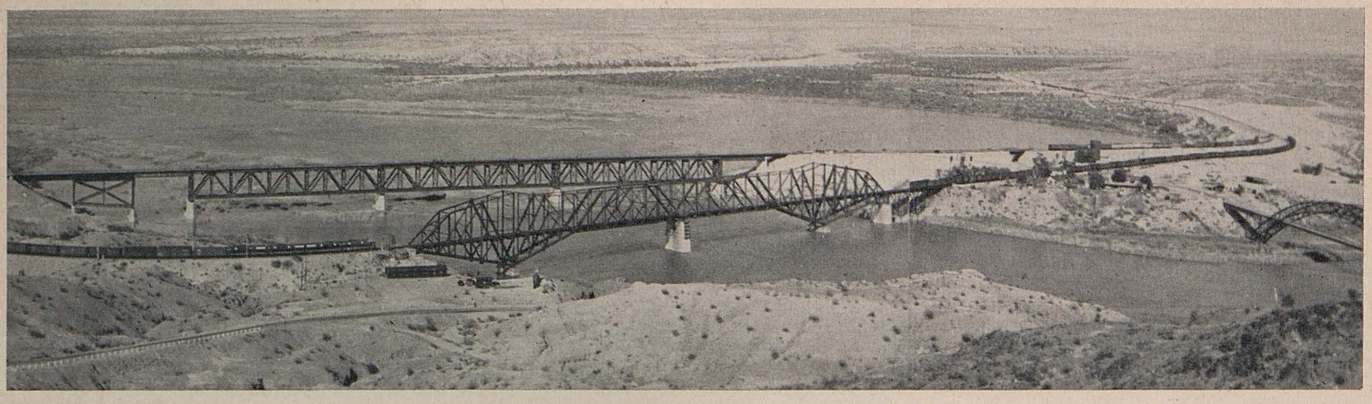
Atascadero Underpass, one of the oldest grade separations; the narrow crooked highway, passing under a bridge built by Southern Pacific in 1902, is protected from flooding by a concrete wall



The Railroad Era ended with the completion of the last long-haul lines—the Western Pacific, the San Diego and Arizona and the Northwestern Pacific in 1915. It included a brief development of electric interurbans, such as Pacific Electric and Sacramento Northern. The outstanding bridge novelty of this late railroad building was Northern Electric's pontoon bridge over Sacramento River at Hamilton City, built in 1908, but this may not have been real progress.

The Highway Era

For highways, the passage of the $18,000,000 bonds for a state system in 1910 marked the beginning of a new era. At first, bridge construction had been



Red Rock Bridge (center) over Colorado River near Needles, once the longest cantilever in America, became a 4-span continuous bridge with addition of central pier. When Santa Fe Railroad shifted to new bridge (left), U. S. 66 was relocated via Red Rock Bridge, leaving the Old Trails Arch (right) for the Texas-California gas transmission line

left to the counties so that many short sections of highway were excluded until old bridges were replaced or new ones built. A change in policy started in 1915 when the State began to participate in the cost of major bridges.

Other factors contributed, of course. The automobile became an economic competitor of the horse in 1915 when Fords were sold for less than $500 and gasoline for less than 10 cents per gallon. The expositions that year in San Francisco and San Diego attracted more than a million people, many of whom stayed here, increasing the demand for land. Panama Canal was completed, reducing freight rates on eastern steel and cement.

The Highway Era was (and still is) characterized by a progressive raising of standards of design for high speed, heavier loads, multiple lane, long life and safety. For example, at the beginning of the era, it was considered good economic practice to select bridge sites at narrows of streams where the structure would be shorter and foundations better, because bridges cost 10 times as much as paved approaches. Gradually the practice has changed, first to avoid dangerous curves at bridge heads and later to shorten highway distances, until now the bridge is built where highway alignment happens to intersect a stream line. This trend was not caused by a change of relative cost of bridge and pavement, but by an increasing value to traffic of shorter distances, straight alignment and safe operation. As a result the skew bridge is now the rule instead of a rare exception, and this rule has had a great influence on the development of certain types of structures, such as the box girder and the single-column bent.

High Loads on Through Bridges

As another important example, long bridges of the Pioneer and Railroad Eras were through bridges which have lateral and portal bracing over the deck. Often this bracing was so low that high loads were prevented from using the bridge. In the case of slow-moving wagons the insufficient clearance would be evident before damage was done, but high loads on trucks frequently collided with and damaged the bracing. Similarly wide overhanging loads collided with web members of the truss. *Plate IV* illustrates the modern trend toward deck bridges which do not impair overhead or lateral clearances.

During the era, public enterprise in road and bridge construction, which had largely supplanted private enterprise, tended toward higher levels of government. The State began to build the long-haul roads, the primary system connecting county seats and heavy-construction routes into undeveloped regions. This interest was extended to feeder roads and laterals in the counties and to selected arteries in the cities. Federal Aid was extended to the states and through the states to counties and cities, first because of nontaxpaying public lands and later because of interstate routes and hazard at grade crossings. This trend generated higher standards and more uniformity in design of bridges.

Long Span Structures

The era was started with state participation in four unprecedented bridges. The Old Trails Arch over Colorado River (*see illustration*) was a slender three-hinged steel arch spanning 592 feet, the longest of its kind at the time. California, Arizona and the United States each contributed one-third of its cost. The Yolo Causeway, 3.13 miles long, boasted of the longest (14,106 feet) highway concrete trestle in the world, and was the first major bridge designed and built by the State. The Pit River Bridge, now submerged in Shasta Lake, was built jointly by State and county; its 242-foot concrete arch was the longest concrete span for many years. The South Scotia Bridge over Eel River with its two 302-foot trusses was also a State-county project. All four were completed in 1916.

Back Log of Projects

The slackening of construction on the West Coast during World War I created a back log of projects for the succeeding years. Checking of county plans for bridges on the State Highway System became so important that a Bridge Department was created July 1, 1919. The grade separation program which started in 1921 added a new field for design. In 1924 the department was expanded to take charge of bridge construction as well

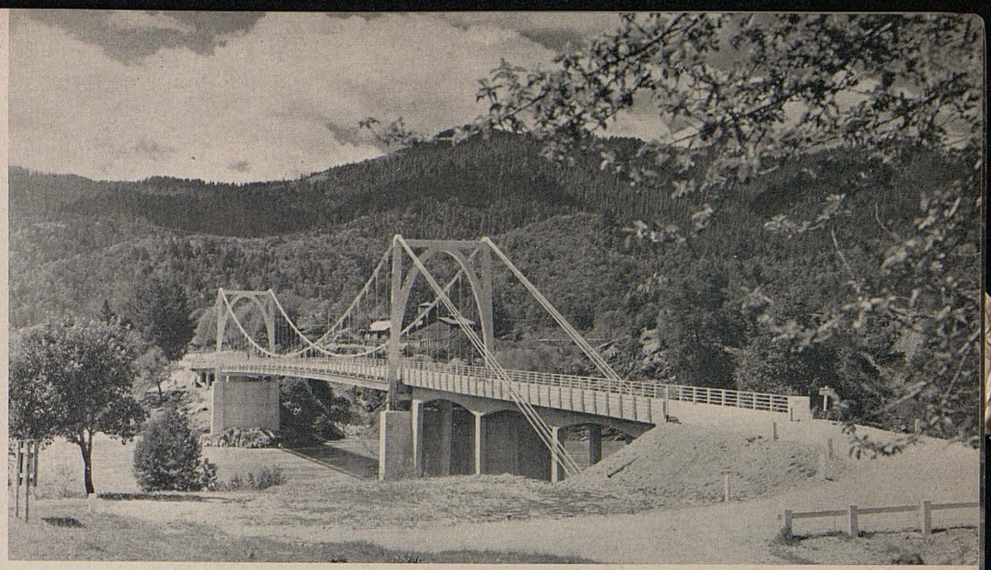
as design and the counties were practically relieved of their former obligation to provide bridges on state highways. Bridge building was a $1,000,000 business which grew to $2,000,000 in 1930, $4,000,000 in 1940 and $18,000,000 in 1950.

Improvement of timber bridges is remarkable in some ways. Even the simple log bridge grew to 85-foot spans over Trinity River (*see photo*). Timber trestles were standardized and used by the hundreds on desert routes, facilitating the rapid expansion of such routes and spreading the cost of maintenance and ultimate replacement by permanent types over a long period. Multistory timber trestles made good use of local materials in the Northwest. At Albion River in 1922, timber Howe trusses were set high on multistory bents (*see photo*) in spectacular and somewhat precarious fashion. During World War II, timber was used as an emergency material when steel was in short supply, but in a surprising upset at the end of the war the demand of housing for timber made it too expensive for bridges.

Short Timber Trusses

Los Angeles and Orange Counties used hundreds of short timber trusses of a characteristic type, singly or in series on trestle bents. Several of the Santa Ana River bridges are of this type and although mortality was high in the 1938 flood, the bridge at Atwood with 25 spans of 40-foot A-frames is still in service. Others had Howe pony trusses up to 54-foot spans.

Timber bridges have also proved more vulnerable to fire with the coming of motor vehicles. Twenty bridges have been totally destroyed by fire in the last decade, mostly after collisions in which the vehicle burned first. Originally water barrels were maintained on all timber bridges, but the cost of keeping them full of water exceeded the cost of replacing an occasional victim. The risk is another reason for the passing of the timber bridge.



Suspension bridge of 360-foot span built in 1940 across Klamath River at Orleans. Awarded American Institute of Steel Construction Prize as most beautiful of its class

Steel Warren deck trusses (3 @ 265 feet) over San Luis Rey River at Oceanside on XI-SD-2-C; built in 1929

Carquinez Bridge

Steel bridges, on the other hand, have advanced with the times. The trend to deck types has already been mentioned. Another conspicuous example is the Oceanside Bridge over San Luis Rey River (*see photo*) built in 1929 on a high grade so as to provide waterway clearance under the deep Warren trusses of 265-foot span. It is the fourth bridge at the site, having been preceded by low pile trestles before and after the Thomas Arch bridge which was destroyed by the 1916 flood. It will soon be widened or replaced as a part of the Oceanside Freeway.

The Carquinez Bridge completed in 1927 by the American Toll Bridge Company and purchased by the State in 1940 is noteworthy for its two 1,100-foot cantilever spans high above Carquinez Strait (*see photo*). It was the most ambitious bridge undertaking of private enterprise. It liquidated its cost and became a free bridge in 1945. Other private toll bridges of this late period were the Antioch Bridge over San Joaquin River and the Ehrenberg Bridge over Colorado River (both of steel and free now) and the San Mateo-Hayward and Dumbarton Bridges over San Francisco Bay (still privately operated).

The Southern Pacific crossed the same water gap at low grade over its Martinez-Benicia Bridge in 1930, replacing a car ferry. This structure is 5,603 feet long, including seven 526-foot steel trusses

Carquinez Bridge, a cantilever with two 1,100-foot main spans, was built in 1923-27 by the American Toll Bridge Company. Traffic has reached 33,993 vehicles in 16 hours

(the longest in the State) and a 328-foot vertical lift span.

Cantilever Bridges

Cantilever bridges are usually ungainly structures because of the arrangement and proportions of members carrying negative moment over the towers and into the anchor span. Line and proportion can be greatly enhanced by making the cantilever a deck structure, as will be evident in the illustration of the Noyo River Bridge near Fort Bragg.

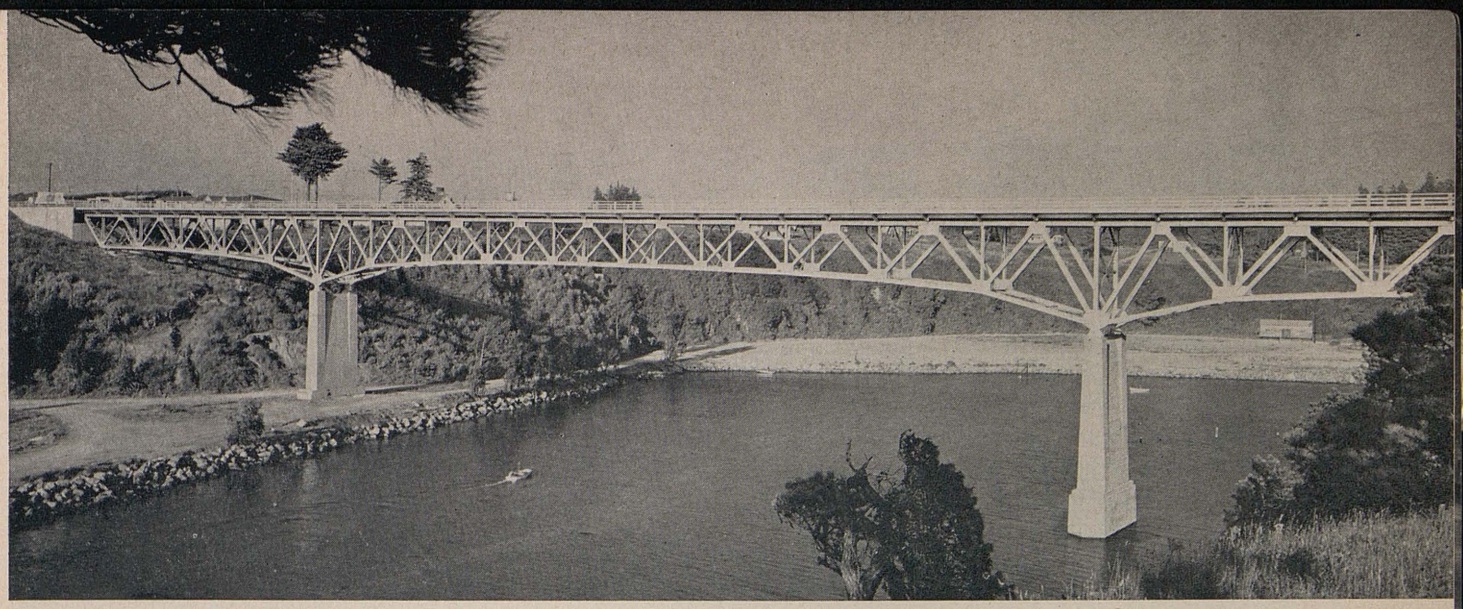
The plate girder, so widely used by railroads in deck and half-through bridges of single or multiple span, is still a popular type. Multiple girders are usually made continuous, or are hinged in the spans with some cantilever action. Longest plate-girder span is 200 feet in the Figueroa Overhead in Los Angeles. *Plate IV* shows a recent four-span continuous design for Nojoqui Creek.

Steel continues to be the best material for movable bridges because of the high ratio of its strength to its weight. Other materials with higher ratios are much more expensive. There are nearly 100 such bridges over navigable waters in the State, of which several have been mentioned already. The I Street Bridge carrying railroad and highway on separate decks over Sacramento River is noteworthy for the 390-foot swing span. The longest double bascule bridges are the six over Sacramento River and Steamboat Slough between Freeport and Rio Vista, each spanning 226 feet. Petaluma has a single-leaf bascule spanning 148 feet. Handsome is the Tower Bridge over the Sacramento River, like a gateway to the Capitol Mall; it won honorable mention in the prize awards for 1935. The new Mossdale Bridge over San Joaquin River (*Plate IV*) has an unusual counterweight for its bascule span; built with heavy magnetite aggregate to reduce its bulk, its shape conforms to the curve of the trunnion and the Warren frame of the leaf.

Suspension Bridges

Suspension bridges, of course, have been built to monumental proportions. The San Francisco-Oakland Bay Bridge, completed by the State in 1936, has so many noteworthy points that it will be covered in a separate article. To name a few, it established new depths for caisson foundations (240 feet below MLLW), uses a massive center anchorage to balance differences in its two serial suspension bridges, is a continuous bridge through a tunnel, has as a part of the East Bay Crossing the longest (1,400 feet) cantilever in the United States, set a record for cost ($77,000,000), and has carried 95,000 vehicles in one day. Financed by revenue bonds, its cost will be liquidated in 1952 by tolls which are now less than 5 cents per mile of structure. The Golden Gate Bridge, completed a year later at half the cost, boasts a 4,200-foot span, the longest in the world. It was also financed by revenue bonds, in this case sponsored by local governments organized as a bridge and highway district.

Short suspension bridges are still economical in primitive areas. An out-



Steel deck cantilever (405-foot span) over Noyo River near Fort Bragg; built in 1948

standing example of modern design is the prize-winning Orleans Bridge over the Klamath River (*see photo*) spanning only 360 feet. The elliptical portals under the saddle towers combine beauty with strength and high clearance.

Concrete Bridges

Concrete bridges have been left to the last because of the many new applications of this material in the Highway Era. At the beginning, concrete was used only in very small structures or in arches, the latter designed to make optimum use of concrete in compression. Design has continued to use only the compressive value of concrete, but ingenuity has developed frames other than the arch which minimize tensile stresses, and deck sections which use only a small amount of concrete around steel members in tension. A few of the devices are the T-beam, the rigid frame, the continuous girder, the short end cantilever and prestressing. Other important factors were the control of concrete materials to assure specified strengths, the use of light-weight aggregates, air entrainment and admixtures, advances in cement technology, research into interaction of concrete and steel, availability of local cements and development of new techniques in stress computation.

Of the concrete arches, the first large project of the State was the Douglas Memorial Bridge over the Klamath River, with five 210-foot spans completed in 1926. In 1932 the record-breaking 330-foot Bixby Creek Arch, said to be the highest concrete arch in the world, was built on the Monterey Coast Road. One of the handsomest (*Plate IV*) is the 240-foot arch over Russian Gulch, in which the open spandrels are varied in length, the highest spandrel columns being the farthest apart. Others are shown and described in *Plate III*.

Concrete Girder Bridges

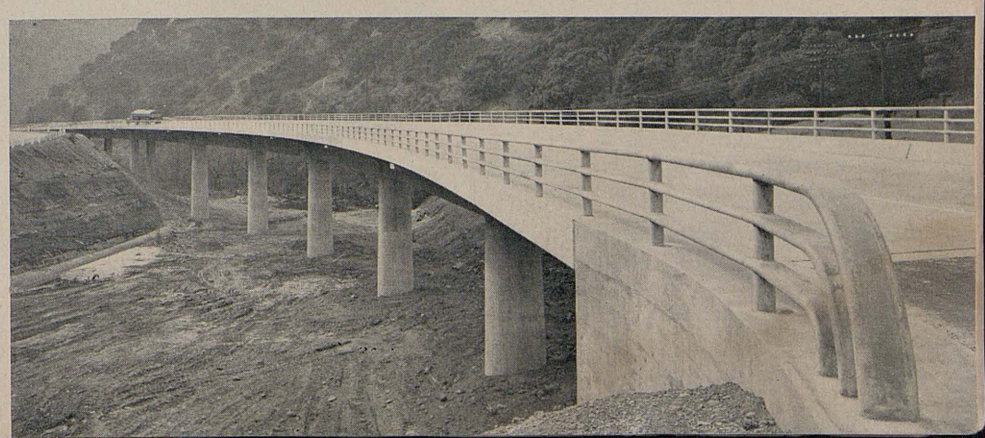
Concrete girder bridges developed to large proportions early in the period, spans of 20 to 60 feet being quite common. In fact the longest spans of this type were built in 1919 when Salt River was bridged at Port Kenyon by two half-through 142-foot spans supported by two I-shaped concrete girders 12 feet deep. In the shorter examples, the girders act with the slab like parallel T-beams. When clearance is limited, girder soffits are raised and widened. The limit of this modification is the slab bridge, which simplifies formwork, is economical for spans up to 40 feet and has been used for a 64-foot span in Fresno (California Avenue).

Economy of either girder or slab is increased by providing negative moment over the supports so as to reduce positive moment at midspan. Continuous girders are widely used in this way. For single spans and end spans of multiples, the provision is made by adding a short end cantilever or fixing the span to the abutment wall, the latter forming rigid frames. In one instance, the Santa Paula Creek Bridge on Route 126, the main span of 120 feet is balanced by 17-foot end cantilevers held down by counterweights, producing a slender slab-girder design to fit a difficult combination of low highway grade and high flood plane.

Box Girder Bridges

The modern development is the box girder, in which the tension steel is not closely confined in the bottoms of girders but spread in a lower slab, and shear is carried in vertical web walls like parti-

Reinforced concrete curved box-girder spans (6 @ 81½ feet) on cylindrical single-column bents over Alameda Creek on IV-Ala-107-A; built in 1947



tions, enclosing cellular spaces between the two slabs. The type is particularly adaptable to curved alignment, so that it is widely used in freeway structures. Its adaptability is shown in the picture of the recent (1947) bridge over Alameda Creek and the Western Pacific Railroad. Ten years ago such an oblique crossing would have been designed with skewed piers and diamond-shaped spans, but the single-column bents and box girders were easily fitted to the geometric pattern with little obstruction to the channel. The longest box girder span built so far is the 136-foot span just completed on Hollywood Parkway over Figueroa Street, but another under construction at Heliotrope will have a 143-foot span so that the economic limit of this type has not been reached yet.

Serious consideration is being given to precasting and prestressing of concrete slabs and girders. Precasting has been tried experimentally and prestressing is having its first trial now. This technique is being used on a bridge over Arroyo Seco in Los Angeles, the first such experiment in the West.

Situation Today

With all this bridge construction in the past century, producing perhaps 50,000 bridges of which 30,000 are standing, there is still a great demand for more bridges. The State's program foresees expenditure of over $100,000,000 in the next four years. The Bay region is asking for several more great bridges, each of which would cost more than this amount. There are still fords and ferries on the state system, besides the many dips over dry washes that occasionally interrupt traffic. As traffic increases there will be demands for many new bridges for such crossings.

