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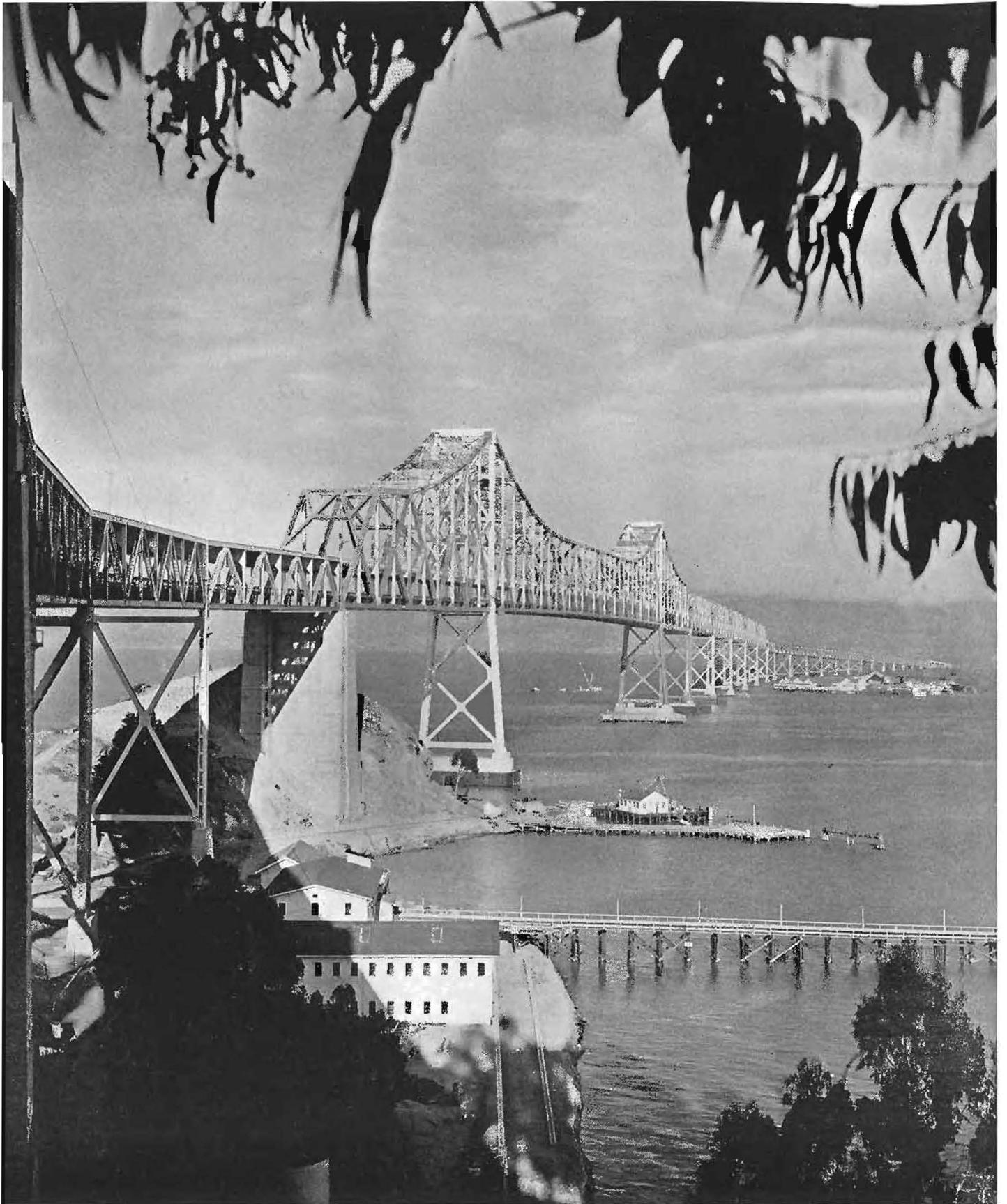
CALIFORNIA  
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# CALIFORNIA

HIGHWAYS AND PUBLIC WORKS

*San Francisco-Oakland Bay Bridge  
Dedication Number  
November 1936*

Official Journal of the Department of Public Works



Cantilever Span and East Bay Approach Structure as Seen from Yerba Buena Island



Flanked by Earl Lee Kelly, Director of Public Works (left) and Chief Engineer C. H. Purcell (right), Governor Frank F. Merriam burns first barrier on Oakland side of Bay Bridge.

# Burning Barriers, Governor Merriam Opens San Francisco-Oakland Bay Bridge

**A**N ACETYLENE torch in the hands of Governor Frank F. Merriam burned asunder a heavy chain barrier; an electric button pressed by President Roosevelt in the White House in Washington flashed the green "Go" signal and three columns of whirring automobiles sped from each shore of San Francisco Bay over six lanes of the world's greatest aerial highway—the San Francisco-Oakland Bay Bridge—a half hour after noon on November 12, 1936.

Cannons roared, bombs burst in air, sirens and whistles shrieked and massed thousands of enthusiastic citizens at the east and west approaches to the great structure blasted the welkin with their cheers.

California's long dreamed of bridge across the bay of San Francisco had become a reality.

With the formal opening of the huge span to automobile and truck traffic, the curtain rose on the highway drama of wheels over San Francisco Bay that will present a continuous performance to be enjoyed by future generations down through the centuries.

During the first 108 hours of its

operation as a State Highway this record breaking bridge broke all traffic and safety records by carrying more than 250,000 autos, buses and trucks and approximately one million persons without one serious accident. Traffic experts have figured that for each 100,000 cars traveling at highway speed there are three fatal accidents in each cycle of twenty-four hours. The only mishaps were bent fenders and bumpers.

The setting of this remarkable record was attributed to the bridge's six traffic lanes, its unsurpassed night lighting system, the segregation of truck and auto traffic on different decks and efficient handling of an unprecedented traffic situation by the California Highway Patrol.

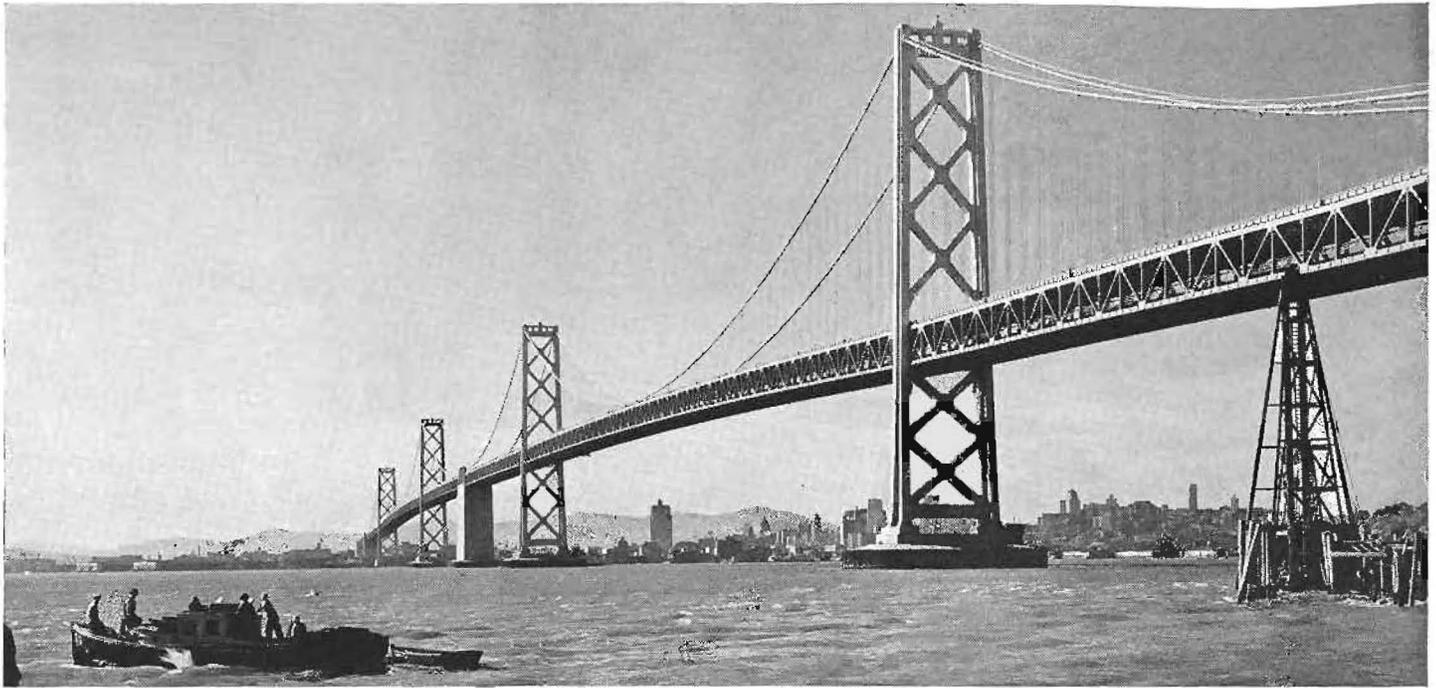
This safety record climaxed a day of thrilling events on land and sea beginning with impressively staged dedication ceremonies at both the Oakland and San Francisco plazas marked by stirring speeches by noted state and national figures, the cheering of jubilant throngs, a spectacular air show by fifteen squadrons of navy planes, a colorful marine parade by