Recalling that bridges in service on major highways have been built over a period of 70 years, it will be obvious that there is a wide variation of load capacity. Many old ones have been strengthened, but many are still posted for restricted loads or speeds. New ones are built for a safe margin over a standard of strength. Nevertheless, and this would be true for

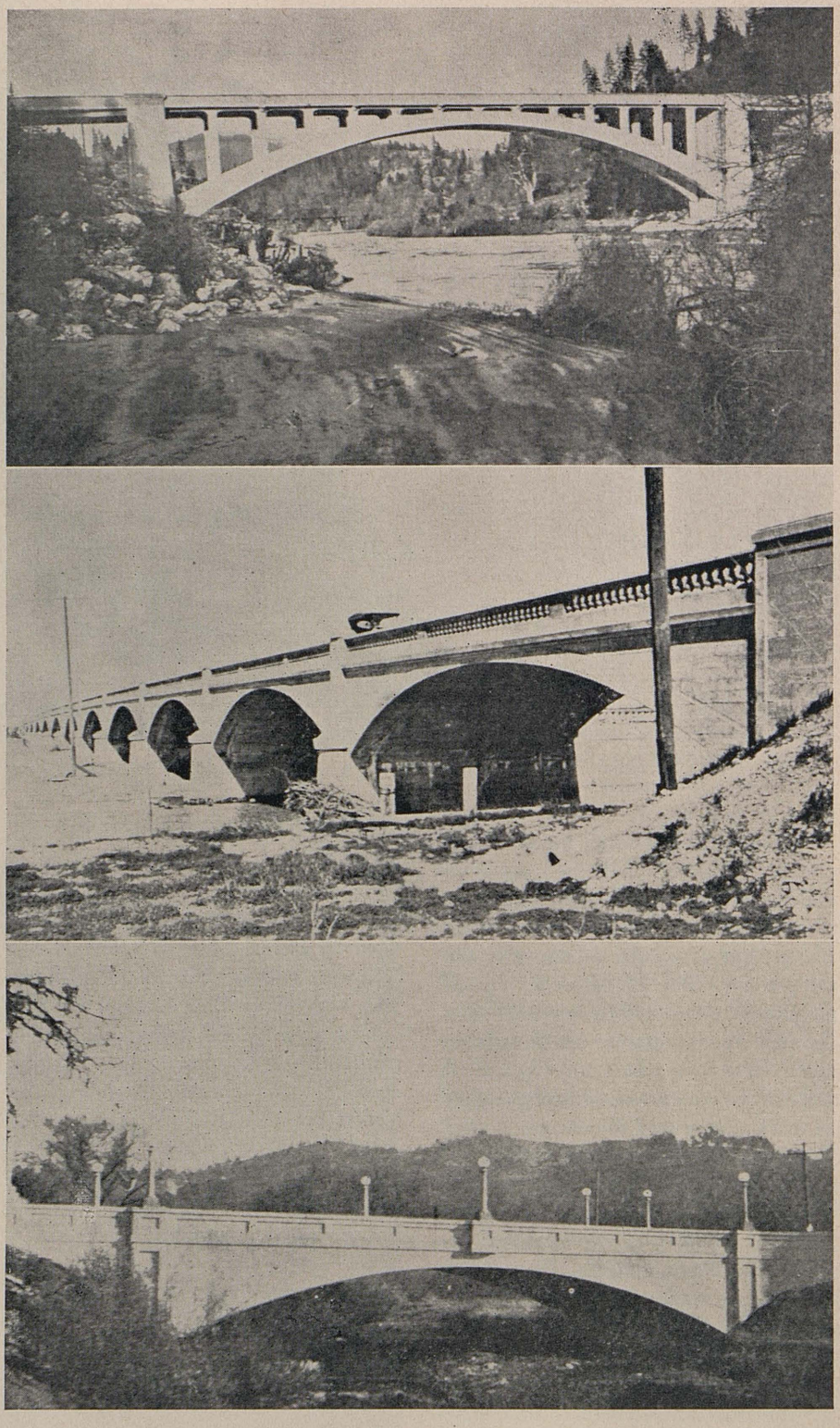
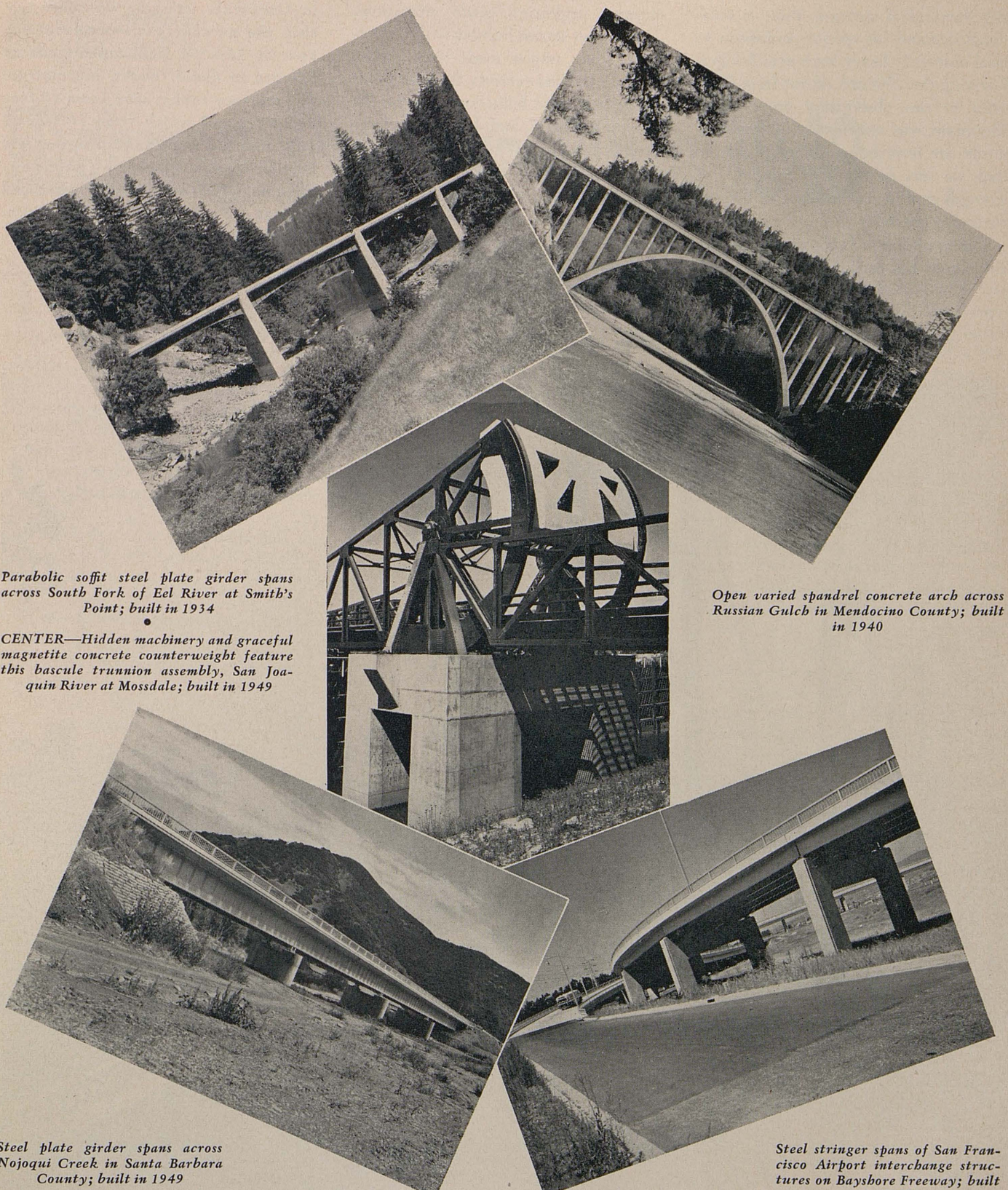


PLATE III
Early Concrete Bridges

UPPER—Pit River Arch was longest concrete span (242 feet) in California when built in 1916; it is now submerged deep in Shasta Lake. CENTER—Stony Creek Bridge is 1,187 feet long and consists of 13 filled-spandrel arches. LOWER—Atascadero Creek Bridge, an 80-foot concrete arch built by San Luis Obispo County



Parabolic soffit steel plate girder spans across South Fork of Eel River at Smith's Point; built in 1934

•

CENTER—Hidden machinery and graceful magnetite concrete counterweight feature this bascule trunnion assembly, San Joaquin River at Mossdale; built in 1949

Open varied spandrel concrete arch across Russian Gulch in Mendocino County; built in 1940

Steel plate girder spans across Nojoqui Creek in Santa Barbara County; built in 1949

Steel stringer spans of San Francisco Airport interchange structures on Bayshore Freeway; built in 1947

PLATE IV
Modern Bridges

any standard of strength, there is occasional demand for special permission to haul unusually heavy loads over bridges. Carrying the 200-inch mirror from Pasadena to the observatory on Palomar Mountain was one instance. Lesser requests are received nearly every day, so that we can foresee that standards of strength may have to be raised still higher than they are today.

Contrasting new bridges with the old, this report has exemplified bridges over streams, neglecting grade separations. These latter started humbly without publicity when wagon roads were located through railroad culverts. Railroad grade separations were built especially for the purpose in 1917 and highway separations as early as 1911 (Mission Street in San Francisco). Today such bridges are "big business," largely because of freeways, so that 72 percent of our current budget is for grade-separation structures.

Summarizing a century of progress in California bridges, we could say that the number has increased from two to 30,000; load capacity from ox-cart to diesel trucks, locomotives and military tanks; span from 20 feet to 4,200; and width from 10 feet to 100. But the important progress has been in the development by public enterprise of free bridges wherever bridges are needed. When man wants to cross, no river's too wide or deep, no price too high or steep.

View of San Francisco-Oakland Bay Bridge looking westerly across the structure showing the City of San Francisco in the background

Chapter XVI

Highway Progress Since 1943

By Richard H. Wilson, *Assistant State Highway Engineer*

There are approximately 14,000 miles of state highways in California serving an estimated 10,875,000 people and 4,580,000 motor vehicles. The economic and social welfare of the State and the defense of the Nation are particularly dependent upon these traffic arteries. It is the function of the Division of Highways to construct and maintain the State Highway System to the highest degree possible with available funds.

In 1943 the Nation was embroiled in World War II. All normal peacetime activities had been set aside for the necessity of all-out war effort. Concurrently with this transition in national life, the activities of the California Division of Highways had undergone drastic and rapid changes.

For many years prior to the war, improvement to the California State Highway System had been on a definite program of development aimed at providing adequate facilities for motor vehicle transportation of the entire State and highway budgets had been prepared on that basis.

War Program

Beginning in 1941, as the possibility of the United States entering the war became more and more imminent and the national defense program rolled into action, construction costs began to rise rapidly. Shortage of rubber, speed limitations and rationing of gasoline resulted in material reduction of state highway revenues. Budgetary set-ups based upon prewar estimates became obsolete and their continual revision became the order of the day.

Working in conjunction with the Public Roads Administration the Army, Navy, and Marine Corps, the Division of Highways had prepared a comprehensive program of projects for construction of roads serving as access to military and naval establishments in California and to industrial plants engaged in production of material and equipment needed for prosecution of the war. Of the $290,000,000 appropriated by Congress for such access road construction throughout the Nation, California was originally allotted approximately $35,200,000. With its depleted engineering personnel the Division of Highways prepared plans for and supervised construction of 209 contracts costing $38,443,000.

Highway Work Curtailed

During the war period federal restrictions on materials and equipment further curtailed highway activities to the extent that construction was practically at a standstill. Maintenance operations were limited to the barest essentials. Repair of highway surfaces and bridges, however, became the major activity of the department in an effort to stem to some degree the accelerating deterioration of the State Highway System.

With highway construction and development being blocked by the necessities of the war effort the department set about with such personnel as was available to make surveys and prepare plans and specifications for the work so deferred. Under this procedure a shelf of needed construction projects was built up for the time when such operations could be undertaken at the close of the war.

There was complete agreement between the state administration and the Department of Public Works as to the relation of highways to the economic condition of California.

Importance of Highways

This agreement of opinion included the premise that all direct contribution to the conduct and advancement of the war had not been concentrated in the armed forces and war industries. Transportation was just as important a factor as fighting men, planes and tanks, for without adequate facilities for transport, these instruments of war would have been ineffective in promotion of the national effort. As a corollary to the premise is the self-evident fact that one of the most vital roles in the transportation industry is played by highways, roads, streets and bridges.

Of more importance to the period since the war and to the future was the conviction that the conduct of all operations of the Nation's business, whether in war or peace, is dependent to a large degree upon these same highways, streets and bridges. Particularly in California with its dense motor vehicle traffic and great distances does this dependency upon highways obtain. As a matter of fact, the entire economics of the State is interlaced with the need for adequate highway facilities.

Postwar Planning

At the convening of the 1943 Session of the State Legislature the tide of the war had turned and serious thought was being turned toward the postwar era and to the speeding up of preparations for that period. Recognizing the need for a ready-to-go postwar highway program that session of the Legislature, at the instance of Governor Warren, appropriated the sum of $12,000,000 for surveys, plans, specifications, and the acquisition of right of way for the postwar highway construction program.

At the same session of the Legislature the statutes governing the organization of the State Highway Commission were revised to provide for a commission composed of six members appointed by the Governor for staggered four-year terms

with the Director of Public Works serving as ex officio seventh member and chairman. Formerly commissions were composed of five members appointed by and serving at the pleasure of the Governor.

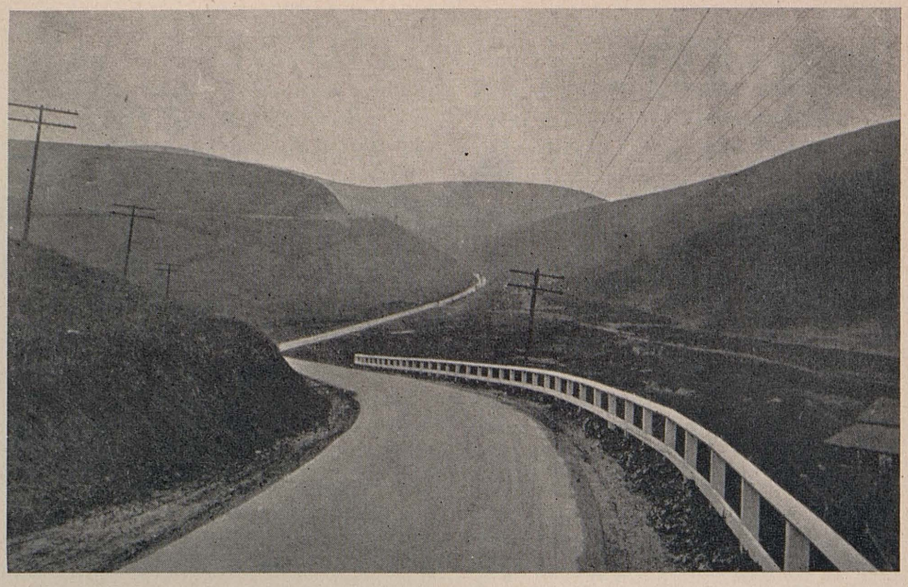
Highway Commission Terms

Under provisions of the new statute the terms of office of the six appointive members expire on January 15th, one in each even-numbered year and two in each odd-numbered year. Under this method there is a certain continuity of policy through possible changes of state administration which should prevent any abrupt shift in policy which might disrupt the long range planning of state highway development. After this law became effective the new commission took office on September 14, 1943.

With the additional $12,000,000 furnished by the 1943 Legislature, work within the Division of Highways was concentrated more and more upon preparation of the postwar construction program.

Postwar Program

On November 18, 1943, the new commission began its consideration of projects proposed by the department for inclusion in the postwar program and on January 20, 1944, such a program was officially adopted and funds budgeted for the preliminary engineering and right of way acquisition for the projects.

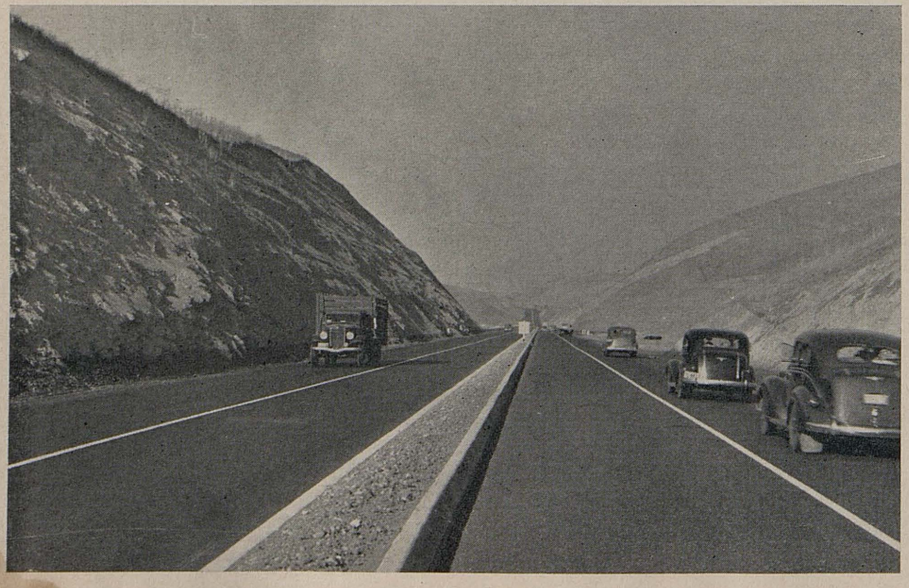


This is the old Altamont Pass on U. S. 50 before it was modernized with gas tax funds

The original program included 145 road and bridge construction projects, the estimated construction cost of which amounted to $80,000,000. It provided for improvement to approximately 600 miles of state highways. A very considerable portion of the program involved urban development with a large number of major structures, there being 181 bridges and 147 grade separations. Of these latter, 25 were railroad grade separations and 122 separated the grades of two or more highways.

Determination of the size of the program was based upon an analysis of available state highway funds, including the $12,000,000 legislative appropriation and all available funds from the then current and previous highway budgets. This analysis indicated that the estimated state highway revenue of four fiscal years would finance a three-year construction program amounting to the $80,000,000 figure. On this basis the projected postwar program was kept within the limits of state highway revenue in sight.

Altamont Pass as it looks today. This entire route in Alameda County is being converted to a four-lane divided highway



Selection of Projects

Selection of projects for the postwar program was influenced by several factors: First, projects where improvements adequate for existing traffic were most urgent; second, priority of projects deferred from previous budgets because of the war; third, correction of critical deficiencies in the physical status of the State Highway System; fourth, projects located in and adjacent to large centers of population where possible postwar unemployment was likely to be most severe; and finally to balance statutory requirements relative to distribution of funds between northern and southern county groups and between primary and secondary state highway routes.

In addition to the $12,000,000 appropriation for preliminary engineering and right of way on state highways, the 1943 Session of the Legislature also appropriated the sum of $1,500,000 for surveys

and preparation of plans for postwar improvement to county roads.

Federal Aid Highway Act

As the war progressed through 1944 the Nation gave more and more thought to preparation for the postwar era. On December 20, 1944, Congress passed the Federal Aid Highway Act of 1944 and California was assured of approximately $67,000,000 in federal funds for the first three postwar years. Of this amount about $27,100,000 was made available for improvements on the Federal Aid Primary System, $15,500,000 for the Federal Aid Secondary Highway System, and $24,400,000 for construction of federal aid urban highways.

The addition of these federal funds and the jump in state revenue which followed the lifting of tire and gasoline rationing called for a revision of the postwar highway program. On September 24, 1945, the California State Highway Commission adopted a construction budget of projects for the first postwar year. On April 18, 1946, and November 21, 1946, similar programs were approved by the commission for the second and third postwar years respectively.

First Three Years

The total value of these programs set up for postwar state highway rehabilitation and improvement amounted to $145,000,000. With available funds it was possible to finance projects amounting to only $95,000,000 for the three years. There still remained, however, in the approved programs badly needed projects amounting to $50,000,000 which were not financed and would have to wait their turn in the future unless additional revenue was provided.

Preparation of state highway projects prior to the postwar period had so progressed during 1944 and 1945 that as soon as federal approval was received for the first year's program in October, 1945, the Division of Highways began advertising for bids and the first bids for postwar construction were opened on November 28, 1945.

This policy adopted at the close of the war of immediately placing under way a large postwar construction program was of definite advantage to the State and the motorist. It provided a degree of early relief to the rising postwar traffic and accomplished a large volume of construction at the lower prices prevailing before the inflation had really taken hold.

There were some difficulties, however, in advancing those projects on proposed freeways in the metropolitan areas of Los Angeles and San Francisco.

Protection of Tenants

During the three years before the end of the war the department had been acquiring right of way for the postwar development. Much of this right of way was covered with buildings of various descriptions—single dwellings, apartment houses, and commercial establishments. As this property was acquired it was rented in most instances to the occupants and the State became a landlord with extensive holdings in densely populated areas. In the meantime the housing shortage became more acute month by month so that when postwar construction could be started the Division of Highways was faced with the problem of either evicting tenants, at a time when it was almost impossible for them to find other quarters, or of deferring portions of needed highway development.

In conformance with instructions of Governor Warren the latter policy was pursued and no tenants were moved out until other suitable accommodations were found. This rehousing of tenants was not an easy task and it required a very considerable portion of the time of right of way agents in the territories affected.

Federal Aid Secondary Highways

In addition to the state highway programs, the Division of Highways has administered both federal and state funds for improvement to the Federal Aid Secondary Highway System. This secondary system consisted of both state highways and county roads established as logical feeder roads to the regular Federal Aid System.

For this phase of highway work, California was apportioned approximately $5,000,000 a year for each of the first three postwar years. As it was considered for the best interests of transportation in California that much of the Federal Aid Secondary Highway funds be expended on county roads, the 1945 Session of the State Legislature passed the County Highway Aid Act, appropriating $12,000,000 for the counties' use in matching the $15,000,000 in federal aid secondary funds. The act stipulated that 87½ percent of the federal aid secondary funds received by this State be expended for improvement to county roads and bridges.

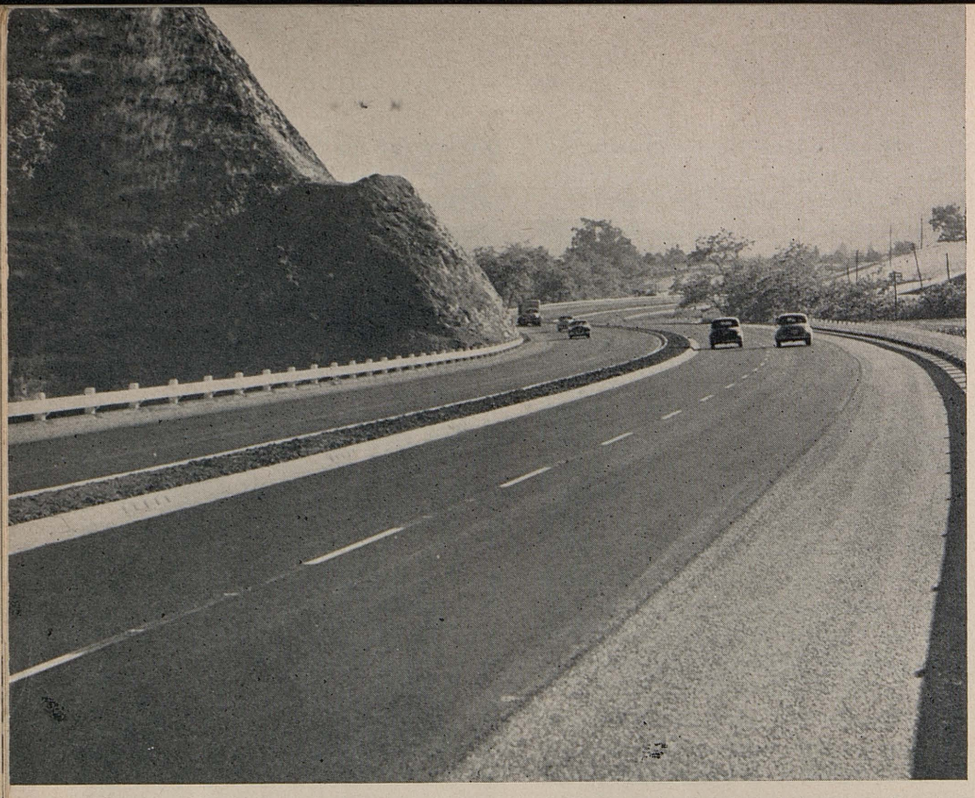
New Department Created

The task of administering these secondary funds and the formulation of construction programs acceptable to the counties, the Public Roads Administration, and the State was of such proportions that it was necessary to establish a separate department in the headquarters organization of the Division of Highways for the purpose. This department began functioning on June 1, 1945, and the excellent progress made in the work presents a splendid commentary on what can be accomplished by cooperative effort between agencies on three levels of governmental administration. In California this secondary program for improvement to county roads was started from scratch, beginning with the allocation of funds between the counties; selection of acceptable routes; the choice of needed improvement projects which would fit the money allocated; preparation of plans and specifications, either by the counties themselves, or, where they were not adequately equipped, by the State; then, upon federal approval, advertising for bids, award of contracts and construction supervision.