scores of gaily decorated yachts and motor boats, and roaring salutes from the big guns of the United States battle fleet anchored just south of the bridge.

San Francisco and the East Bay district celebrated the opening of the bridge with a four-day festival unequalled in the history of the state. Oakland set the pace on Armistice Day with parades, a regatta on Lake Merritt, fireworks and a great military and naval ball, curtain raiser for the long-awaited opening of the structure on November 12 and the parades, pageants and festivities that were to follow in San Francisco.

## STARTED AT OAKLAND END

Official dedication ceremonies began at 10 o'clock on the morning of November 12 at the toll plaza at the eastern terminus of the bridge. Here were gathered thousands of men, women and children, many of whom had passed most of the night in their automobiles in order to be among the first to cross the bridge when it was formally thrown open. They came to hear the speeches of prominent officials, leading citizens and the builders of the huge transbay struc-



Taken from water level, this photograph shows the majestic sweep of the Bay Bridge suspension spans between San Francisco and Yerba Buena Island.

ture themselves, and to see Governor Merriam cut the chain barrier that stretched across the traffic lanes soon to be opened to them.

In front of the crowd, vividly reminding of pioneer California days and slower modes of travel were an ox-drawn cart from Sacramento, a stage coach from Auburn, a prairie schooner from Woodland, an Indian with squaw and papoose on a drag from Oroville and prospectors and their burros from Placerville.

Presiding on a speakers' platform filled with notables, Harrison S. Robinson of Oakland, president of the Financial Advisory Committee, officially started the dedication ceremonies.

"This bridge," he said, "is an inspiring example of the great things which can be accomplished when men work together—a modern miracle—a supreme achievement of human endeavor."

Mayor William J. McCracken of Oakland marvelled at what the bridge engineers had achieved.

#### ANOTHER WORLD WONDER

"What they have produced," he said, "is a world-wonder, significant in its economic, human and spiritual advantages to all of California."

"It is the greatest engineering feat of modern times," declared William J. Hamilton, chairman of the Alameda County board of supervisors.

Mayor E. N. Ament of Berkeley and

W. J. Buchanan, chairman of the Contra Costa County Board of supervisors expressed themselves in similar vein and were followed by former Governor C. C. Young, under whose administration preliminary steps toward the building of the bridge were taken.

"Feeling that privately owned bridges had no proper place in a great publicly owned state highway system," Mr. Young said, "we laid in 1929 the legislative foundation upon which this magnificent structure has been built. A policy of public toll bridges was inaugurated. The present Toll Bridge Authority was created and given the specific task of projecting a bridge between San Francisco and Alameda counties."

#### MEEK'S VISIT TO WASHINGTON

Mr. Young told of the visit B. B. Meek, then Director of the Department of Public Works, made to President Hoover in Washington in the summer of 1929 and of the cooperation he obtained from the federal government in the creation of the joint State and Federal Bridge Commission.

"The commission met and organized in my office in Sacramento, October 7, 1929," Mr. Young concluded. "With the assistance of State Highway Engineer C. H. Purcell and the Department of Public Works within a year the commission had

completed its study and made its report. The site had been selected. The design had been adopted. The finished product is before us.