At County Level

One of the primary objectives of the Federal Aid Highway Act of 1944 in which the State is wholeheartedly interested is the development of effective administration and engineering at the county level. This is also the intent of the Collier-Burns Act of 1947. Most of the counties have shown improvement along these lines, and the close contact maintained between the Division of Highways and county personnel has been instrumental in furthering this objective.

To date the program of federal aid secondary improvements to county roads involves improvement of 917 miles at a cost of $38,500,000. Of this total, 660 miles, costing $28,900,000, is either completed or under contract.



Four-lane divided freeway approaching San Luis Obispo from the north on U. S. 101

While California converted its federal aid funds from the 1944 Act into highway improvements in the shortest possible time, many states were slow to obligate their federal aid funds. Consequently Congress made no federal aid available for the 1948-49 Fiscal Year.

New Federal Aid Bill

The Federal Aid Highway Act of 1948 authorized federal aid for the 1949-50 and 1950-51 Fiscal Years in an amount 10 percent less than the 1944 act. California received approximately $39,700,000 for the two-year period of which $16,100,000 was for improvements on the Federal Aid Primary System, $9,200,000 for the Federal Aid Secondary System and $14,400,000 for the Federal Aid System in urban areas. Congress is now considering a new Federal Aid Bill and the amount of federal aid to be apportioned California in the future depends entirely on the final form and amount of this legislation.

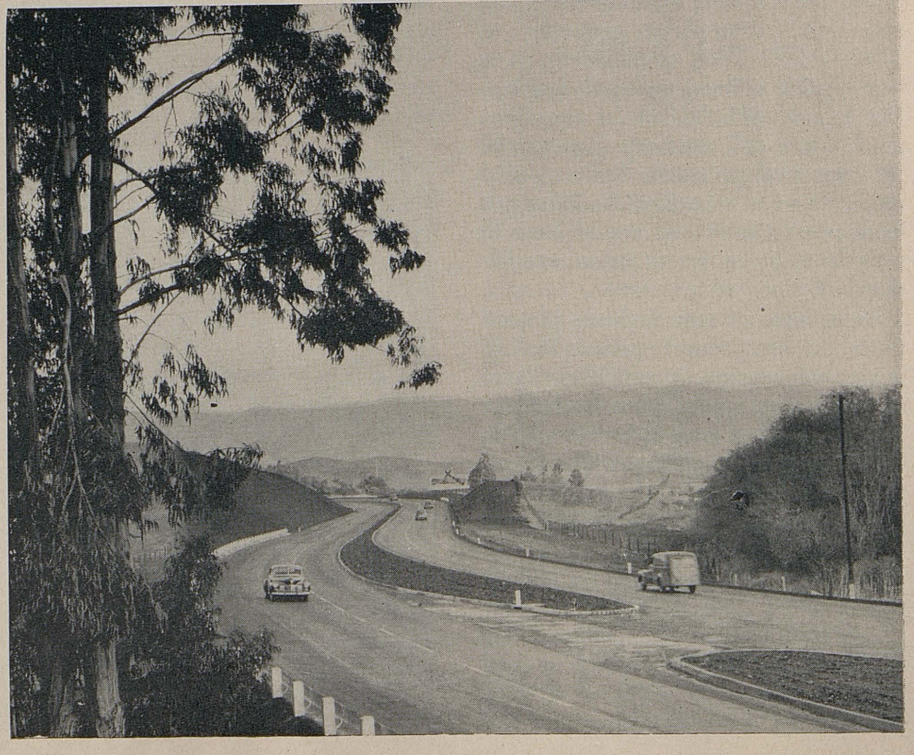
Preparation of the postwar program had shown beyond the shadow of a doubt that state highway revenue, even when augmented by federal aid apportionments, was insufficient for adequate development of the State Highway System. The inordinate increases in traffic after the war accentuated the condition and it was apparent that the adequacy of California roads and highways was falling farther and farther behind.

Fact-Finding Committee

At the instance of Governor Warren there was appointed from the State Senate a Fact-Finding Committee on State Highway Finances. The findings of this committee clearly indicated the seriousness of the situation with the result that the 1945 Session of the Legislature created a legislative Joint Interim Committee on Highways, Roads, Streets and Bridges, comprising representatives from both houses. The work of this committee was thorough and of far-reaching importance to California.

In order to obtain a broad viewpoint on highway needs the committee established an advisory council which included representatives from many business and civic organizations. Members of the advisory council included representatives from the Private Truck Owners Bureau, League of California Cities, Mayor's Office of San Francisco, Los Angeles Traffic Association, Automobile Club of Southern California, Motor Vehicle Advisory Committee, Highway Development Association of San Diego, Western Oil and Gas Association, County Supervisor's Association, Associated General Contractors, California Transit Association, Bureau of Public Roads, Redwood Empire Association, California Farm Bureau Federation, California Retailers' Association, State Cham-

Freeway relocation of U. S. 101 south of San Luis Obispo looking north toward Santa Lucia Range



ber of Commerce, Greater Los Angeles Safety Council, Agriculture Council of California, California Railroad Association, Department of Motor Vehicles and Department of Public Works.

Study by Experts

Under the Joint Committee's direction an extensive and all inclusive study was made by independent engineers and highway economists of state highways, county roads and city streets. The results of this study were presented to the committee in three comprehensive reports:

(1) "Engineering Facts and a Future Program for Highways, Roads, Streets and Bridges," by G. Donald Kennedy.

(2) "An Analysis of Taxation for Highway Purposes in California," by Richard M. Zettel.

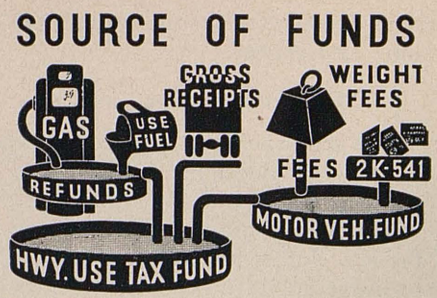
(3) "A Proposed System of Highway Financing for the State of California," by Bertram H. Lindman.

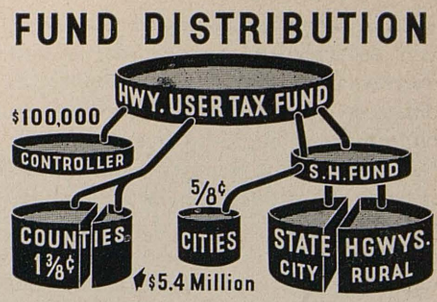
These reports covered traffic and financing studies for the entire highway network—state routes, county roads and city streets. The recommendations to the committee for proposed development were broad and all inclusive, featuring a long range plan for the entire State.

The value of the study and recommendations is attested by its reception by other state highway organizations when published late in 1946. It was probably the most complete highway study made up to that time and the fact that similar studies have since been made by some of the most progressive state highway departments speaks for its worth in highway development.

Turning Point

In the annals of California highway progress the 1947 Session of the State Legislature will be marked as a turning point. In 1909, the California State Legislature passed the first highway bond issue which established a state-wide highway system. In 1923, the Legislature changed the method of financing state highway improvement to the "pay as you go" plan by levying a tax upon gasoline. The third most important highlight in California highway history was the passage by the 1947 Legislature, in special session, of the Collier-Burns Highway Act.





Governor Warren, cognizant of the seriousness of an ever-increasing traffic congestion and the inadequacy of highway revenue for proper development had called a special session of the Legislature to consider and provide additional highway revenue. This special session ran concurrently with the Regular 1947 Session.

Collier-Burns Act

Based upon recommendations of the Joint Interim Committee, a bill was introduced and after many stormy sessions passed on to the statute books as the Collier-Burns Highway Act. Opposition to the bill was strong and backed by a powerful lobby sponsored by certain vested interests. However, the Governor stood firm in his demands for passage of an adequate bill and took a most active part in support of the legislation. It was one of the most stubborn and dramatic fights in California legislative history.

The Collier-Burns Act as finally passed by the Legislature was, of course, a compromise based on the bill originally presented. It did, however, follow in general the outlines of the committee's recommendations.

Gas Tax Increased

The tax on motor vehicle fuel was increased from 3 cents to 4½ cents per gallon and the net revenue divided between the counties, cities and the State. Registration fees for automobiles were raised from $3 to $6 per year and weight taxes on trucks were increased proportionately. After the costs of administering the Department of Motor Vehicles and policing state highways are defrayed from these two latter sources, the residue is transferred to the Highway Users Tax Fund for allocation between the counties and the State Highway Fund. Also under the Collier-Burns Highway Act the net revenue from the 3 percent tax on gross receipts of common carrier truck and bus operators is directed into the State Highway Fund.

Counties and Cities

The provisions of the act allocate to the 58 counties for development of primary county roads 1⅜ cents from the gas tax revenue, approximately $46,000,000 per year, plus a lump sum originally approximating 5½ million dollars annually but now adjusted to about 6½ million dollars; five-eighths of a cent from the gas tax or approximately $18,000,000 per year is apportioned to cities for use on major city streets other than state routes; and the remaining revenue of approximately $109,000,000 per year is allocated for state highway purposes. At the same time cities were relieved of the obligation and expense of maintaining state routes within their limits and this responsibility was transferred to the State.

To insure a minimum degree of state highway improvement in all counties the Collier-Burns Act carries provisions for stipulated minimum expenditures of state highway funds in each county throughout five-year periods. The minimums are based upon the relationship which the determined critical deficiencies on the state routes within the county bear to the total determined critical deficiencies on the State Highway System.

Looking to Future

For the first time in California highway history, legislation has been enacted which, with some degree of adequacy, looks to the future and provides a continuing system of furnishing revenue which is dependable and can be used as a basis for intelligent long range planning.

It is, however, estimated that there will be available annually for the first 10 years an average of about $76,000,000 exclusive of federal aid for construction on the State Highway System. While this is a substantial increase in revenue, it amounts to only $760,000,000 in 10 years as compared to the determined list of deficiencies on state highways in which needed projects total over 1½ billion dollars. It, therefore, becomes immediately obvious that it will be many years before more than the most critical of deficiencies on the State Highway System can be corrected.

Highways Division Reorganized

To meet the greatly expanded state highway construction program under the 1947 act it was found advisable to reorganize the Division of Highways on a broader basis more adaptable to administration of the larger volume of work. The comparative ease with which the reorganized department has moved into smooth operation on the enlarged program is evidence of the advisability of the reorganization.

Highway administrative organization in California has been distinctly of single executive control. It started that way in 1910 and continued that way for 37 years —the State Highway Engineer; Assistant State Highway Engineer; Surveys and Plans Engineer; Construction Engineer; Maintenance Engineer, and Office Engineer.

As the number of motor vehicles increased, the public became more demanding for better highways and provided additional revenue. This necessitated growth and expansion of the department. New functions were added—the Materials and Research Laboratory; the Equipment Department, then, with the cooperation of the Bureau of Public Roads, the State-wide Planning Survey, state routes were extended through cities and a department was necessary to handle city-cooperative projects. State aid to counties increased under the federal aid secondary program and a separate department was needed to administer this phase of development. Traffic congestion became such a major problem, it was necessary to set up an independent Traffic Department. The growth by this time having become so great, it became an economic necessity to establish a unified Stores Department.

New Plan Functioning

With the increase in size and variety of functions within the Highway Department coupled with the enactment by the 1947 Legislature of the Collier-Burns Highway Act, it became apparent that the single executive type of administration was inadequate.

After much study a plan for reorganization was put into effect late in 1947 and which is now functioning exceptionally well in handling the large expansion of the highway program.

Briefly the reorganization is as follows:

The headquarters staff was revamped by changing the old position of Assistant State Highway Engineer to Deputy State Highway Engineer and by establishing positions of five Assistant State Highway Engineers.

Work Divided

The work of the Division of Highways is divided so that four of these Assistant State Highway Engineers exercise executive authority over the following subdivisions: Operations, Administration, Planning, and Bridges. The fifth Assistant State Highway Engineer supervises personnel matters, service agreements and miscellaneous other functions. Upon equal footing with the five Assistant State Highway Engineers is the Chief Right of Way Agent who supervises all right of way matters. The Comptroller of the Division of Highways directs the administration of the accounting system, disbursements, and the internal audit.

District Changes

At the time the headquarters staff was reorganized, it was deemed advisable to revamp the organization of two of the 11 highway districts. These two metropolitan districts comprising the areas around San Francisco and Los Angeles were expanded with an administrative set-up following closely that adopted for the headquarters organization. Each of these two districts is functioning under the direction of an Assistant State Highway Engineer with the rating of Metropolitan District Engineer.

Under the reorganized Division of Highways, state highway development, revitalized by the Collier-Burns Act, will continue to advance at the maximum rate possible with the revenue provided by the act and by federal aid. Within the department constant forward improvement of both internal and external operations must be maintained if progress is to continue. While even a bare listing of engineering and operative improvements accomplished during the last seven years would be too voluminous for any normal report, there are certain accomplishments in performance of the several phases of highway administration which should be mentioned.

Traffic Data

Fundamental to the planning of highway development is the accumulation and analysis of factual data relative to the traffic which uses the highways.

All reported accidents on the rural portion of the State Highway System, received through the offices of the California Highway Patrol are coded and tabulated. Special studies covering points of accident concentration and accident-prone sections are made, the accident pattern analyzed and, where possible, corrections are made.

Among the major sections studied were the Arroyo Seco Parkway, the Ridge Route at Grapevine, and the entire Feather River Route between Oroville and Hallelujah Junction. Corrective measures taken as a result of these studies were: Revisions in the median strip and emergency parking areas on the Arroyo Seco Parkway; a restricted speed zone of 45 miles per hour established on the Ridge Route near Grapevine; delineation and stated speed signs installed at various locations on the Feather River Route.

Included in research being performed is a special study covering the accident relationship of the various types of median strips on multilane highways.

Trucks Classified

A new truck counting procedure was inaugurated in 1945 which classifies trucks in terms of the number of axles instead of by light, medium, or heavy trucks previously used. This method, together with the information obtained by the systematic weighing of trucks at numerous locations throughout the State, which has made it possible to determine within closer limits the average weight

This is U. S. 99 through Piru Gorge on the Ridge Route

of trucks of each type, affords a means of determining the extent of the use of the highway system by commercial vehicles in terms of ton-miles which is most valuable in the structural design of highways.

Truck Paths Study

With the advancement in highway design and the increasing number and complexity of channelized intersections, grade separations, interchanges, on and off ramps, and divided highways, the dearth of knowledge of the paths which large trucks and trailers and tractor-truck, semitrailer combinations make on short radius curves became more and more critical. Last year the Division of Highways, with the cooperation and assistance of several bus and trucking operators who furnished the vehicles, conducted an exhaustive series of tests at a nearby airfield to determine the paths necessary to accommodate these large vehicles. A report of the results of the trials and providing recommended curve data and lane width is now being used as a guide by the design sections of the several districts of the Division of Highways. It also has attracted the interest of other state highway organizations and city and county engineering departments because of the common need for such information.

Origin and Destination Survey

New traffic engineering techniques are employed to obtain traffic data for planning new highways. Among the latest and most important is the origin and destination survey. These surveys are made in cooperation with the U. S. Bureau of Public Roads and the California Highway Patrol. The drivers themselves are asked to furnish information as to the origin and destination of their trip in addition to other pertinent information, usually by stopping them on the highway, but sometimes by home interview or other means. When these data are tabulated and analyzed, new highways can be located so they will provide the best possible service to the highway users for the money expended.

Cooperation with the California Highway Patrol Academy was instituted by presenting the subject of Traffic Engineering to classes of Highway Patrol

cadets. Several traffic engineers participated in this instruction, three to five lectures on the subject being given to each class of future highway patrolmen. Rudimentary knowledge of traffic engineering principles should promote better understanding of the mutual problems of the Highway Patrol and the Division of Highways and should result in greater over-all efficiency in the prevention of highway traffic accidents.

Yearly Programs

In the planning of highway development, programs are now prepared each year for succeeding five-year periods. Project reports outlining the basic features and estimated cost of each proposed improvement are analyzed and processed through headquarters of the Division of Highways before preparation of preliminary budgets.

As an aid to preparation of highway programs, on July 15, 1948, the California Highway Commission adopted a resolution establishing a procedure for the dissemination of information and the holding of hearings on all freeway projects where new location or major relocation is involved. These hearings are conducted by members of the commission, giving them an opportunity to hear, first hand, the reaction of the communities to the proposal being presented by the State Highway Engineer. The hearings are well publicized and give each interested citizen an opportunity to be heard. It is a function of the planning section to properly coordinate the action of the highway districts and to make recommendations to the State Highway Engineer for presentation to the California Highway Commission.

Budget Section Established

In October, 1947, a budget section was established as a separate entity for the purpose of more efficient and expeditious preparation of the division's budgets and their proper control once they were adopted. The necessity for this action became particularly urgent with the greatly enlarged program of highway work made possible by the enactment of the Collier-Burns Highway Act and the resulting increased revenues for highway construction.

The essential elements in any budget procedure are:

1. **Determination of probable revenue.**
2. **Recommendation for the allocation of available funds to specific uses.**
3. **Control of expenditures as allocated.**

With undertakings of the magnitude and complexity of those with which the Division of Highways is charged, it becomes physically impossible for those upon whom major decision rests to acquaint themselves with the immense detail involved. To assure both efficiency and expedition in the over-all job which the division has to do, this multitude of detail must, in some manner, be sifted down to those major essential elements which are of controlling value in final decision.

To assure that proper consideration is given to all items which go to make up the annual budget and, at the same time, to assist in expediting the final review and decision on these items, all candidate projects are subjected to a careful screening process.

Project Reports

Initially each individual project is made the subject of a "Project Report" setting forth simply and understandably the job under consideration with detailed statements of all pertinent facts involved and containing the definite recommendation of the District Engineer. These reports in turn are distributed to all headquarters departments for their study preliminary to thorough discussion in regularly scheduled conferences of all department heads presided over by the State Highway Engineer.

Obviously, the aggregate of funds which would be required to match the potential cost of all these proposals is so many, many times any possible expected revenue that only those showing the highest warrants can qualify for further immediate consideration. More exact detail as to probable cost of each of these is then prepared and this group, always representing a total outlay greatly in excess of currently available funds, forms the base for more extended scrutiny by the State Highway Engineer and the California Highway Commission in their determination of final selection for inclusion in the budget.

Process of Screening

In the assembly of this still very large and extensive group—although numerically greatly concentrated in comparison with the total which have been reviewed—care is taken to assure comprehensive coverage of the entire State Highway System, having in mind various legal requirements as to the allocation of expenditures between north and south county groups, and among the individual counties within these groups. Without this process of screening, or one similar, it would be extremely difficult, if not altogether impossible, for those charged with the final decision to allot the time required even for superficial review of all proposed undertakings. For assistance in final review, and to assure that all suggestions have been given attention, a condensed summary is prepared listing all requests received from the many individuals and organizations interested in particular locations or phases of the highway program.

Budget Control Major Function

With the inauguration of annual, in place of the former biennial budgets, and the provision for the letting of contracts in advance of the actual beginning of the fiscal year, the work of preparation and control of budgets has become a major function, continuous and unbroken throughout the year. The enormous increase in traffic and the consequent increased demands for more and more improved facilities, coupled with the fact of inadequate—even though substantially increased over those formerly available—funds, make the task of selection continually more difficult.

Engineering control of all phases of budgetary operations is maintained by a special section under the direction of the Office Engineer. The duties of this section include the review of planning programs, review of project reports, attendance at budget meetings where the recommended priority of future projects is determined for submission to the commission, the estimating of revenue for future budgets, the estimating of available funds in current budgets, the review of budgets and preparation of votes for commission action on necessary revisions,

Gas tax funds built this mountain highway with concrete center barrier on Ridge Route, U. S. 99

the preparation of documents necessary for Department of Finance approval of budget revisions and the keeping of records and making reports of all budget transactions, including revisions, allotments, savings, reversions and contingency reserve funds. Continual revision of budgets is necessary as bids for projects are opened and unforeseen conditions on projects create overruns or savings that require financing or reallocations.

Payments to Contractors

The Division of Highways has an enviable record of prompt payment to contractors for work performed. This fact enables contractors to finance projects with less cash and consequently at lower cost. The state benefits by the lower bids received. To achieve this end contractors' progress estimates must be processed for payment in the shortest possible time. The number of progress estimates per month varies from a low of 150 to a high of 270, and the monthly payments to contractors vary from three to eight million dollars.

The value of contracts under way throughout the State does not vary to the extent that it does in some other states where work is more seasonal in nature. In the last three years the value of contracts under way has varied from a low of $57,000,000 to a high of $97,000,000.

Design Section Enlarged

While design of each highway project originates in the District Office of the district in which the project is situated, the design features incorporated conform to standards adopted by the department and are subjected to review both in field and office by the headquarters design section.

So as to meet the increased volume of work since 1943, the design section has reorganized and increased its personnel. The increased volume of work and the increased engineering considerations that must be given to various features of the present-day highway, caused by the efficiency with which modern traffic must be handled, have resulted in the present organization of specialized sections. The design organization is now divided into sections covering structural design, intersection and interchange design, drainage, and special investigation and a review or liaison section. This latter section consists of five men whose special duties are to keep close contact between the districts and headquarters, to the end that there will be a minimum of lost motion or misunderstanding in the development of contract plans.

Realistic Budgets

Project reports have been developed during the past seven years. A form has been worked out for these reports for use by the districts which has resulted in complete information being made available to study the project and determine its appropriateness and priority for construction. This has resulted in more realistic budget preparation.

The policy of tying surveys into the California Coordinate System has been developed and progress is being made in this respect. It is a slow process but ultimately will result in a great saving in relocation of right of way lines, property corners and other survey points as well as making highway survey points useful to the general public through private engineers.

The freeway and expressway concept of design has developed rapidly during this period. Development of this type of highway has been expedited by many new design details which are resulting

in more efficient and safer use of freeways. This is especially true in intersection and interchange design where better statistical traffic information has resulted in the development of practical details such as acceleration and deceleration lanes, free-turning lanes, ramps designed to adequate standards, and development of the rolled gutter design. This latter detail results in better delineation of the edge of the roadway and the feasibility of building lightly designed shoulders, since they will be used for emergency parking only and will not be subjected to repetitive heavy wheel loads.

Standard Traffic Lanes

The general acceptance of the 12-foot traffic lane and wider shoulders has been accomplished during this period with its resulting increased safety and traffic capacity. Increase in pavement thicknesses and treatment of road bases with Portland cement both have added to the life and strength of California highway surfaces.

In cooperation with the Materials and Research Laboratory and the Construction Engineer, new design charts have been developed and placed in use so as to give a uniformity in determining the thickness of pavement and base. This has eliminated many uncertainties by developing better design practice. These charts have been made possible by the development and better use being made of statistical traffic information on the heavier loads using the highways and use of the 5,000-pound equivalent wheel load repetitions from this information.

Design of Pavements

The Division of Highways has made many changes and improvements in the design of concrete pavements which have made better riding and more durable pavements.

These include the use of forming strips for weakened plane joints that remain in concrete pavements and are finished over without edging, which eliminates the possibility of introducing surface roughness at transverse joints and results in greatly improved riding qualities. Several of last year's projects measured by the Bureau of Public Roads type of trailer roughometer under the auspices of the University of California show a degree of riding comfort never before attained in the entire United States.

Cement has been used to solidify the subgrade under concrete pavements in soils that are susceptible to softening and extrusion under rocking slabs. This solidification will extend the life of concrete pavements for a great many years.

Expansion joints have been eliminated in concrete pavement, thus removing the weakest point in pavement design. Many hundreds of miles of this design have been constructed. This should result in a considerable extension of maintenance-free service for concrete pavements.

War Time Maintenance

By January 1, 1943, the state highway maintenance organization was operating on a full wartime basis. The working force was at a minimum of approximately 2,150 men and their efforts were concentrated on upkeep of structures and traveled way and particularly on the portion of the highway system most used by wartime traffic. The special seasonal services, such as snow removal, which were necessary for the general welfare, were never neglected. It was fortunate that for the several winters during the war storms were well distributed, the snowfall was below normal, and damage from floods was comparatively slight. The protection work which had been done in previous years at many streams and known slide areas paid off during this period.

In 1943 the maintenance equipment was still in reasonably good condition. Here again the program of replacing equipment and of stockpiling essential materials, which had been undertaken in 1940 and 1941, made it possible for the limited maintenance forces to carry on with good results during the war years.

Military Hauling Damage

The surfacing on many secondary highways was seriously damaged due to heavy and continuous hauling of lumber products, aggregates, mining products, etc., as well as the movement of military equipment and supplies. With such exceptions the highway system was in reasonably good condition at the end of the war. This could not be said of the maintenance equipment. By 1945 the shop forces were having great difficulty in securing parts and in keeping the equipment in operating condition. At times as many as one-third of the motor graders, for example, were out of service. Frequently a unit would be tied up for several weeks lacking an essential part.

Prior to the war, the maintenance forces relied on renting privately-owned equipment for special jobs or as relief units in case of breakdowns. Equipment from this source of supply was not available during or immediately following the war.

Equipment Shortage

The limitations, as outlined, on maintenance work existed from January 1, 1943, to a year or more after the end of the war. In fact it was not until 1947 that the situation eased insofar as the securing of equipment and many materials was concerned. It was necessary, therefore, to continue the maintenance work on a makeshift basis during the entire period. Advantage was taken of every expedient in order to render the most necessary services. Materials available for traffic lacquer, for example, were entirely unsatisfactory as compared to prewar specifications and when applied to the road had only about one-third of the life of the prewar lacquer. These factors not only increased the work of the maintenance forces, but also added greatly to the cost of the service rendered for various phases of the maintenance work.

During the entire war and postwar periods, every effort was made to keep the working force to a minimum. With the return of more normal conditions during the past two years, such efforts have been continued. In January, 1941, 3,100 men were employed. At that time, however, special effort was being put forth to get as much repair work done as possible in anticipation of restrictions on materials and manpower, which developed later.

Maintenance Forces

As of January, 1943, the maintenance field forces consisted of some 2,150 men including the office staff in the maintenance superintendents' offices. By July 1, 1950, this force was about 2,400 men. This compares to a normal prewar organization of some 2,500 men. This increase in force, however, does not represent a

UPPER—Old winding highway, U. S. 99, on Grapevine Grade, Kern County. LOWER—Same section after being modernized by Division of Highways. Both views looking north toward Bakersfield

return to prewar status. It has been a gradual development and made necessary by added functions such as assumption of maintenance of state highway routes in cities in 1948, as authorized by the Legislature, and more particularly by the increase in number of bridge and grade separation structures, as well as the necessity of making up for deferred maintenance, the increase in the number of traffic signals and highway lights and the addition of landscaped areas on freeways, etc., which require continuous concentrated maintenance.

Maintenance Routine

The maintenance work, in general, is of a piecemeal and intermittent character that does not lend itself to set times or procedures. It carries with it responsibility for routine patrol of the highways, emergency calls in case of accidents and

for special services such as storm damage and snow removal, etc., which require the continual attendance of a minimum crew. The special advantages of contract work are fully appreciated. It has been possible to keep the crew to a minimum by handling work under contract when the detail can be clearly specified and the time element allows of preparing and advertising a project. As a matter of fact, it would be impossible to keep up the highway surfaces with the present force and equipment except for the 300 to 500 miles of thin surface blankets which are placed each year under contract.

The current program of highway improvement carries with it a need for constant expansion of the maintenance work. The divided highway type of construction not only doubles the mileage of pavement, but also the number of structures, the miles of shoulders and, in general, also the area of right of way to be policed. In addition, of course, there are the grade separation structures on freeways, together with approaches and special facilities. Many of these layouts are elaborate with signals, lighting, etc., and require extensive maintenance. There is also a constant increase in demands throughout the highway system due to increase in traffic volumes, as well as for special services such as traffic stripes and snow removal. It also should be noted that both degree of activity and cost of maintenance are directly proportional to the volume of traffic. With the abnormal increase in California's population and the accompanying rise in both car and truck traffic required maintenance operations are greatly augmented.

Radio Communication

The Division of Highways radio communication system, which was in service during the war years under special emergency license, is now in process of reconstruction to high frequency type of service. Under the license granted by the Federal Communications Commission system this method of communication can be used for any phase of highway work. An installation has been made in the Eureka district area, as well as the Los Angeles area.

The system, which has been in use in the Redding, Marysville, Bishop and San Bernardino districts, will be changed to the high frequency type as rapidly as the men and materials are available to carry out the work. This method of communication is very useful in maintenance work and particularly in connection with snow removal and sanding operations. The operating equipment can get in touch with their headquarters immediately in case of any breakdown or unusual condition on the road. The supervisor is in a position to direct the assignment of the equipment to the points where it is most badly needed. He can also order replacement parts or shift the equipment from place to place with the minimum of delay. When the system is completed, as planned, very considerable savings are anticipated in the supervision and actual carrying on of the work. The public will be better protected in case of any road closures of other emergency and the routine work can be carried on more quickly and economically than is possible without such communication.

Equipment Department

The Equipment Department of the Division of Highways is a self-supporting unit established to supervise, maintain and account for all of the automotive, construction, and maintenance equipment owned by the division. Its chief income is derived from rental of this equipment to the other departments and districts of the Division of Highways. By this means all mechanical and motor vehicle equipment is efficiently and competently serviced and maintained, and the full proportionate cost of purchase, upkeep, and replacement of every piece of equipment of the Division of Highways is properly charged to each particular function or project on which it may be used.

Under the present organization the main shop in Sacramento handles not only the cars of the Headquarters Office, as well as some equipment for other state agencies, but also cares for cars, trucks, and maintenance equipment of the Stockton and Marysville districts. The Sacramento shop is tooled to handle construction of any special machinery for highways, such as paint striping machines, oil distributors, boring rigs, as well as special work which may be requested by other state agencies. There are 10 additional shops to serve the nine districts (other than Stockton and Marysville) and the San Francisco-Oakland Bay Bridge.

Value of Equipment

The inventory of the equipment department includes a total of 5,333 separate pieces of equipment. Of this number 1,035 units are passenger cars, 1,827 units are trucks of varying sizes and weights, and the remaining 2,471 units are made up of over 50 different kinds and types of construction equipment. The total inventory value of this equipment is approximately $13,000,000. This is an increase since the war of approximately $6,000,000.

Substantial standardization has been achieved in the sizes, types and capacities of many equipment units in common use. This has resulted in a saving of the required number of spare parts stocked and in more familiarization on the part of repairmen.

After six months of intensive study a new rental rate system was put into effect in October, 1949. The regrouping of the equipment serviced under the new system resulted in a reduction in the total number of different rental rates by approximately 130 individual rates. This innovation has resulted in a considerable saving in the preparation of rental reports and related accounting. Changes were also instituted in the accounting statistical section which will simplify and reduce the cost of future rental rate studies.

Bridge Information

Since 1943 a great improvement and advancement has been made in the method of securing foundation information for bridges. This is of utmost importance since an accurate determination of the bearing capacity of foundation materials has a major effect on the cost of bridges. Within the last two years very efficient foundation equipment has been developed and is in charge of an engineering geologist who has been well trained and has had valuable experience in this work. At the present time far more accurate and dependable information is being secured, which means a great saving in the cost of bridges. Incidentally, at the last National Meeting of the American Association of State

Highway Officials, the Bureau of Public Roads Bridge Engineer from Washington stated that the greatest concern through all of the states was the lack of sufficient foundation investigation, which resulted in an epidemic of settlements in bridges and other bad effects.

From conversation with bridge engineers in other states, it would seem that California has one of the best, if not the best, organizations and equipment to secure desirable results. It is impossible to state definitely the amount of money this has saved the State but it runs into many thousands and hundreds of thousands of dollars.

Stores Department

Since V-J Day in August, 1945, the Division of Highways, acting through the Department of Finance, has made large purchases of material from the War Assets Administration resulting in a very considerable net saving to the State. In order to take advantage of further savings and to expedite the buying and distribution of state-owned materials used in maintenance, design and construction of state highways, it was decided to organize a Highway Stores Department in April, 1947.

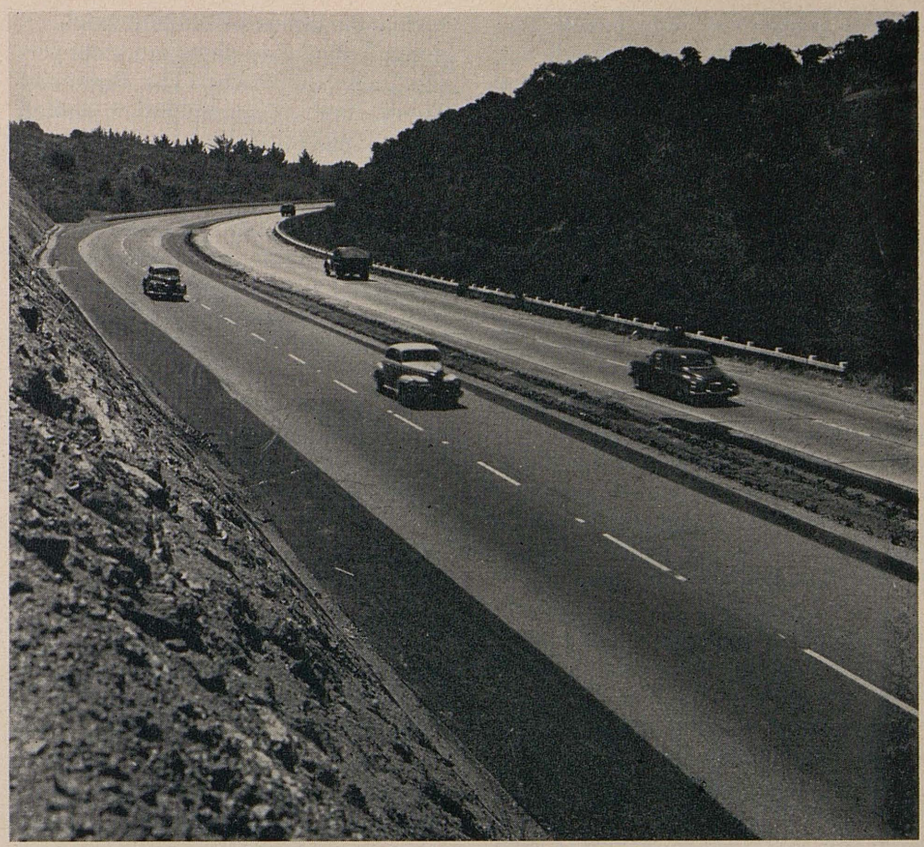
Subsequently, two central warehouses were established, one in the Los Angeles area serving the southern part of the State, and one in Sacramento to serve the northern portion. The headquarters offices of the department are located in the Public Works Building in Sacramento.

In general, the Highway Stores Department works in conjunction with the several headquarters departments and the 11 highway districts concerning the problems of securing materials and supplies.

Because of material shortages during and after the war, special emphasis was placed on the availability of materials. The procedures and methods developed during this period have proven adaptable to a permanent stores department in line with modern industrial practice.

Savings Effected

The purpose of the Stores Department is to provide storage facilities for those commodities capable of being purchased in large quantities with consequent reduction in price and to afford rapid distribution from warehouses with a minimum of delay and paper work. For instance, under the old system it was found that every item was purchased on an average of 12 times per year. The purchase of 1,000 items, 12 times each, results in 12,000 purchase orders and 12,000 bills to pay. When considered that each purchase results in multiple copies of local requests, requisitions, purchase orders, receiving records, shipping records, invoices, bills, transfer records, schedules, and various correspondence, the amount of paper work is overwhelming. Purchasing highway materials on a wholesale basis once or twice a year rather than on a retail basis of 12 times per year, not only results in substantial monetary savings but also in large savings in paper work.



Typical view of new four-lane divided highway developed from existing two-lane highway in Monterey County

Large Scale Buying Power

Except in unusual cases, under the former method, each purchase was subject to a minimum delay of 30 days between the time of originating a requisition and delivery of the material; whereas, the Stores Department at present stocks approximately 4,000 items and attempts to maintain 48-hour delivery service. It is estimated that the number of items carried by the warehouse will double within the next year.

The prime consideration is, first to expedite the flow of materials to points of usage, and second, to realize a savings by using the large scale buying power of the Division of Highways. The Stores Department is a sound engineering addition to supplement the other departments of design, construction and maintenance. The analytical study of needs and usage effects a substantial savings in expenditures, which are both direct and intangible; direct savings insofar as purchase price is concerned and intangible insofar as savings can be effected in lost time waiting for delivery.

Duplication Eliminated

Further reasons for organizing a Stores Department was that there were five separate groups in headquarters office with a total personnel of 16, whose functions consisted of procurement of materials in some form or another. These

separate groups have been incorporated into the new department. Each has brought his special problems to the new department with the result that the Stores Department has broadened beyond the scope of merely warehousing and distribution of supplies.

Additional Activities

Some of these additional activities are included in the following:

1. Initiation of projects for large quantity production such as the purchase and/or fabrication of steel fence posts, guide posts, signs, piling, survey stakes and miscellaneous other items.

2. Analyzation of the changing needs for materials and supplies in the line of economy, availability, and extent of usage.

3. Maintenance of an organization for the procurement of surplus material from the War Assets Administration. Purchases from this agency to date represent a cost of $881,612 with a commercial value of $1,461,337.

4. Supervision and maintenance of Public Works Buildings, together with the custody of property and equipment.

The distribution of materials, property accountability and accounting work in connection therewith, which was formerly performed by the districts and other departments, has been taken over in part by the Stores Department.

The total personnel of the new department is now about 55 employees.

Construction Cost Index

Rapidly changing economic conditions since the end of the war made it necessary that some reliable method of measurement of highway construction costs be devised which would reflect the changes in the cost of highway work due to economic conditions alone, independent of engineering factors, such as design standards, which also influence costs.

After considerable study and research, including a study of other cost indexes, the California Highway Construction Cost Index was developed. It is believed that this index is an accurate barometer of changes in highway construction costs in California due to economic conditions.

California Index

While the California index follows the same general trend of other indexes, such as the Bureau of Public Roads Composite Mile Index, there are some very significant differences. The Bureau of Public Roads index reached a peak of 230.9 (1940 = 100) in the fourth quarter of 1948. The California index reached a peak of 216.8 in the first half of 1948. In other words California's peak in highway construction costs was reached sooner and was 14 points lower than for the United States as a whole. The B.P.R. index declined 28 points to 202.9 in the fourth quarter of 1949. In the same period the California index declined 38 points to 178.8 for the fourth quarter of 1949. In other words, California's index decreased faster, by 10 points, and is now lower, by 24 points, than the national average.

Bid Advertising

While there are many reasons why the Division of Highways can get better prices from highway contractors than the national average, it is believed that by far the greatest influence is the careful planning of the advertising schedule. This careful planning, in contrast to the erratic advertising practiced in some states, has resulted in a saving of over 7½ million dollars in the last 18 months. This 7½ million is the difference between actual bid prices paid and the prices which prevailed nationally as indicated by the Bureau of Public Roads index.

The continuation of cost analyses and very careful planning of advertising schedules is an absolute necessity to insure that the motorist receives the maximum amount of highway improvements possible from the funds available.

As an indication of the competition which prevails among highway contractors for projects advertised by the Division of Highways the average number of bidders per project is the best measure. The average number of bidders per project has increased from 5.6 in the 1947-48 Fiscal Year to 8.5 for the first three months of 1950.

Keen Competition

The present keen and healthy competition in bidding on California highway work is to a large degree the result of the hundreds of millions spent in this State during the war. Many large midwest and eastern contractors came to California for wartime contracts and, finding that operations could be conducted during 9 to 12 months of the year, have kept their Pacific Coast organizations intact by bidding on California projects. There are now over 650 contractors prequalified with the State to bid upon state highway construction. Prequalification ratings are based upon a review of a contractor's financial statement, experience record, and equipment inventory. While the ratings fall in several brackets it is sufficient to state that 359 are rated up to a quarter of a million dollars and 158 are rated $1,000,000 dollars and over. The total rating of all prequalified contractors is approximately $1,375,000,000. This is a clear indication that the contracting industry in California is ably financed and equipped to undertake construction up to many times the value of any program which the State might inaugurate.

Right of Way Department

During the past seven-year period, practices and procedures in the State Highway Right of Way Department have been completely revised, modernized and streamlined with the result that California is now recognized as having the most efficiently operated public land acquisition organization in the Nation.

Prenegotiation-appraisal procedure as initiated with a fully equipped valuation section, which has been in operation for five years, has tremendously reduced overhead cost in right of way acquisition and has resulted in fairness and equity to all affected property owners. This is conclusively proven by the fact that during the past fiscal year 5,125 parcels of right of way were acquired by negotiation, which of course means meeting of the minds between the property owner and the State, while it was only necessary to acquire 63 parcels by trial in eminent domain proceedings.

Procedure Improved

Every phase of modern state highway right of way acquisition procedure has been improved during the last five years with a thoroughly accurate record having been installed to keep track of every phase of the work.

A land economics research section has been created under which the actual effect of every type of highway development that has been completed is studied

over a period of two to five years to determine the actual and conclusive effect of such development thereby eliminating guess work in determining market value and damages.

Further advance in expediting right of way matters prior to construction operations has been accomplished during the past three years by the establishment within the district offices of a section devoted to handling the readjustment of utilities within right of way limits.

Engineers Recruited

Employees of the Division of Highways numbered about 5,700 at the beginning of World War II. This number was reduced by entrance of members of the department into the armed services to a low of about 4,200 in January, 1944. Engineering personnel was reduced to a low of 900 in December, 1945.

At the time the postwar program was activated, the greatest personnel deficiency was the lack of trained engineers. A vigorous recruiting program was initiated for young engineers which has increased the engineering personnel to about 2,500 at the present time and the shortage no longer exists. A veterans on-the-job training program was initiated and carried on during the postwar period. Many veterans have completed the training course and attained the grade of junior civil engineer.

While the total personnel of the Division of Highways is now about 7,100, compared to about 5,800 in 1941, it should be pointed out that this increase is less than the increase in volume of work over the prewar period. One of the factors which made this possible is the reduction of maintenance personnel from about 3,500 in 1941 to about 2,700 in 1949 due to the policy of letting work to contract that was formerly done by maintenance personnel. Maintenance personnel employment represents one employee for each five and one-half miles of the State Highway System.

Legislature Creates Institute

In 1947 the Legislature appropriated funds to establish the Institute of Transportation and Traffic Engineering in the Department of Engineering of the University of California at Berkeley.

This institute has undertaken:

(1) To carry on research work in the street and highway problems. The Division of Highways is joining with the institute on some of these projects and cooperating in a consulting capacity on many others.

(2) To carry out undergraduate and postgraduate courses in highway engineering in order to furnish men needed in the accelerated California highway program.

(3) To conduct an annual three-day conference or road school for the benefit of city, county and state engineers engaged in street and highway work, at which speakers of both national and local prominence are presented. The conference in Los Angeles this year had a registered attendance of 392.

(4) To conduct extension lectures on street and highway subjects in various cities of the State for the benefit of the city, county and state engineers engaged in this work.

The Division of Highways is cooperating very closely with the Institute, particularly in the extension work, by furnishing some of the lecturers and is using this extension work as a form of in-service training for its own engineers. At a recent meeting in Berkeley over 200 engineers from the Design Department of the Division of Highways were enabled to hear a representative of the U. S. Bureau of Public Roads from Washington, D. C., present the latest developments in freeway design.

War Changes Traffic Calculations

During the decade prior to the war State Highway Department worked out projections of traffic increases for 10 to 20 years in the future. These projections were based upon all available information relative to anticipated growth of population, motor vehicle production and similar items. Anticipated population growth included factors which were considered adequate for trends of migration.

The Division of Highways was convinced that the projections provided a sound basis for future planning, until in 1939 and 1940, preparations for war made it increasingly evident that industrial expansion and development of military establishments in this State were invalidating the calculations.

When the United States entered the war it could be seen that the Pacific Coast was in for unprecedented growth, the extent of which could not be gauged by any previous experiences.

In 1940 California's population was 6,907,387, today it is estimated at nearly 11,000,000, an increase of over 4,000,000 people in 10 years—57 percent—and still growing at a rate of from twenty to twenty-five thousand per month.