"Hearty congratulations are due to the present State administration, which has brought this great work to so successful a conclusion. I know how happy they must be to present it to the people of California and I rejoice with them in its completion. This is a great day for all of us."

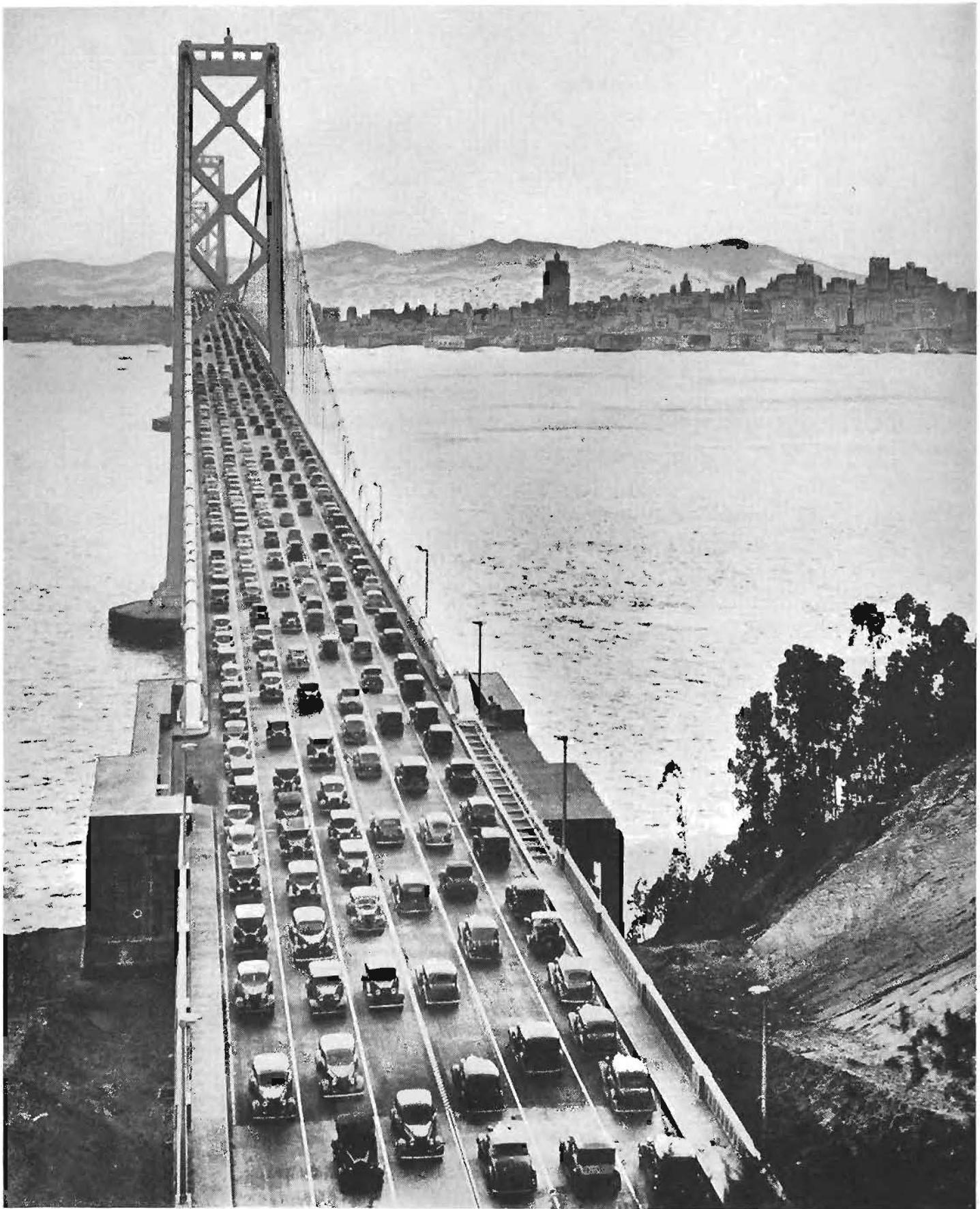
#### TRIBUTE TO WORKERS

The man who built the bridge, Charles H. Purcell, Chief Engineer and State Highway Engineer, followed Mr. Young. He declared that the completion of the bridge ahead of schedule and below estimated cost is "a tribute to the intelligence of the American working man, which can not be equalled by any other nation."\*

"The opening of this bridge," said Earl Lee Kelly, Director of the Department of Public Works, "is the first step in eliminating the isolation of San Francisco. This isolation never will be entirely done away with until the bridge is toll free and I predict that it will be toll free in not to exceed twenty years.