Motor Vehicle Registrations

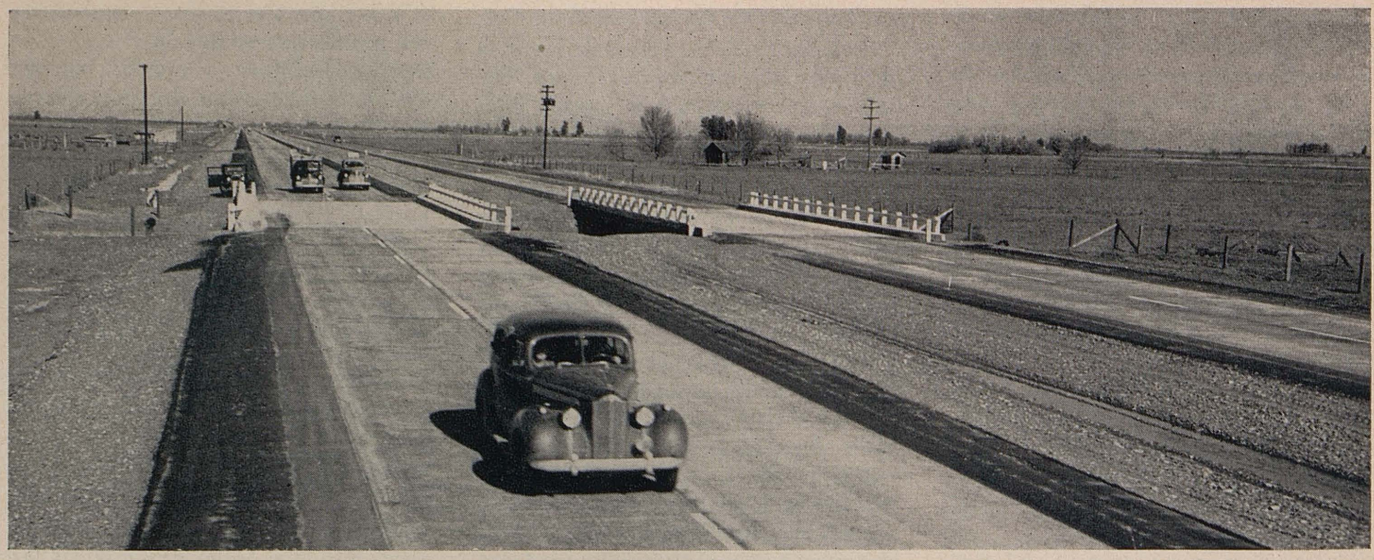
During this same 10-year period, motor vehicle registration rose from less than 3 million to over 4½ million, an increase of 63 percent. In addition to the 4½ million registered California vehicles, about a million out-of-state cars use the State's highways each year. Another factor which must be given consideration is the ever-increasing percentage of trucks included among the registered vehicles. Current traffic counts on rural state highways show that 18 percent of the vehicle miles traveled on California roads are generated by trucks.

It is the two interrelated factors of increase (population and motor vehicles) that have produced the enormous volumes of traffic and resulting congestion existent on California highways.

Congestion is, of course, most severe in the urban areas and of prime importance to the over-all development of the State Highway System is the provision of adequate highway facilities on those state routes in urban locations where congestion is most critical. In solving the problem of traffic congestion, first attention must be given to increasing the capacity of major arteries.

Freeway Development

In accomplishing the needed arterial improvement, development of four-lane divided highways and freeways is a major effort. The reason for such a policy is quite obvious. Freeway construction involves the separation of opposing lines of travel, the elimination of cross-traffic, and control of access to the freeway. It is axiomatic that it is easier and safer to drive where there is no opposing traffic and further that it is easier still and more safe to drive where cross-traffic and left turns do not have to be considered.



This photograph was taken north of Midway looking toward Dixon in Solano County and shows bridge units which converted this section of U. S. 40 into a four-lane divided highway

Analysis of traffic flow shows that on an uninterrupted highway, where nothing can cross or stop the movement of vehicles, traffic can be moved along at a rate of 1,500 cars per lane per hour but, when one stop signal is installed, movement is slowed down to 800 cars per hour.

In a similar vein of comparison it may be noted that a truck equals four ordinary automobiles in space required on a highway in flat country and the space of six cars on a foothill road. It can readily be understood, therefore, that the phenomenal increase in truck transportation which has occurred in California has added materially to the highway problem.

These, then, are the supporting facts behind the Division of Highways policy of freeway development in both urban and rural areas: They are safer; they make driving easier; and they move traffic.

Freeways Expensive

Such construction is expensive, requiring as it does, wide right of way, separation structures, extensive lane channelization and, at some locations, outer highways. In rural areas four-lane divided highways cost from $200,000 to $300,000 a mile including right of way. In urban areas the cost may run as high as $6,000,000 a mile including right of way. It is expensive development, but on routes carrying large volumes of traffic it pays dividends in economic savings and safety.

There has been and still exists opposition to the State's freeway policy. This opposition stems largely from minority groups, some of it organized by promoters of self-interest. The short-sighted viewpoint of such groups considers only the possibility of short-lived increase of local business, neglecting the greater economic values of long-range transportation development. In their hue and cry against freeway construction such groups continually cite what they term the "wishes of the people," referring, of course, to their own small clique, ignoring completely the fact that state highways are for service to traffic and that traffic is made up of people in motor vehicles and that on heavily traveled routes the number of people benefited by high standards of improvement far exceeds the small group which may object to some particular project.

Freeways Up Property Values

This opposition to modern highway development fades rapidly through the presentation of the facts. For instance, opponents to freeway development have claimed that construction of such projects destroys property values out of all proportion to the value of the improvement. This argument has been disproved by the actual facts in communities now being served by freeways. Unless congestion is eliminated in any given area property values will decline. Unless encroachments which interfere with the efficiency of the highways which we build are prevented, the money expended for the improvement is wasted.

Some years ago gas tax money was used to build a 25-mile stretch of highway out of Los Angeles which was expected to relieve considerable congestion in the city. A four-lane *undivided* highway was built and immediately became a heavily traveled route. Hundreds of small businesses were attracted to the road side and within two years after construction it became necessary to post 14 miles of the route with 25 mile an hour speed limit signs and accompanying traffic signals. The original purpose—that of moving traffic fast enough to relieve congestion—has been defeated. Instead of providing a major traffic artery only, a new business thoroughfare had been built and now another route must be provided to accommodate the traffic which the original highway was intended to carry.

Benefits to Property

In the files of the Division of Highways are numerous letters from owners of property located along freeways and served by proper outer highways testifying to the benefits with which they and their businesses have been rewarded by the elimination of traffic congestion

and hazards. Conversely, the building up of congestion at locations where arterial construction has been undertaken without division of travel lanes and control of access and cross-traffic, property values decline perceptibly.

While development of freeways on routes carrying heavy traffic volumes is a major policy of the Division of Highways and the State Highway Commission, it by no means overshadows the aim to raise the standards of traffic facilities throughout the entire State Highway System. Under the Mayo amendments to the Collier-Burns Highway Act, state highway improvement must be made in every county within each five-year period. This provision limits concentration of activity and insures against the possibility of any county going without state highway improvement for any considerable length of time.

Volume of Construction

As a gauge to the volume of highway construction administered by the Highway Commission and the Division of Highways, it may be noted that in the four and one-half years after the end of the war contracts with a construction value of $297,513,000 were awarded, $181,715,000 of which have been put under way since the Collier-Burns Act became effective. In addition, there were outstanding calls for bids for proposed work totaling $14,581,000. Of the total contracts awarded in the postwar period, $164,043,000 or 55 percent were for the construction of freeways throughout the State in both rural and urban areas.

That highway construction activities will be held at levels comparable to the accomplishments of these past few years is indicated by the $66,000,000 state highway budget for the fiscal year ending June 30, 1951. Of this construction proposed for the coming year, contracts amounting to $2,292,000 were awarded on April 1st under the provision of the Collier-Burns Act which permits award in advance of the beginning of the fiscal year.

In spite of the progress that has been made in the construction of modern highways, notably freeways, these accomplishments seem very small indeed when compared to the enormous task which remains ahead of developing the entire State Highway System to such modern standards that congestion and delay no longer exist.

This objective can be met, as evidenced by the modern highways and freeways that have been completed in the postwar period. The engineers of the Division of Highways have the experience and ability to plan, design, and construct a modern highway transportation system which is so vital to the economic well-being of the State. The contracting industry has the organization and equipment to do the actual construction.

The time required to do the job is now only dependent upon the funds available.

Chapter XVII

Redwood Highway

By Marsh Maslin
Redwood Empire Association

Back in the teen-age years of this century highway travel in The Redwood Empire (we use the word "highway" humorously) was so rough and tough that it was a three-day automobile trip from San Francisco to Eureka, if you could make it at all.

In those years if you wanted to take your automobile across the Golden Gate to Marin County you practically had to get a special dispensation from the operators of the passenger ferries—and then drain all the gasoline from your car's tank and have it pushed on and off the ferry.

There were no bridges across the Russian River at Jenner, or across the Klamath River, and the only passage was by crude ferry. Grades were dreadfully steep wherever you went. The roads were narrow and winding and rutted and in the northern part of the Redwood Empire they were surfaced with puncheons —redwood slabs laid crossways.

Rough Traveling

Few traveled then for what may be termed pleasure and there were many places to which you couldn't travel at all except by foot or on horseback.

Travel conditions were probably the worst in the State in the Redwood Empire, which did not bear that name before 1925. The very magnificence of terrain which has made it into an incomparable tourist attraction stood in the way of easy travel in the first quarter of the twentieth century. The dramatic coastal region with its many inlets—the ridges and ravines and peaks of the Coast Range—the mighty redwood forests of the giant sequoia sempervirens—the great rivers such as the Russian, Navarro, Eel, Smith, Klamath and the Rogue (of Josephine County, Oregon)—all these tremendous factors in the Redwood Empire's popularity today made travel arduous and sometimes even torturing. They were also to make construction of modern highways a costly undertaking.

When the people of California some 40 years ago voted their first bond issue of $18,000,000 for a modern highway system, that seemed a tremendous sum of money. But in the light of the huge

Russian Gulch Bridge in Mendocino County, one of the interesting sights in Redwood Empire

amounts voted and appropriated since then for California's modern highways, $18,000,000 now seems like small change . . . In fact, from January 1, 1912, to June 30, 1949, California spent $125,401,956 for highway construction, reconstruction and maintenance in the eight Redwood Empire counties of California alone. These counties are San Francisco, Marin, Sonoma, Napa, Lake, Mendocino, Humboldt and Del Norte.

Dream of Better Highways

The most northern of the Redwood Empire counties is Josephine in Southern Oregon. When the Redwood Empire came into being less than 30 years ago, the people of that region had their troubles, too, and also encountered skeptical opposition to their dreams of better highways. At that time an automobile trip from Grants Pass to Crescent City in California's Del Norte County required 14 hours of travel, in spots reduced to four or five miles an hour. (Now a resident of Grants Pass can drive over to Crescent City to lunch with friends and be home again in time for an early dinner.)

Many people doubted that a fine modern highway system would be possible in the Redwood Empire and the Oregon State Highway Commission looked askance at the high costs involved. One of its spokesmen once said that it would cost a king's ransom for California to link its highways with Oregon's, and if California ever spent that much money it would be time for Oregon to put a modern highway through. Since then, Oregon has spent over $3,000,000 on Redwood and Oregon Caves Highways in Josephine County, strong links in the Redwood Empire's highway system.

First Construction

Even after the State of California went to work building good highways to take the place of the narrow roads the counties that were to be members of the Redwood Empire did not fare too well on appropriations. The now famous Redwood Highway was one of the first in the present empire system to come into being. An interesting phase of its construction was the use of San Quentin inmates, with their first camp near Laytonville in Mendocino County.

James A. Johnston, later to become nationally famous as warden of Alcatraz prison, was warden of San Quentin in 1915 when the first convicts were used. He remembers that the camp was in a virtual wilderness. Supplies were brought by ship to Westport above Fort Bragg and carried by trail to the camp. No refrigeration was possible and the meat was hung from trees to keep it cool and out of reach of wild animals.

Section of unpaved Redwood Highway before State took it over

The men bunked on the ground, built rude structures in the trees, or lived in hollows in the base of the great redwoods. The famous Tree House at Lilley Redwood Park, 193 miles north of San Francisco, housed about 20 workers. At first the men from San Quentin did only the rougher work, such as making cuts and filling and blasting under supervision of Division Engineer Francis Somers; but later they did much of the surfacing of the highways.

Association Formed

The great redwoods were themselves a hindrance to highway construction, and some of them had to be removed. At a somewhat later period, on a project above Orick in Humboldt County, it was necessary to cut down over 2,000 giant redwood trees in a distance of about 26 miles, in order to make possible the construction of a road of reasonable width.

Soon the citizens of the counties, sons and grandsons of the pioneers who had come to this region during the Gold Rush and afterwards, realized that they would get nowhere by divided effort to win appropriation of funds for highway construction.

The present Redwood Empire Association first came into being in 1920 as the "Northbay Counties Association" at a meeting held in Santa Rosa, after the northbay counties discovered that they were securing comparatively small state (and federal) highway construction appropriations—mainly because they were competing each with the other and losing appropriations to other areas.

The counties decided to pool their funds, ideas, energies and manpower, unite on a joint cooperative program and support each other. The wisdom and material value of this policy has since been demonstrated in terms of millions of state and federal highway funds allocated since then.

The region was not even named the "Redwood Empire" until 1926 after the association was reorganized in 1925 and christened the "Redwood Empire Association" by its then new General Manager.

Campaigns for Better Roads

The Redwood Empire Association is unique among highway and tourist development organizations of the Nation. Its relations with the California High-

Approximately same section of Redwood Highway as shown on opposite page as it looks today

way Commission have been friendly and mutually helpful, but it does not exist merely to show up at commission hearings and request appropriation of state funds. It has campaigned vigorously and successfully, for years, in behalf of state and federal appropriations of money for the commission to spend in the entire State—out of which state highway construction in the Redwood Empire is financed.

Through its efforts the tremendous scenic, historical and recreational attractions of the Redwood Empire have been publicized to the entire Nation and the world. Great increases in tourist and vacation travel have resulted, achieving more and more tax money for Highway Commission use—population in all nine counties of the empire has grown greatly—hundreds of excellent tourist accommodations have been developed everywhere—all business and industry in the empire has been increased mightily through the mutually helpful cooperation of the Redwood Empire counties and the California Highway Commission, working jointly with the Golden Gate Bridge and Highway District.

Douglas Memorial Bridge

Travelers who cross the Klamath River in southern Del Norte County on the magnificent Douglas Memorial Bridge find it difficult to imagine a time when the river was traversed only by a little raft ferry carrying but three or four automobiles . . . and then only when tide and weather permitted. A $500,000 special appropriation was obtained to bridge this river. A similar raft ferry accommodated the few motorists who crossed the mouth of the Russian River on what is now known as the Shoreline Highway. A modern bridge under joint highway district proceedings with Highway Commission cooperation, was financed and built to take the place of the ferry. At that time motorists on that coast road had to open and close gates between cow pastures every few miles.

The Division of Highways did not merely improve old highways; much of its work has been construction of highways where none had ever existed. For instance, there were no highways on the now populous east shore of Clear Lake in Lake County and the Highway Commission had to be taken in boats to inspect the sites where the citizens of that county wished a new road built.

The original Cloverdale-Hopland sector led over the old road, narrow and twisting, steep and dangerous. On a new location, more than $1,300,000 was spent for a new sector. To the south a main highway ran over the old Corte Madera grade and all the highways were below standard. In many places, latest type highways, costing millions, have replaced the substandard highways.

Obstacles Overcome

Difficult engineering obstacles had to be conquered in constructing these highways. Streambeds were moved, rocky cliffs and mountains were blasted, deep canyons and wide rivers bridged, great trees were felled and acres of dense undergrowth hewn out. It was a task for giants and it was achieved.

In 1933 certain county roads were taken into the State Highway System by legislative act, a tremendous advance promoted by the Redwood Empire Association and its supervisors' unit, working with the Highway Commission, State Division of Highways and many civic organizations in California.

Great sections of the Shoreline Highway, through a spectacularly beautiful region, were taken in—as were other highways in San Francisco, Marin, Napa, Sonoma, Lake, Mendocino, Humboldt and Del Norte Counties.

Another tremendous achievement in roadbuilding was construction of that famous "highway in the sky," the Golden Gate Bridge. Commodious though the great automobile ferries were, it early became evident that the Golden Gate had to be spanned if development of the Redwood Empire was to continue. Leaders of the empire fought for years for this mighty improvement, and at last they won their point, organized the Golden Gate Bridge and Highway District and in 1937 completed the Golden Gate Bridge, longest and tallest single-span suspension bridge in the world, at a cost of $35,000,000. It links San Francisco, a Redwood Empire county (southern gateway), with the northbay counties of the empire. It serves local and interstate traffic of all types traversing the state and interstate highway systems.

Millions Are Spent

The spending of millions for modernization of the highways of the Redwood Empire has had a tremendous effect on the economic development of all this part of Northwest California and Southern Oregon. Industry and population have grown and now millions of

Douglas Memorial Bridge over Klamath River at Klamath

tourists and vacationists visit the empire who would otherwise be unable to do so.

The Redwood Empire Association's widespread and intensive activities in publicizing the attractions of the empire has enormously increased tourist travel to San Francisco.

These visitors cross the Golden Gate Bridge to visit Muir Woods and other Marin County attractions, including the beaches; they travel to the Russian River section, to Fort Ross, to the Valley of the Moon, to Sonoma's Mission and other historical sites; they see the great vineyards of Napa, Sonoma and Mendocino Counties, the all-year mineral springs health resorts of these counties and Lake County, the attractive resort areas of Clear Lake, Blue Lakes and other sections; they drive up the Shoreline Highway to the grandly scenic region along the coast and linger long in the great redwood forests of Mendocino, Humboldt and Del Norte Counties; they hunt, fish, swim, ride, relax; they visit the Oregon Caves of Josephine County and enjoy vacation trips that would otherwise be impossible if it were not for the astounding achievements of the California Division of Highways in building the highways for which the State Highway Commission appropriates money.

Nonprofit Organization

Expenditures by vacationists benefit state, county, city and district treasuries —particularly motorists who must pay gasoline tax, the same as California and Oregon residents. These visitors must also pay sales tax on meals and commodities purchased; their expenditures enhance pay rolls and increase purchasing power benefiting all lines of enterprise.

The Redwood Empire Association which works so closely with the Highway Commission and its staff is a grass-roots organization. It is nonprofit and semi-governmental and its activities and campaigns are determined by the taxpayers of the Redwood Empire. Recommendations are established and policies prescribed by the constituent counties through the respective county boards of supervisors.

Each year a "Master Schedule of Recommendations" of highway construction projects is drawn up by the boards of supervisors for submission to the Highway Commission and for inclusion in its future budget. The Redwood Empire Supervisors Unit works closely with the commission and appears at its monthly meetings with local delegations organized by the association. The Golden Gate Bridge and Highway District works just as closely with the REA and it is also represented at the commission's hearings by its officers and directors.

The Redwood Empire counties and their Redwood Empire Association are profoundly aware of the accomplishments of the California Highway Commission and the State Division of Highways, in building and maintaining the Redwood Empire System of Highways. They treasure this friendly and sympathetic relationship with the commission and staff members and pledge themselves to maintenance of this valuable cooperation in the future.

Chapter XVIII

Maintenance

By W. A. Smith, Assistant Maintenance Engineer

The maintenance of roads in California has been important since the early days. The users of the emigrant trails had difficulty in this regard. A more or less typical example is the Carson route which crossed the mountains south of Lake Tahoe, one branch leading down the ridge to Placerville and Diamond Springs. It is reported that by 1861 the entire distance from Placerville to Lake Tahoe was sprinkled every day during the summer, and in the winter, large sums were spent to press down the snow so that travel should not be interrupted. In view of the equipment available and the stage of development, such work represented a major maintenance effort.

There was also a traffic problem even in those days. The estimated amount of business done per annum over this mountain road in 1861 and 1862, according to Bancroft in "Chronicles of the Builders," was as follows:

30,000 tons of freight @ $100 per ton	**$3,000,000**
36,500 passengers @ $30	**1,095,000**
Meals and express	**125,000**
	$4,220,000

Former teamsters on the Placerville road often reported a detention of several days in the passage from Virginia to Placerville, occasioned by the difficulty in passing loaded wagons going in the opposite direction, which constituted a continuous train in the narrow grade.

In the Third Biennial Report of the Department of Engineering covering the period from December 1, 1910, to November 30, 1912, the history of the so-called "State Roads" and "State Highways" is detailed at some length. The road from Placerville to the state line near Lake Tahoe was adopted as a state road in 1895. In 1900-1901 a stone bridge of 81-foot span was constructed across the American River, which exhausted all the funds available for maintenance or improvement on the road. In 1903, $8,000 was appropriated for maintenance which was expended largely in repairing and rebuilding culverts and bridges, of which more than 80 existed along the road.

Highway maintenance as a branch of engineering began to develop with the improvement of the state highways in 1912. It was the policy in the early days for the State to take over for maintenance only those sections of the state highway which had been improved. It was not until 1925 that the State assumed responsibility for all routes designated as state highways. The development of the maintenance organization and work as now established began at that time.

During the war years the state highway maintenance forces, in common with many similar organizations, had gone through a serious adjustment period. In January, 1941, some 3,100 men were employed. At that time special effort was being put forth to accomplish as much repair work as possible in anticipation of the restrictions on materials and manpower which later developed. Within a short time the force had been reduced to some 2,150 men, including the office staffs in the maintenance superintendents' offices. This force was employed to the end of the war.

The wartime activities carried on in the intervening years had increased the need for maintenance work. The volume of truck traffic had increased on many routes and the average weight of loads had also increased. The need for lumber, aggregates and products of the mines and the development of military establishments had not only caused a great increase in traffic on secondary, as well as primary routes, but had also extended the hauling period to a year-round basis. This latter development became a most serious matter, particularly in timber-producing areas.

Wartime Traffic

The efforts of the maintenance forces were concentrated on the upkeep of structures and traveled way and, of course, on the routes most used by wartime traffic. The special services, such as snow removal, which were necessary for the general welfare, were never neglected. It was fortunate that for the several winters during the war storms were well distributed, snowfall was below normal, and damage from floods was comparatively slight. The protection work which had been carried out in previous years at streams and known slide areas paid off during this period. Nevertheless, the administration staff of the Maintenance Department was concerned each winter season, as any protracted storm period or extensive storm damage would have created a disaster period for the limited field forces.

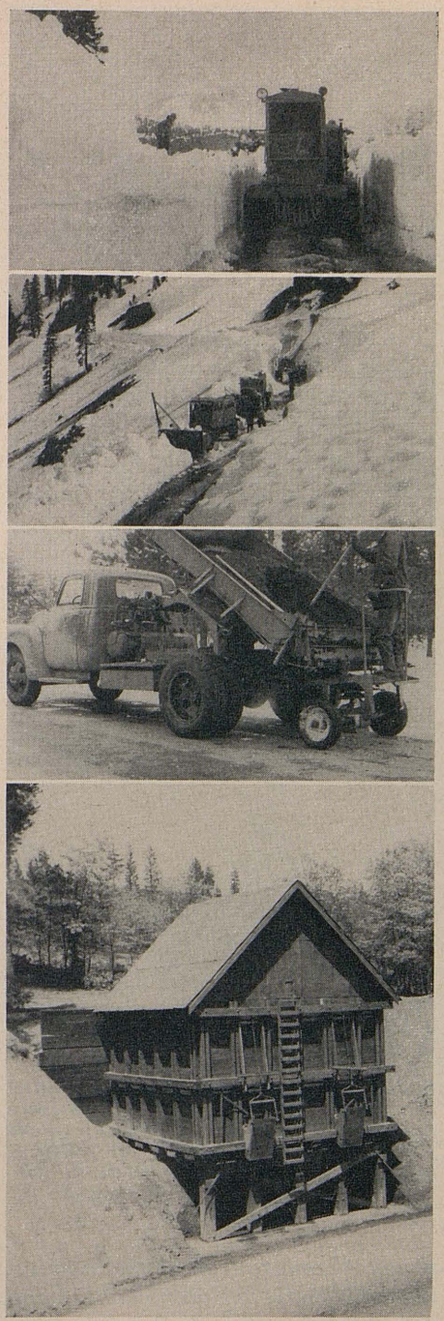
In 1943 the maintenance equipment was still in reasonably good condition. Here again the program of replacing equipment and of stockpiling essential materials, which had been undertaken in 1940 and 1941, made it possible for the limited maintenance forces to carry on with good results during the war years. The surfacing on many secondary highways was seriously damaged due to heavy and continuous hauling of lumber products, aggregates, mining products, etc., as well as the movement of military equipment and supplies. With such exceptions, the highway system was in reasonably good condition at the end of the war. This could not be said of the maintenance equipment.

Shop Problems

By 1945 the shop forces were having great difficulty in securing parts and in keeping the equipment in operating condition. At times as many as one-third of the motor graders, for example, were out of service. Frequently a unit would be tied up for several weeks lacking an essential part. Prior to the war, the maintenance forces relied on renting privately owned equipment for special jobs or as relief units in case of breakdowns. Equipment from this source of supply was not available during or immediately following the war. The limitations, as outlined, on maintenance work existed to a year or more after the end of the war. In fact, it was not until 1947 that the situation eased insofar as the securing of equipment and many parts and materials was concerned. It was necessary, therefore, to continue the maintenance work on a makeshift basis during the entire period. Advantage was taken of every expedient in order to render the most necessary services. Materials available for traffic lacquer, for example, were entirely unsatisfactory as compared to prewar specifications and when applied to the road had only about one-third of the life of the prewar lacquer. These factors increased the work of the maintenance forces and added greatly to the cost of the service rendered for various phases of the maintenance work.

Forces Expanded

During the entire war and postwar periods, every effort was made to keep the working force to a minimum. With the return of more normal conditions during the past two years, such efforts have been continued. In January, 1941, as mentioned above, 3,100 men were employed. As of January, 1943, the maintenance field forces consisted of some 2,150 men, including the office staff in the maintenance superintendent's offices. It is expected that by July, 1950, this force will total about 2,400 men. This compares to a normal prewar organization of some 2,500 men. This increase in force, however, does not represent a return to prewar status. It has been a gradual development and made necessary by added functions such as assumption of maintenance of state highway routes in cities in 1948, as authorized by the Legislature, the taking over of maintenance of all highway signs, the increase in number of bridge and grade separation structures, the increase in the number of traffic signals and highway lights and the addition of landscaped areas on freeways, etc., which require continuous concentrated maintenance.



Two UPPER PHOTOGRAPHS—Snow plows opening highway through Lassen Volcanic Monument. CENTER—"Missouri" type sander for sanding icy pavement. LOWER—Sand shelter for storing sand mixed with salt

Piecemeal Work

The maintenance work, in general, is of a piecemeal and intermittent character that does not lend itself to set times or procedures. It carries with it responsibility for routine patrol of the highways, emergency calls in case of accidents and for special services such as snow removal, etc., which require the continual attendance of a minimum crew. The special advantages of contract work are fully appreciated. It has been possible to keep the crew to a minimum by handling work under contract when the detail can be clearly specified and the time element allows of preparing and advertising a project. As a matter of fact, it would be impossible to keep up the highway surfaces with the present force and equipment except for the 300 to 500 miles of thin surface blankets which are placed each year under contract.

The current program of highway improvement carries with it a need for constant expansion of the maintenance work. The divided highway type of construction not only doubles the mileage of pavement, but also the number of structures, the miles of shoulders and, in general, also the area of right of way to be policed. In addition, of course, there are the grade separation structures on freeways, together with approaches and special facilities. Many of these layouts are elaborate with signals, lighting, etc., and require extensive maintenance. There is also a constant increase in demands throughout the highway system due to increase in traffic volumes, as well as for expansion of special services such as traffic stripes and snow removal. To keep the crew within the present limits under such conditions has required careful planning and close cooperation between the district and headquarters offices. Some of the measures taken are reviewed:

Bridge Repairs and Painting

During the war years work on bridges was limited to the most essential work to keep them in service and preserve the investment. Painting of the bridges was practically ignored during that period. Furthermore, the number of structures in the highway system has increased, as previously mentioned, due to divided highway and freeway construction. It has been necessary, therefore, to increase

the number of men assigned this phase of maintenance. The painting by maintenance forces is confined practically to incidental spot painting and to work on the smaller structures where the cost of advertising would be out of proportion to the total cost of painting guard rail, etc. All major work is handled under contract. This applies particularly to painting work, but the practice is followed, also, where major repairs are necessary if the time element and type of work will allow. A number of bridges that have failed under overloads have been replaced under emergency contract arrangements in a most expeditious and satisfactory manner.

The work of the bridge crews has been expedited and economies made by providing gasoline operated generating plants to operate power tools. Trucks with special bodies for storing and transporting tools and flat rack trucks equipped with winches and hoists to handle heavy timbers are now standard equipment. Pole dollies for hauling long timbers are now furnished these crews.

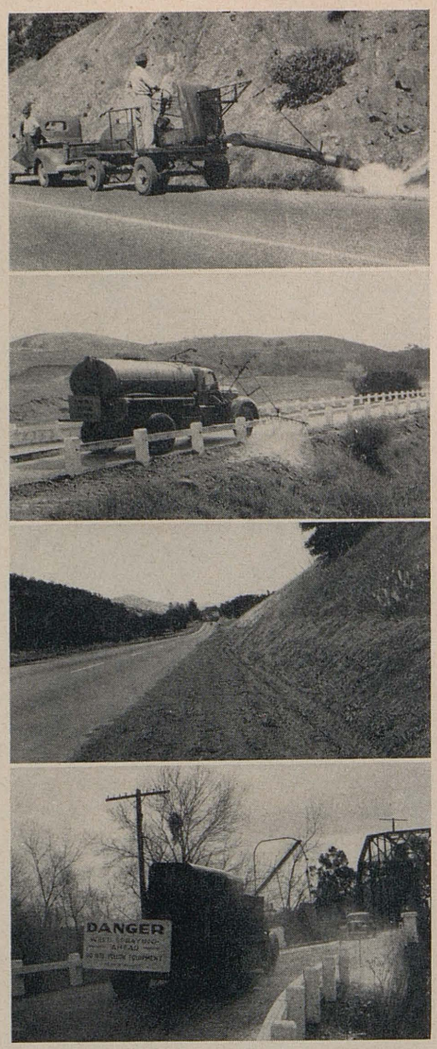
Snow Removal

The cost of snow removal has increased greatly since the war, as shown by the following tabulation:

Winter season	Direct cost	Total cost (including prorated overhead)
1942-43	$347,007	Overhead charges were not prorated for these five years
1943-44	522,322	
1944-45	474,510	
1945-46		
1946-47	509,737	
1947-48	818,778	$1,040,657
1948-49	1,487,103	$1,774,115
1949-50	1,258,000	Not available at time of writing

The 1949-50 totals shown are estimated, as the cost of opening the mountain passes closed during the winter have not been accumulated at this time. There is little that management can do in the control of cost of snow removal, except to provide the best possible equipment in sufficient amount and see that the supervision is adequate. The work required varies greatly from season to season, depending to some extent on the volume of snowfall, but much more on water content in the snow, air temperatures, wind velocities, spacing of storms and traffic pattern.

The expense of handling removal work for a given storm may be affected considerably in a given area, depending on whether it occurs during a week-end



TOP—Trailer-type burner unit used in control of roadside vegetation. NEXT—Tank truck equipped with outrigger for spraying around guard rail and sight posts. NEXT—Showing area sprayed for fire control purposes. BOTTOM—Equipment en route to weed spraying area

period of heavy recreational traffic or during the Monday to Friday period of normal through traffic. It is necessary to organize a minimum standby force at the beginning of a season and to keep such force activated regardless of whether storms are heavy or light. The length of the storm periods is also an unpredictable factor, as overtime of men and equipment increases the cost.

Sanding Roads

During the last two years the cost of sanding icy pavement has been on the increase. The principal improvement in this work has been the adoption of the "Missouri" type sander. The total number of sanders in regular service is 75. An additional 21 units have been requested for next season. Of the present total, 48 are of the "Missouri" type. In order to save time in connection with sanding operations, large sand storage bunkers have been constructed at convenient points on several routes such as the Ridge Route in Los Angeles and Kern Counties and at a number of locations in the northern part of the State. Dry sand or sand mixed with calcium chloride is stored in these shelters at the beginning of the season. The shelters are so designed that trucks may be loaded by simply lowering the chute and opening the gate. The sanding operations are thus speeded up, as well as handled more economically.

A major economy on snow removal work is secured in connection with proper timing of start of work in the spring on roads which have been closed during the winter. There is always pressure by chambers of commerce and other interested groups for early start of such work. There is nothing gained by starting such work on a Sierra pass route until the snow has softened sufficiently so that ready progress can be made. Every effort is made to so time this work that the routes will be open at the earliest possible date consistent with economy in the operation.

Traffic Striping and Pavement Markings

On traffic striping work the broken single line adopted during the war years has been continued as standard practice. The use of this broken stripe makes a saving of 110,000 gallons of traffic lacquer in a single year. This represents a saving of $200,000 per year on an average for the last five-year period. Immediately after the war a new traffic striping machine was designed and constructed in the headquarters shop. This machine is believed to be one of the most modern type in service anywhere in the United States. The new machines are so designed that a single stripe, a double stripe, or even two white stripes and a center black stripe may be placed at one time at the will of the operator. Further, a solid stripe and broken stripe may be placed continuously as desired, alternating from right to left. Glass beads are

applied at any desired rate at the same time. These machines permit the application of reflectorized or plain traffic striping at considerable increased speed with resulting savings, of course, in the cost of the work. The specifications for traffic lacquer now conform to prewar standards, and provide better and more long-lasting material than could be secured during the war years. Specifications for beads applied to the stripe have been changed to provide a smaller diameter of beads which will also give a longer life on the road.

Tree Maintenance

An economy has been secured in the maintenance of roadside trees and shrubs through the use of electrically powered chain saws on tree trimming work, representing a major saving for this item. Flatbed trucks have been acquired also for this type of work. These trucks are fitted with power winches for handling heavy limbs and similar loads. Equipment with telescoping tower is used on tree-trimming operations. This equipment is particularly applicable in the areas in the State where there are considerable numbers of palm trees, as the cutting of the dead fronds from these trees is always a slow and very uncomfortable operation from the operator's point of view when it was necessary to rig lines and work from a swinging platform or rope chair.

Noxious Weed Control

A considerable portion of the annual control of noxious weeds has been delegated to county authorities where the counties were properly equipped and manned to handle the work. Some economy is effected due to the fact that we only pay the actual cost of the work and since their operations also include county roads, we secure whatever benefits result from the increased volume of work. There is also the advantage that state crews are available during the season when most needed for regular maintenance work on the highways.

Erosion Control

It has been found that economy can be made in maintenance of slopes if work is undertaken as soon as small gullies, etc., start to develop, rather than waiting until a major project develops. Such control measures as are taken thus not only keep the slopes in better shape, but reduce the amount of material washed into the ditches which must later be removed. The maintenance of landscaping of freeways, etc., is becoming a major item of work. The upkeep of planting of this type is primarily for appearance' sake, although, of course, there is some benefit from the protection of slopes, etc. There is little opportunity to effect an economy on the work. The watering, mowing, cultivating, etc., must be kept up to a certain standard at all times to be effective. It is found that the cost of maintenance for the first year following the establishing period of plantings of this type sometimes is almost as great as for the original planting. Some savings are effected by the use of chemical weed controls and savings are also made by providing larger power lawn mowers, which the operators are finding they can operate on steeper slopes than formerly, thus eliminating considerable handwork. It is essential that machine methods be used to the greatest possible extent on all this work.

UPPER—Preparing premix surfacing material. NEXT—Reworking pavement surfaces with heavy-duty scarifier and mixer unit. NEXT—Cleaning joints in concrete pavement preparatory to sealing with rubber compound. LOWER—Jig attachment and jackhammer used in drilling holes in concrete pavement preparatory to pumping asphalt for subsealing

Fire Hazard Control

Commercial compounds are being used largely for work of this type. While there is little saving in the cost of the use of these compounds in comparison to the use of diesel oil, there is saving due to the fact that the necessity of burning the wilted vegetation is eliminated with the compound if applied sufficiently early in the season. The practice has been changed to provide for spraying a six-foot width adjacent to the shoulder. This replaces the nine-foot width formerly sprayed adjacent to the fence lines. The work can be handled more rapidly and a considerable saving results, of course, in material required.

Trailer-type weed burners which were acquired immediately after the war are used where vegetation growth is heavy. These units are equipped with an outrigger arm and designed to carry a burner head through which burning of roadside weeds and other roadside vegetation is carried on from the shoulder line as a continuous operation. Wherever possible, motor graders are used to blade off the vegetation. This type of work, of course, is restricted to suitable localities, as it is not always desirable to disturb root growth. Commercial compounds are being used to sterilize the soil and reduce the amount of vegetation growth in areas where such practices will not result in later erosion damage. These materials are used, also, around sight posts, road signs, guard rails, etc., where hand-control methods were formerly practiced. The equipment used in spraying roadsides has also been improved by an outrigger arrangement which can be more efficiently handled by the operator riding in the seat of the truck.

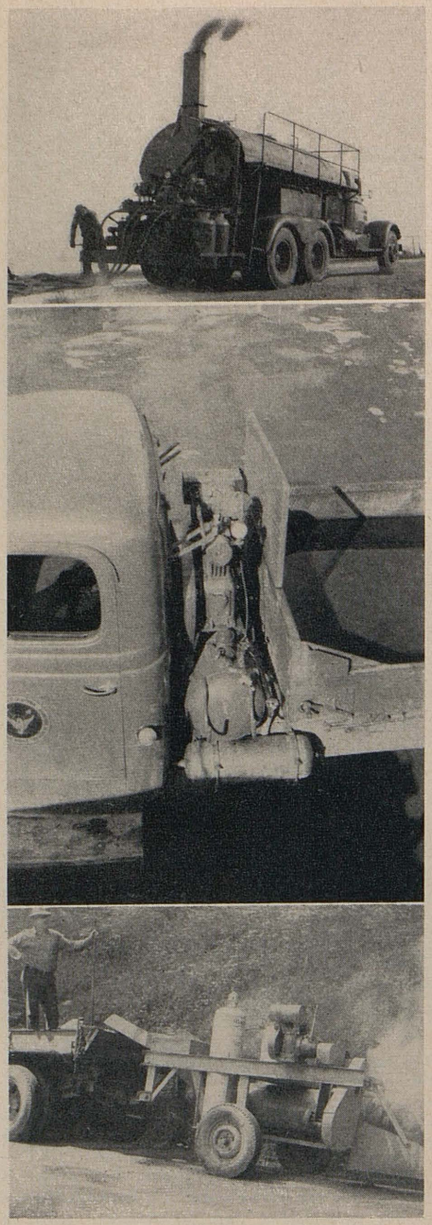
Subsealing Concrete Pavements

The practices followed in subsealing concrete pavements with asphalt have been improved. An outrigger jig is used to support the jackhammers in drilling holes on such work. The use of this outrigger doubles the number of holes which can be drilled in a day and practically cuts the cost of this item in half. Special asphalt tanks have been constructed at headquarters shop for handling the material and for pumping it under the pavement. These trucks are equipped with burners so that the asphalt can be kept at the proper temperature, and hoses and other appliances are arranged to permit the most ready operation.

In the past four years some $750,000 has been expended on this type of work. It is anticipated that it will be continued for a number of years. The savings made in the more efficient operation will be considerable over a period of time. The original asphalt heating units used in connection with subsealing operations are also used in sealing longitudinal joints on Portland cement concrete pavements where asphaltic materials are used. The use of this equipment represents a considerable advance, as platforms for the men are installed on the rear of this equipment and special nozzles are installed which are adjustable to meet varying conditions so that it is possible to fill longitudinal joints at a speed of two to three miles per hour. Not only is neater work performed with this equipment as compared to former hand methods, but there is a saving of time and economy in this manner of handling the work.

Cleaning and Subsealing of Joints

A good deal of study has been given to the practice to be followed in sealing the construction joints in concrete pavements. Both hot rubber and emulsified latex type asphaltic compounds have been used. Special equipment is required for each of these types. The joints must first be cleaned, which requires special equipment. The maintenance forces have worked with the manufacturers of such equipment, which has resulted in development of very effective units for this type of work. The methods used in applying the filling material have been improved upon over the former practice and the Division of Highways has worked with the producers of material in order to secure the best product for the purpose. While the original cost of sealing joints with the rubberized types of materials is considerably higher than the asphalt compounds previously used, it is expected that the new materials will have a long life which will far offset the first cost.



UPPER—Tank and heating unit for pumping asphalt used in subsealing concrete pavement. CENTER — Compressor unit and 30-gallon storage tank for asphalt emulsing mounted on 1½-ton maintenance truck. BOTTOM— Heater unit used in heating premix material for patching during cold weather

Routine Maintenance

Many advances have been made in securing the most modern and practical equipment for different phases of maintenance work. The headquarters shop has constructed several asphalt distributing trucks with large capacity pumps, adjustable spreader bars, intercommunication control, and a number of other features which were suggested at conferences between representatives of the maintenance department and the equipment department. During the war years little attention was given to roadsides and on many miles of the highway the growth of brush was encroaching on the roadsides, and in a great many cases presented a hazard to traffic due to the obstruction of visibility.

In 1948 a heavy-duty brush cutter was secured which does a very effective job in cutting the brush and in eliminating a large amount of hand labor. Two of these units are now in service and once the brush cutting work is caught up, the organization will be able to keep the roadsides in good condition with these two units. The ton and one-half trucks used on general maintenance work have been equipped with a 30-gallon tank and air compressor for use in applying emulsified asphalt as a tack coat, etc., in connection with general patching work. These small units are thus always available to the crew and as a result a number of the 190-gallon emulsified asphalt kettles have been retired from service. It is anticipated that a considerable number will ultimately be retired due to more effective use of the tanks on the maintenance trucks. This arrangement will result in real economy in the routine patching work.

Patchwork in Winter

The maintenance organization also worked with the manufacturer in the development of a heater unit for heating premix bituminous materials. Using these units, patches can be made during the winter season in areas along the northwestern coast line of the Redwood Highway and similar locations throughout the State. In previous years it has been necessary to patch breaks in the pavement by placing road rock, which was only a temporary measure. The use of the premix material not only gives a

more permanent repair job, but the traveling public is better served.

The handling of materials by hand methods has been largely eliminated by the purchase of front end type loaders. A number of elevator type loaders were secured as soon as possible after the end of the war and such units are used to good advantage where the material can be windrowed by blade and placed in a position to be picked up readily. These units have reduced the time required and the over-all cost of cleaning ditches in several areas of the State, particularly along the Redwood Highway where frequent cleaning of the ditches is necessary due to the heavy rainfall and the character of the material along the roadsides in the cuts.

Heavy Duty Graders

Heavy duty type motor graders with 12-foot blades are now being furnished to all districts. These replace many of the eight-foot type which were in service during the war years. While these units are more expensive, they can handle heavier work and cover any kind of work to advantage. Another benefit is the reduction in the number of tow type graders. These units require a tractor for motive power and the use of two men—one to operate the tractor and the second the tow grader. A considerable number of the tow type graders and tractors have been retired as a result of the extensive use of the heavy duty motor graders.

Another feature developed in the last five years is the shoveling apron which is mounted on the rear of maintenance trucks. With this apron a quantity of material can be released from the body of the truck and carried in the apron. The apron is so mounted as to be convenient for the men spreading screenings and adds considerably to the ease and economy of making bituminous patches or screening sections of seal coat work. In reworking of bituminous surface, two types of equipment—one known as a preparizer and the other the pulvimixer—are used to advantage. The preparizer is a heavy duty scarifier type of machine which does an excellent job of breaking up bituminous surfacing and can also be used in remixing the material after oil has been added. The pulvimixers are smaller units which are not effective in the original breaking up of the surface,

UPPER—View of Donner Summit maintenance station showing radio towers. NEXT—Radio telephone installation in truck. NEXT—Truck shovel on slide removal work. LOWER—Power loader picking up spoil from roadside ditches

but are quite satisfactory units for remixing the material when once broken up. The use of this equipment results in better surfaces as compared to former methods of reworking with motor graders.

Signal and Highway Light Maintenance

Special equipment is required for the maintenance of traffic signals and lights along the highways. Ladder trucks are provided which will reach up to a height of some 30 feet and can be rotated to an angle of about 85 degrees. Equipment of this sort is necessary in relamping operations and similar work. The equipment used on the maintenance of traffic signals in the Los Angeles area have two-way radios installed so that the operators may be instructed to cover locations where difficulty has developed. These trucks are provided with special bodies for convenient handling of equipment, storage of tools, etc.

Road Signs

The maintenance of warning and directional signs, which had formerly been handled by forces of the two major automobile clubs, was taken over by the Division of Highways Maintenance Organization early in 1948. This work required the development of special equipment and training of men for the special activity. Some 17 crews are now engaged on this work throughout the State. These crews not only maintain the existing signs, but also install signs on new construction projects as required.

Radio Communication

The radio communication system, which was in service during the war years under special emergency license, is now in process of reconstruction to high frequency type of service. Under the license granted by the Federal Communications Commission System this method of communication can be used for any phase of highway work. An installation has been made in the Eureka district area, as well as the Los Angeles area. The system, which has been in use in the Redding, Marysville, Bishop and San Bernardino districts, is being changed to the high frequency type as rapidly as the men and material are available to carry out the work. This method of communication is very useful in maintenance work, particularly in connection with snow removal and sanding operations. The operators of equipment can get in touch with their headquarters immediately in case of any breakdown or unusual condition on the road. The supervisor is in a position to direct the assignment of equipment to the points where it is most badly needed. He can also order replacement parts or shift the equipment from place to place with the minimum of delay. When the system is completed, as planned, very considerable savings are anticipated in the supervision and actual carrying on of the work. The public will be better protected in case of any road closures or other emergency matters and the routine work can be carried on more economically than is possible without such communication.

Chapter XIX

Materials and Research Department

By T. E. Stanton, Materials and Research Engineer

During the early period of state highway construction in California between 1912 and 1920, preceding the later upsurge (national as well as local) in testing and research, the laboratory force consisted of one testing engineer and one to two assistants.

The work was carried on in a small house or shed at the State Fairgrounds and with very limited equipment.

In 1912, the automotive industry was in its infancy and as a consequence, paved roads outside cities were of limited mileage with a negligible background of experience on which to base performance predictions.

The approximate total motor vehicle registration in California in 1907 is reported to have been 10,020 and still less than 100,000 when state highway work was started in 1912. By 1914, the truck count was only 6,156 with no heavy trucks of today's standards. By 1920, the total motor vehicle count had reached 540,000 of which 32,555 were recorded as being trucks of all classifications with not over 2 percent or 10,000 being of five tons or over.

Serious Situation

It is obvious therefore, that the standards of construction of 1912 to accommodate less than 100,000 relatively lightweight motor vehicles were grossly inadequate to accommodate the traffic of only eight years later and that with a sixfold increase in truck traffic, the light pavements constructed during that period had shown serious distress long before 1920.

In fact, so serious had the situation become by 1919, that in 1920 the Bureau of Public Roads at the request of the California Highway Commission, made a study to determine the true condition of the roads built and, as far as possible, the causes of the existing conditions.

The bureau report on the California Survey was made in 1920.

The following year (1921), the California State Automobile Association and the Automobile Club of Southern California, published a joint engineering report on the California State Highways in which it was strongly recommended that the Highway Commission set aside a budget of sufficient funds for the continuous study of special problems including soils and subgrades, pavements and the effects of traffic.

Program Launched

The report commented that:

"These and other tests suggested by modern practice should be programmed. They would be expensive, would take time and would require a specially trained staff of assistants, but the magnitude of the work justifies such expenditures and would teach the commission and its engineers how to avoid otherwise costly mistakes."

Whether as a result of the above investigations, reports and recommendations, or as a logical development of the experience of previous years, it is a fact that shortly thereafter the State Highway Department started a program of testing, research and development which was continued unabated through subsequent years and which has kept pace with the increasing volume of traffic and the increased design, construction and maintenance problems.

The State Legislature of 1921, set up the Department of Public Works and included the State Highway Department therein. Immediately thereafter, all testing including the work of the Chemistry Department, which had up to that time been operating as an adjunct of the State Purchasing Agent, was placed under the jurisdiction of the Director of Public Works who, in turn, assigned the work to the Division of Highways.

Laboratory Established

To handle the increased volume of work, the California Highway Commission authorized the erection and equipment of a building to be known as the Testing and Research Laboratory.

The structure erected was a Class A building of brick, one story in height and covering an area of 3,465 square feet. Today, after nearly 30 years, this building still constitutes the main administrative part of the department, although expanding activities over the period of years have required ten-fold expansion of operating area. This requirement has been met by adding wings at each end of the old brick building for a total length of 80 feet and excavating a basement under the entire area for a total area of approximately 11,000 square feet. In addition, the operations have been expanded into corrugated metal warehouse areas outside the main building, approximately 25,000 square feet, or a total of 36,000 square feet.

All current operations are under cramped conditions in buildings built to accommodate only a fractional amount of the work now carried on. Hedged in by the Equipment Department requirements, there is no room for further expansion of the laboratory at its present site. This condition has been the motive behind a movement for a new laboratory to be built on a 10-acre site at Folsom Boulevard and 59th Street, purchased in 1946 in anticipation of an enlarged program of testing and research under the expanded highway program.

It is expected that the new structure will be built within the next two years; construction to start as soon as the Division of Architecture can complete the plans and funds become available.

TOP—Laboratory facilities of Highway Department during period 1912-1921—located on State Fair Grounds. CENTER—Laboratory Building constructed at 34th and Serra Way in Sacramento in 1921. BOTTOM—Laboratory at same location, enlarged in 1933

The new building will provide approximately 60,000 square feet of working area, sufficient it is hoped, to accommodate any forseeable future requirements, and will probably cost in excess of one and one-quarter million dollars.

Research

Among the outstanding phenomena of the second quarter of the Twentieth Century, has been the development and expansion of the research activities of private and public agencies in an effort to produce either more durable products or new products to satisfy the insistent demands of the public.

Webster defines "Research" as:

1. A searching for something, especially with care and diligence.
2. Careful or critical inquiry or examination in seeking facts or principles; diligent investigation in order to ascertain something.

"Research" is elsewhere further defined as:

> Critical and exhaustive investigation or experimentation having for its aim the discovery of new facts and their correct interpretation, the revision of accepted conclusions or the practical application of such new or revised conclusions.

By these definitions, it will be noted that by the term "Research" we do not mean merely searching in the ordinary sense of the word, but searching again and again—researching critically, exhaustively, until the goal of new facts, correct interpretations, right conclusions, or practical applications are attained.

What Research Involves

We speak of research as being "pure" or "applied." By "Pure Research" we usually mean the seeking after new knowledge principally for knowledge's sake. "Applied Research" on the other hand, connotes the desire to acquire knowledge in order that it may be applied in some practical way, such as increasing the serviceable life of highways, eliminating traffic hazards, or producing equally durable pavements and structures at lower cost. To be specific, the field of "Applied Research" as it relates to highway design, construction and maintenance involves studies and tests not only to determine the quality of rock, sand, cement, road oils, asphalts, steel, timber, paints and all of the other types of materials which may on occasion enter into state highway construction, but likewise the proper combining of these components to produce the most durable and serviceable combination attainable with the materials economically available.

In addition, research may involve studies relating to the type and positioning of warning and traffic guide devices and constructions to reduce traffic hazards to a minimum.

The Advisory Board on Highway Research of the National Research Council was formed November 11, 1920, to assist in outlining a comprehensive national program of highway research and coordinating activities thereunder with a membership consisting of:

> Those organizations of national importance interested in design, construction, economic maintenance and financing of highways; in materials and equipment therefor and in vehicles used on highways; governmental departments and bureaus of similar interests, the higher educational institutions * * *.

Bureau of Public Roads

California has always taken active part in the work of the board and the head of the Materials and Research Department has throughout the years been the official state contact member.

In May, 1918, the Federal Office of Public Roads and Rural Engineering started publication of the magazine *Public Roads*. Within two months, the "Office of Public Roads and Rural Engineering" became the "Bureau of Public Roads" but the official publication of that agency continued under the title, *Public Roads* until December, 1921, when publication was temporarily suspended under what is understood was a ruling that the Bureau of Public Roads was not authorized to issue a journal relating to highway construction, as such.

In March, 1924, publication was resumed under a ruling that the department was authorized to engage in research activities and to publish the results of any research conducted.

Nation-wide Research

The title now became *Public Roads —A Journal of Highway Research,* which title has persisted to the present date and during the intervening years the bureau has actively engaged in research not only on its own account in Arlington, Virginia, and elsewhere, but likewise nation-wide in cooperation with the different state highway departments, universities, and the Highway Research Board.

During the same period, industry engaged in the production of road building materials came to a realization that their interests were vitally affected and that it behooved them to promote quality in their products. As a result, research agencies gradually came into existence representing all materials interests, including the bituminous, Portland cement, aggregate, steel, timber, and paint industries operating in cooperation with nonindustrial technical associations in the different fields, including the universities and state highway departments.

Outstanding Laboratory

The California Division of Highways has available one of the greatest field laboratories in existence in the thousands of miles of state highways which in their construction and traffic control have involved the use of all classes of materials and combinations thereof.

It has, from the start, been the practice of the Materials and Research Department to not only make laboratory quality tests of all materials entering into highway construction, but to likewise continuously study the performance of these materials in actual construction to the end that advantage may be taken of the lessons learned from bad or inferior performance, to so improve the standards as to secure longer life and lower maintenance costs. In this field, the knowledge of the department extends over a period of almost 40 years and, up to the present time at least, not only has there been available the opportunity to observe and study performance history throughout that period, but there has been available for the purpose engineering personnel associated with the department throughout most, if not all, of the period and, therefore, thoroughly conversant with the problems involved.

Progress in Highway Design

It has been the practice of the department to constantly study the performance not only of the California state highway construction, but likewise the performance of construction under other

Testing and Research Laboratory as it looks today

jurisdictions; city, county, state, federal and even world-wide.

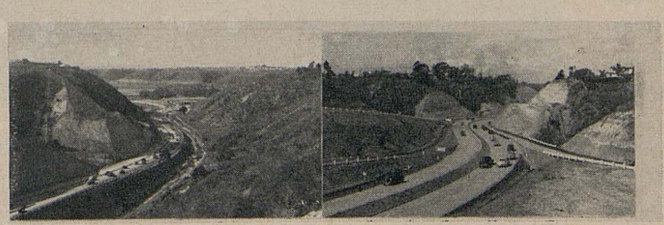
The result has been a gradual improvement in the performance and lasting quality of California state highways and the development of design standards not only leading to greater durability but likewise regulating and facilitating the flow of traffic and the guidance of this traffic so as to minimize traffic hazards.

This control has cost millions of dollars but it is the considered opinion that these millions have not only been well spent but that unsolved problems both new and old which still plague highway engineers justify the continued expenditure of hundreds of thousands of dollars annually not only in the testing of materials but likewise in the development of new standards of design, construction, maintenance and traffic regulation.

The value of the work of the department is best attested by others not connected with the organization as evidenced by the following national awards:

1. **The Wason Research Medal, by the American Concrete Institute in 1938, for a report on studies on "The Resistance of Cement to Attack by Sea Water and by Alkali Soils."**
2. **The Norman Medal, the highest award of the American Society of Civil Engineers, awarded in 1943, for a report on new discoveries of an outstanding nature.**
3. **National Highway Research Board Award in 1949, for an outstanding paper on factors underlying the rational design of pavements.**

In addition to the above, national technical literature is replete with reports on research conducted by the department in all fields of highway design, construction, maintenance and operation.



Chapter XX

The Equipment Department

By E. E. Sorenson, Equipment Engineer

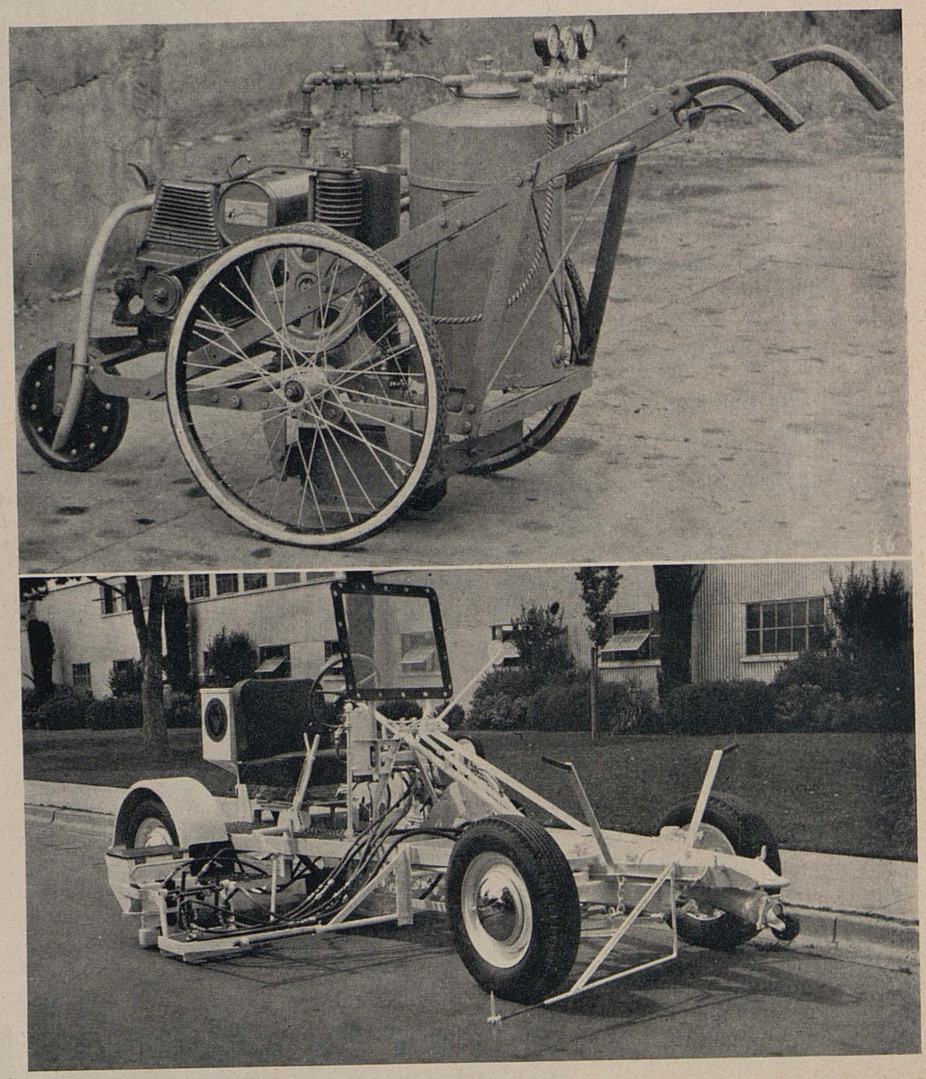
In the early days of the California Highway Commission, which on August 8, 1911, had been given a separate status from the then controlling State's engineering organization, very little need was felt for an Equipment Department; in fact, up to about the beginning of the first World War, the then Highway Engineer initiated and personally directed the purchase of, also oversaw the functioning of, the very few especially designed labor saving devices that were employed.

For much of the time during this period, many of the roads were constructed by handwork, the nearest approach to anything mechanical being horse drawn scrapers, plows, etc., and thereafter the roads were maintained by using the same machines and methods employed in their construction.

Early Day Equipment

With the exception of trucks, the following was about the extent of equipment especially designed for roadwork: pull graders and dump wagons (both for which horses usually furnished the motive power), occasional steam operated power shovels sometime using coal or wood for fuel, a few gas engines, pumps, and three-wheel steam propelled rollers. The same units, with the addition, at times, of timbered drags, were usually the limit of any labor saving devices used on road maintenance.

Until about 1919 the use of any late developments in the construction of roads for the then existing Highway Commission was initiated solely by the Highway Engineer. It was his custom to religiously keep abreast of the fast developing field of especially built equipment that might be adapted for use in road construction. Whenever any new device was announced in the current magazines or engineering pamphlets which he considered suitable, he would cut out the announcement, attach it to one of the then famous "Blue Backs," and, together with some comment as to its probable suitability, etc., for road building, would send it direct to the highway commissioners for comments. Provided their reply was favorable, the great venture of going into an untried field was taken as soon as the equipment could be bought.



UPPER—Highway striping machine in 1933. LOWER—Striping machine, 1948

Army Surplus

As a consequence of much United States Army surplus, resulting from termination of the first World War, the

government disposed of quantities of excess machinery, equipment and materials, all supposed to be adaptable to road building purposes. This surplus was offered to the states, the expense for its acquisition by them being, in most instances, the cost of handling and transportation from point of government's storage to point of the State's use. California's share of this windfall was expected to be various types of road construction equipment, but actually consisted mostly of trucks, although some shop equipment, truck parts, hand tools, pull graders, engines, and pumps with pipes also blasting powder were secured.

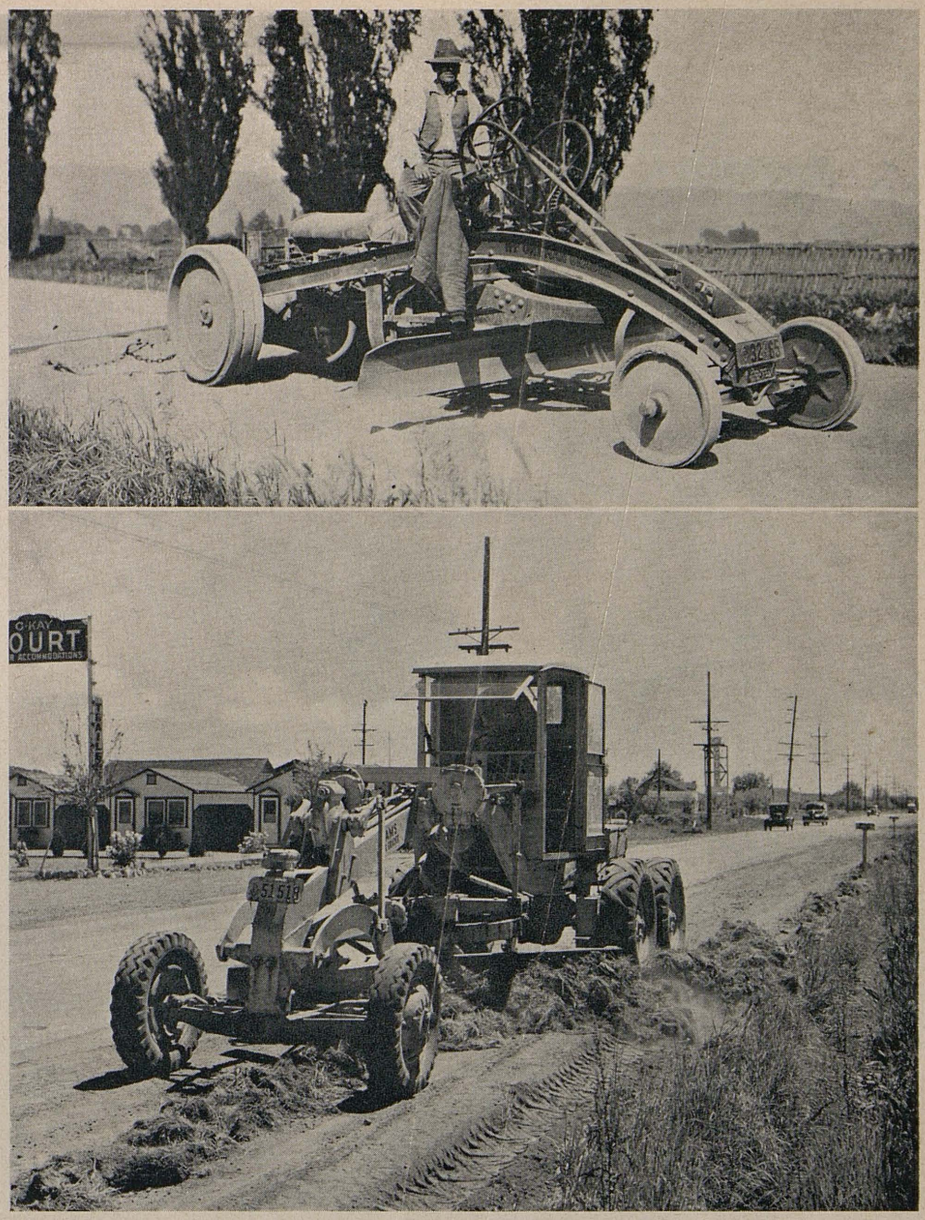
Much of the former government-owned road equipment and materials, allotted this State and said to have cost nearly 4½ million dollars, proved to be not well suited for the purpose intended, or was in poor condition, however its use brought into sharp focus the ease, savings in time, and better results obtained through using machine, rather than hand method, for road building.

Department Organized in 1919

Beginning around 1919 the Equipment Department, as it is now known, was organized, its first function being to select and oversee the acquisition of the State's fair proportion of war surplus equipment. However, as California, unfortunately, was about the farthest removed of all the participating states, and at the time also possessed a population ranking among the lowest, in many instances it was allotted equipment which had been passed over by other states; and this notwithstanding the fact that acceptable units had been selected, specifically designated by qualified personnel and promised for shipment.

During the period following the organization of the Equipment Department, and up to about 1924, the control of all major construction and maintenance equipment in districts, then termed "divisions," was vested entirely in the District Engineer, the Highway Equipment Engineer exercising only a part in its distribution, maintenance and repair.

The State Highway Engineer had by this time become thoroughly convinced that a more centralized control would result in minimizing the natural tendency of districts to hold on to equipment that had become a financial drain upon them.



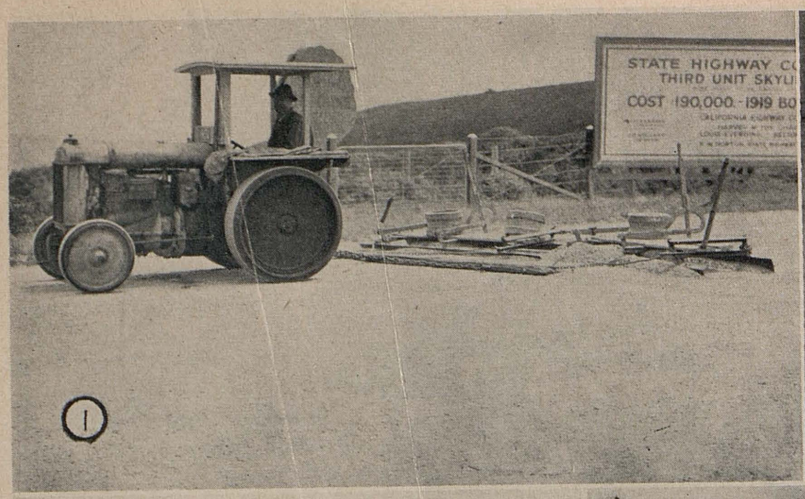
UPPER—One-man motor grader used in 1926—tractor can be separated from grader attachment.
LOWER—Adams motor grader working near Petaluma in January, 1942

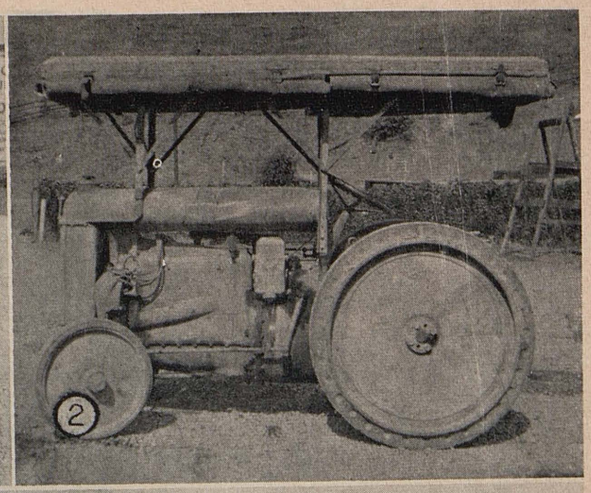
Therefore, it was decided that the newly organized Equipment Department should exercise control over all major highway construction and maintenance units (those assigned a CHC number); also that the department should act in a consultative capacity, passing on the advisability of purchasing any additional equipment asked for by a district.

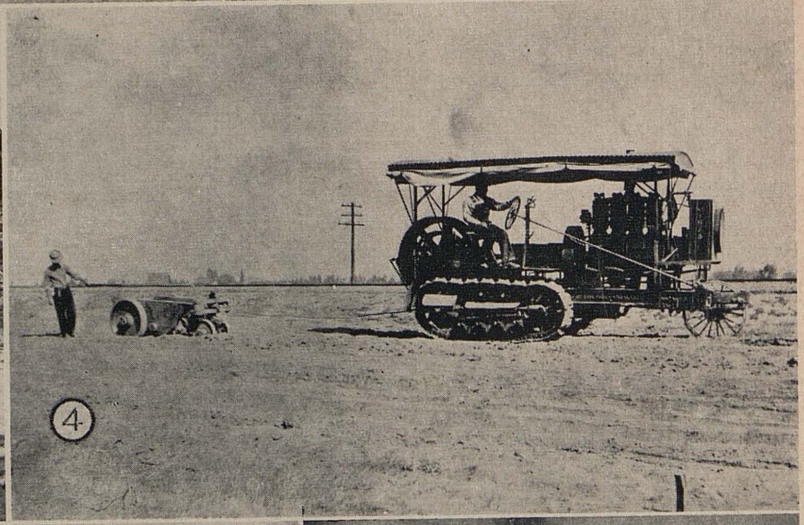
Separate Equipment Fund

It was also decided that all future purchases and repairs should be financed solely from a fund secured through charging all those using equipment, a fixed rental, which would be uniform to each type. In other words, the Equipment Department would own all major equipment and secure its entire revenue for a unit's replacement, current maintenance and administration, from rentals alone, each rental to cover furnishing of a "bare unit" only—without operating labor. All replacements were to be made whenever the unit in question was found to be uneconomical for continuance in service.

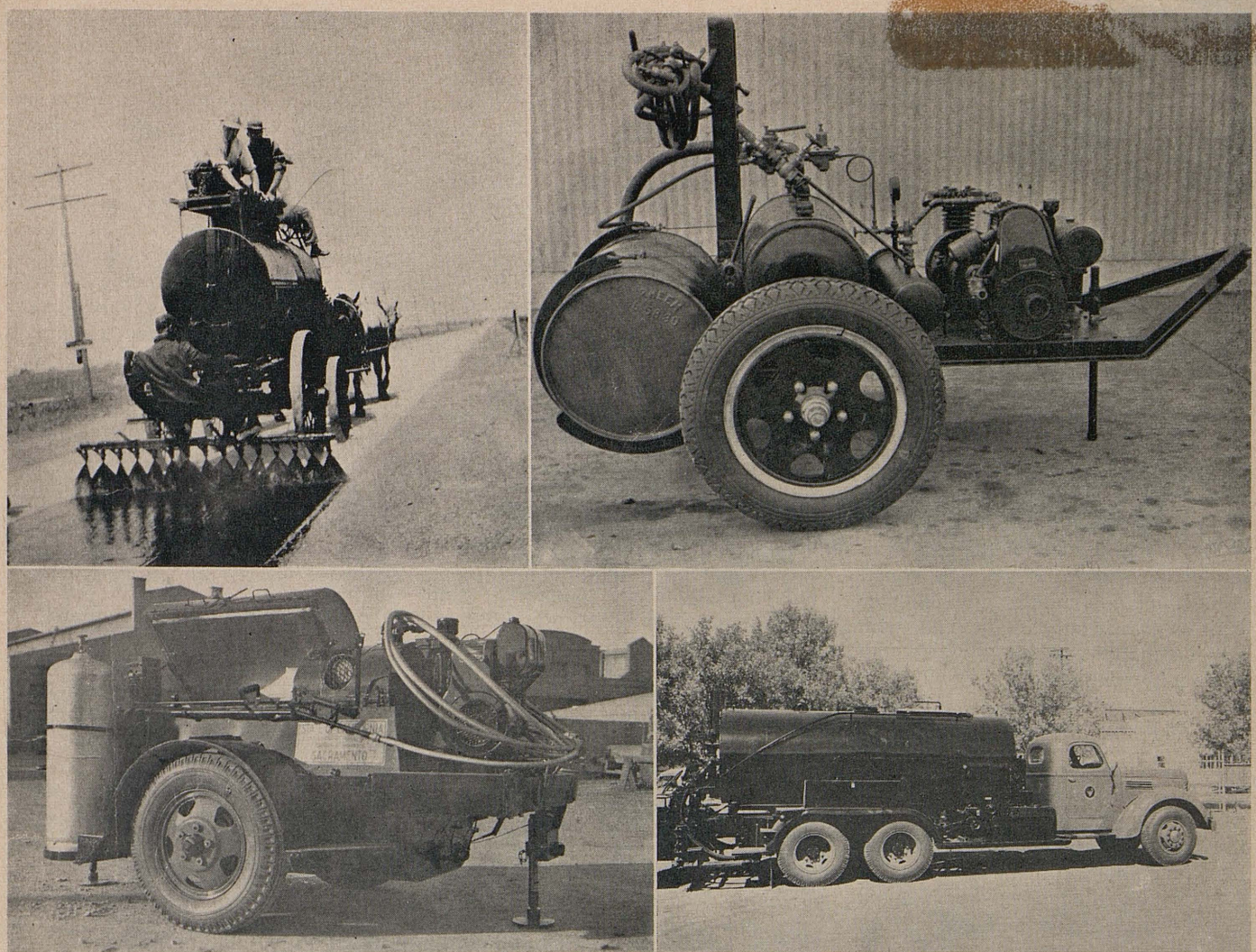
A physical inventory taken as of June 30, 1926, and accounted as of September, 1926, developed that the department had







1—Fordson & Monroe adjustable superior 13-foot two-way road drag, 1924. 2—Fordson tractor with canopy top, an old timer. 3—Three-mule team hauling sand being helped out of bog in early day highway building. 4—Caterpillar tractor pulling Austin-Western scarifier, 1913. 5— Fordson iron mule used on highway construction in Plumas County, 1933-35. 6—Buffalo-Pitts steam roller, 1913



UPPER LEFT—Oiling by 600-gallon, horse-drawn distributor, Fresno County, 1913. LOWER RIGHT—Modern oil distributor, 1,850-gallon capacity. UPPER RIGHT—Emulsified power asphalt kettle, 1937. LOWER LEFT—Modern 165-gallon asphalt kettle

a total of $3,259,649.88 in equipment, that amount being divided into $2,077,679.31 of automotive and $1,181,970.57 in construction units.

Theoretically, the rental applicable to any unit is fixed just high enough to insure its returning sufficient revenue to care for its upkeep, depreciation and administration. However, such a condition can only apply to the whole, as in regard to each unit, unknown and unforseeable factors may result in it returning revenue greater, or less, than that figured on for the average.

Rental System

The existing rental system is flexible and can always be adjusted to meet special conditions; it definitely serves to hold the capital investment to a minimum, also eliminates the natural tendency of districts to hold on too long to equipment for possible future needs.

The system employed to collect each unit's rental is by the use of a monthly equipment pay roll, on which all units assigned to a district are shown. This information is required each month, together with proper notations as to whether units are in use, and if so the number of shifts, etc., of use; whether they are laid up for repairs, or idle in the field. Such a report allows for a continual check to be made on a unit's condition and operation. The system also reveals any surplus of units that may exist in a district, thereby permitting needs for similar equipment in another district to be filled through a transfer.

District Shops

Each district shop, also all rental equipment located in the various districts, is directly controlled by a superintendent of equipment, who has under him a force of productive as well as clerical help. He also has the proper facilities for making all necessary repairs to the units under his supervision. In the event he lacks equipment for doing unusual repairs—permission is always obtainable to have them done in some local, outside shop. Forms incidental to maintaining correct records for each unit are accurately kept.

An excellent feature resulting from the above type of control is the spirit of competition that it engenders; this spirit has been heightened through furnishing

each of the 11 district equipment superintendents, also the party in charge of mechanical equipment on the San Francisco-Oakland Bay Bridge, with a comparative quarterly statement which shows the results of his department's operation.

From early in its organization, the department has furnished much major equipment to prison camps that are located in isolated sections of the State. These camps were established for the dual purpose of relieving congested conditions in the State's prisons, and for the supplying of labor for road work being done in sections where the obtaining of free man labor would be difficult.

Beginning with the fiscal year commencing 1948, the Equipment Department assumed control of all major equipment that had been previously required for maintenance work of the San Francisco-Oakland Bay Bridge. This equipment is now being operated on the same basis as that in all districts, and, with few exceptions, necessary repairs are made at its own shop.

Buildings and Floor Space

In order to furnish proper housing, both for repair and shelter for those units that may be temporarily idle, the Equipment Department has built adequate facilities at strategic points in each of the districts throughout the State. Isolated sections which are not readily accessible, such as prison camps, etc., are also furnished with the necessary tools and facilities to allow for prompt repairs being made to all equipment used at such points.

As of June 30, 1949, the total area of floor space available at headquarters and at the various districts amounted to 228,835 square feet. Since that time, because of an expanded highway program, which necessitated greater facilities for both repairs and shelter, one building containing 12,000 square feet of floor space, and to be used as a truck repair shop, has been built at Headquarters Shop in Sacramento. Also, additions to, and improvements to existing shop facilities at other points, which approximate 50,000 square feet, are now in the course of being designed and constructed.

Rental of Outside Equipment

Because it would be out of the question, as well as financially unsound, to constantly maintain extra units of equipment from which the needs for special jobs could be supplied, it has long been the highway's custom to "rent" some construction units from outside sources. These units are usually completely manned and fueled, and require their upkeep to be cared for by the owner. Before such equipment is secured, the want is always checked against a list of state-owned equipment that, at the time, might be available for transfer. Incidentally, it has sometimes been found that while similar highway-owned equipment may be available for transfer, the short period of the need, plus costs incidental thereto, is found not to warrant its transfer.

Changes in Methods

During the last 18 months, a number of changes in the methods previously used by the Equipment Department have been brought about.

Adequate office facilities have been constructed and are now being occupied. Various departments have been shifted around in the interests of more economical operation, and a new truck repair building has been added to alleviate the crowded conditions in the heavy equipment department.

A standardization committee has been working on improvements to certain equipment or parts that are in frequent use. As the Equipment Department has over 5,300 separate pieces, representing a capital investment of over $14,000,000, with approximately 200 pieces having very similar attachments, such an accomplishment would be very desirable for the Highway Department. But it should be kept in mind that many makers of construction equipment who are involved, question the change as being of general value—as it could not apply to equipment serving parts of the country having widely different requirements.

This standardization procedure is slow and will, unquestionably, require some time to bring about the desired results.

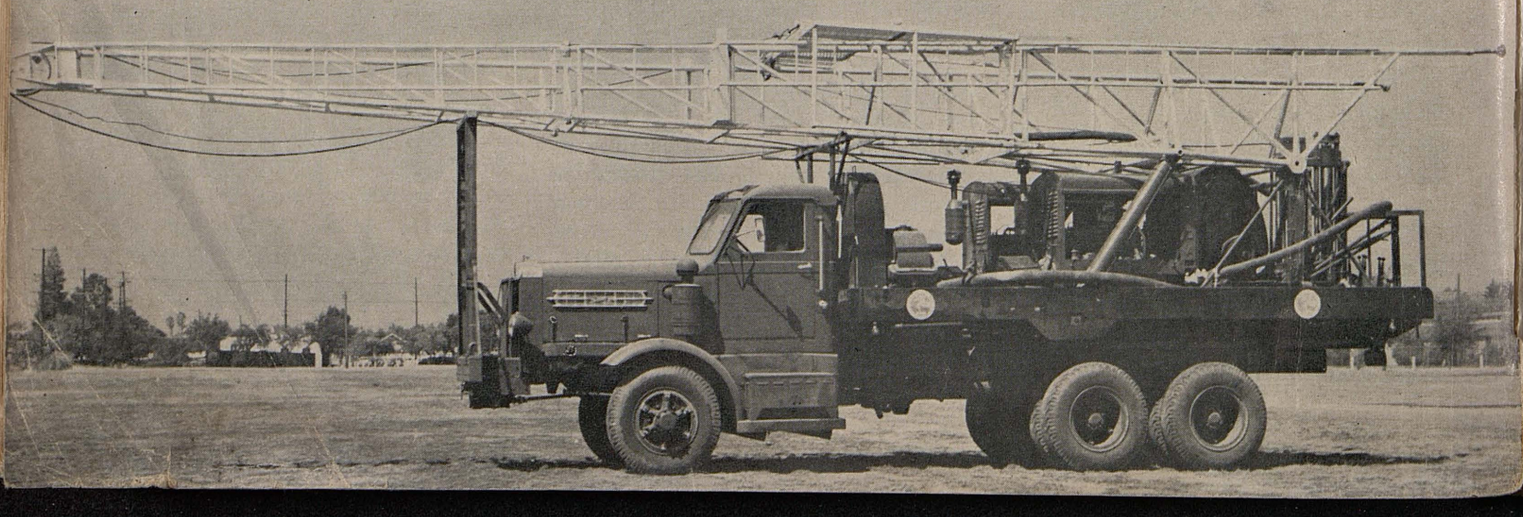
Repairs to Other State Equipment

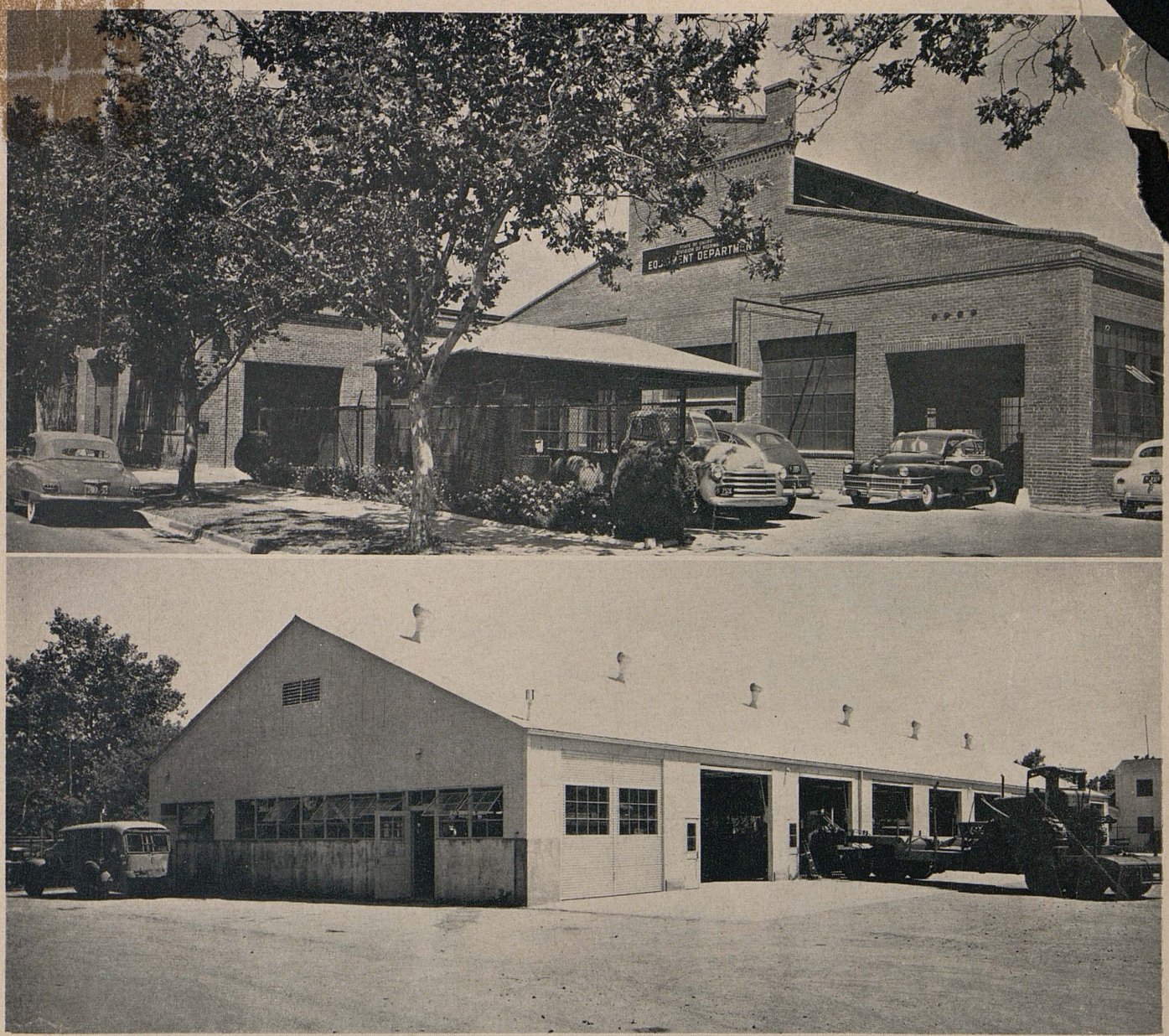
Although the various types of equipment, purchased for special purposes, frequently require alterations in order to better meet the needs of the department, it continues to be the policy of the department to secure such equipment by purchasing in the open market rather than by constructing it in its Equipment Department shops.

So far, most makers of standard equipment have been found very receptive to suggestions which lead to improvements or modifications of their units, so that they may better fit the State's needs or comply with some indicated need developed through actual use.

In furtherance of the task of decreasing the State's general operating costs, facilities of the Equipment Department are increasingly being called on to

Materials and Research Soil Testing Drill Rig Built at Sacramento Highway Shops





Two views of the present Division of Highways Shops in Sacramento

render urgent repairs to equipment of other state departments which may have broken down, or become decommissioned, near a Highway Department's already existing repair shop. The use of these shops invariably does away with the necessity for the long "dead" hauls necessary in returning the broken-down unit to the point where repairs are usually made.

Personnel

Headquarters Equipment Department and Headquarters Shop employ a total of approximately 160 at their plant, located at 34th Street and Stockton Boulevard, Sacramento.

The district shops, and other outlying shops, employ approximately 400, making a total of approximately 560 in the Equipment Department.

The only employee still working who is personally acquainted with the entire history of the Equipment Department is Major William J. Gough, Assistant Equipment Engineer. He was assigned to the department in 1919, at about the time a large quantity of World War I equipment was received, and has been continuously in a supervisory capacity since that time. This article was prepared under his supervision, and from his large stock of personal information.

When the Equipment Department was organized in August, 1921, R. H. Stalnaker, who entered the service of the Division of Highways in 1911 and who retired on January 1, 1949, was placed in charge as Equipment Engineer and served continuously in that capacity until his retirement. He set up the equipment rental system in January, 1924.

EARL WARREN
Governor of California

•

CHARLES H. PURCELL
Director of Public Works

•

FRANK B. DURKEE
Deputy Director

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official Journal of the Division of Highways, Department of Public Works, State of California

CHARLES H. PURCELL, *Director* — GEORGE T. McCOY, *State Highway Engineer*

KENNETH C. ADAMS, *Editor*

HELEN HALSTED, *Associate Editor*

MERRITT R. NICKERSON, *Chief, Photographic Section*

Published in the interest of highway development in California. Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

Address Communications to
CALIFORNIA HIGHWAYS AND PUBLIC WORKS
P. O. Box 1499, Sacramento, California

Vol. 29 — Nos. 9, 10

HIGHWAY COMMISSION

C. H. PURCELL . . . . . Chairman
HARRISON R. BAKER . . . . . Pasadena
HOMER P. BROWN . . . . . Placerville
JAMES A. GUTHRIE . . . . . San Bernardino
F. WALTER SANDELIN . . . . . Ukiah
CHESTER H. WARLOW . . . . . Fresno
CHARLES T. LEIGH . . . . . San Diego

DIVISION OF HIGHWAYS

GEO. T. McCOY . . . . . State Highway Engineer
FRED J. GRUMM . . Deputy State Highway Engineer
J. G. STANDLEY . . Assistant State Highway Engineer
R. M. GILLIS . . . Assistant State Highway Engineer
F. W. PANHORST . . Assistant State Highway Engineer
J. W. VICKREY . . Assistant State Highway Engineer
R. H. WILSON . . . Assistant State Highway Engineer
T. E. STANTON . . . Materials and Research Engineer
GEORGE F. HELLESOE . . . . Maintenance Engineer
C. E. WAITE . . . . . Engineer of Design
EARL WITHYCOMBE . . . . Construction Engineer
H. B. LA FORGE . Engineer of Federal Secondary Roads
L. V. CAMPBELL . Engineer of City and Cooperative Projects
EARL E. SORENSON . . . . . Equipment Engineer
H. C. McCARTY . . . . . Office Engineer
J. C. YOUNG . . . . . Traffic Engineer
J. C. WOMACK . . . . . Planning Engineer
I. O. JAHLSTROM . . . . Principal Bridge Engineer
STEWART MITCHELL . . . Principal Bridge Engineer
E. R. HIGGINS . . . . . Comptroller

Right of Way Department

FRANK C. BALFOUR . . . Chief Right of Way Agent
E. F. WAGNER . . . Deputy Chief Right of Way Agent
GEORGE S. PINGRY . . . . . Assistant Chief
R. S. J. PIANEZZI . . . . . Assistant Chief
E. M. MacDONALD . . . . . Assistant Chief

District IV

JNO. H. SKEGGS . . Assistant State Highway Engineer

District VII

P. O. HARDING . . Assistant State Highway Engineer

DIVISION OF HIGHWAYS

District Engineers

A. M. NASH . . . . . District I, Eureka
J. W. TRASK . . . . . District II, Redding
CHARLES H. WHITMORE . . . District III, Marysville
B. W. BOOKER . . . . . District IV, San Francisco
L. A. WEYMOUTH . . . . District IV, San Francisco
E. J. L. PETERSON . . . . District V, San Luis Obispo
E. T. SCOTT . . . . . District VI, Fresno
W. L. FAHEY . . . . . District VII, Los Angeles
M. E. CESSNA . . . . . District VII, Los Angeles
E. Q. SULLIVAN . . . District VIII, San Bernardino
S. W. LOWDEN . . . . . District IX, Bishop
JOHN G. MEYER . . . . . District X, Stockton
E. E. WALLACE . . . . . District XI, San Diego
HOWARD C. WOOD . . Bridge Engineer, San Francisco-Oakland Bay Bridge and Carquinez Bridge

DIVISION OF CONTRACTS AND RIGHTS OF WAY

Legal

ROBERT E. REED . . . . . Chief
GEORGE C. HADLEY . . . . . Attorney
HOLLOWAY JONES . . . . . Attorney

DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

RALPH A. TUDOR . . . . . Chief Engineer

DIVISION OF WATER RESOURCES

A. D. EDMONSTON . . State Engineer, Chief of Division
P. H. VAN ETTEN . . . . Assistant State Engineer
W. H. HOLMES
Principal Engineer, Design and Construction of Dams
G. H. JONES . . . . . Principal Hydraulic Engineer, Sacramento River Flood Control Project
T. R. SIMPSON
Principal Hydraulic Engineer, State-wide Water Plan
T. B. WADDELL
Principal Hydraulic Engineer, Central Valley Project
GORDON ZANDER
Principal Hydraulic Engineer, Water Rights
GEORGE B. GLEASON
Supervising Hydraulic Engineer, Los Angeles Office
HENRY HOLSINGER . . . . . Principal Attorney
T. R. MERRYWEATHER . . . Administrative Assistant

DIVISION OF ARCHITECTURE

ANSON BOYD . . . . . State Architect
W. K. DANIELS . Assistant State Architect (Administrative)
P. T. POAGE Assistant State Architect (Design and Planning)
D. C. WILLETT . . . . Chief Construction Engineer

Headquarters

A. F. DUDMAN . . . Principal Architectural Designer
C. L. IVERSON . . Supervising Architectural Draftsman
CARLETON PIERSON . Supervising Specification Writer
FRANK A. JOHNSON . . Principal Structural Engineer
C. A. HENDERLONG
Principal Mechanical and Electrical Engineer
WADE HALSTEAD . . . . . Supervising Estimator

Schools

W. H. PETERSEN Principal Structural Engineer, Sacramento
H. W. BOLIN . Principal Structural Engineer, Los Angeles

printed in CALIFORNIA STATE PRINTING OFFICE 25869 4-50 28M

CALIFORNIA REPUBLIC

FR
E. F. W.
GEORGE S. PIN
R. S. J. PIANEZZ
E. M. MacDONALD

printed in CALIFORNIA ST

El Camino Real

THE FIRST HIGHWAY IN CALIFORNIA

Inches
D50 Illuminant, 2 degree observer
Density
Golden Thread
Colors by Munsell Color Services Lab
Don Williams
centimeters