"This bridge today becomes a part of our State highway system, a highway system that is equalled by none in the world. It will do much to help

\* Mr. Purcell's speech in full on page 22.



*Photo by Courtesy of San Francisco Examiner*

Wheels over San Francisco Bay. Six traffic lanes on new bridge filled with autos. View from Yerba Buena Island to San Francisco.



The San Francisco-Oakland Bay Bridge is open for business! Photograph shows automobiles leaving toll station on Oakland side and machines from San Francisco arriving there shortly after President Roosevelt in Washington flashed by wire the "Go" signal on November 12.

the great exposition San Francisco is planning for 1939. It will bring the cities of the bay district into closer union and on this day of its dedication I am proud to sit with the Governor and distinguished guests gathered for its opening."

#### NO LABOR TROUBLE

Director Kelly paid a tribute to Walter Gaines, bridge foreman, for his untiring zeal and the hazardous chances he took with his men during construction of the bridge.

"I also want to express my appreciation of labor's treatment of us," said Director Kelly. "There were no labor troubles. For that I express the appreciation of the Governor and myself. Labor has been more than fair to us and I hope that we have been fair to them.

"This bridge was constructed by your highway engineers, the men who work on your highways. They are the State men who built your bridge. We did not have to employ outside engineers except in one or two instances in an advisory capacity.

"I want to express my appreciation of the untiring cooperation and wise counsel which the Governor has given to us. And I wish to thank the financial interests of San Francisco and the East Bay and the public generally for their encouragement and support."

Director Kelly expressed regret that illness prevented B. B. Meek,

former Director of Public Works, from attending the dedication of the bridge "which was started under his jurisdiction."

#### SOUNDLY FINANCED AND BUILT

Charles Henderson, Director of the Reconstruction Finance Corporation, which loaned the money for the bridge, declared that the structure is "soundly financed and soundly built."

"Great and magnificent as this structure is," he said "it will not convey to the men, women and children crossing on its decks the unseen obstacles encountered in its building.

"Those whose engineering skill and science have created this bridge, and the men far above the water who have done the work, deserve the highest praise. It is not only a monument to the genius of Charles H. Purcell, the engineer in charge, it is a symbol of the unlimited capacity of modern men, working together through government, to unify the physical world around them.

"It is a symbol as challenging to those of us who are not scientists as the China Clipper that flies above it. Twelve minutes from San Francisco to Oakland—eighteen hours from Oakland to Honolulu.

"May we all work with equal success to unify, not alone the physical world around us, but the hearts and the goodwill of men."

High praise of the men who actually built the San Francisco-Oakland Bay Bridge was extended by former

President Herbert Hoover who took an active interest in the project.

#### FORMER PRESIDENT SPEAKS

"I have taken great pride," said Mr. Hoover, "as a modest link in this bridge. Some 12 years ago while Secretary of Commerce I received the report of an investigation by Government engineers of this route for a bridge. They thought unfavorably of it because of military reasons. But later, as President, I was able to take up the problem again in cooperation with Governor Young and Commissioner Meek.

"Our joint commission, whose members were Mark Requa, George Cameron, Admirals Gregory and Standley, Colonels Pillsbury and Daly, Senator Breed, Professor Marx and Chief Engineer Charles Purcell, gave first favorable and practicable report on this bridge.

"Then arose the problem of the financing of such a daring project. I used this bridge and other projects as an illustration of what we could do to help unemployment during the depression and urged the Federal Government lending money for this kind of reproductive public works. Congress gave that authority to the RFC in 1932 and the financing of the bridge became a practicality.

#### DEVOTED WORK REQUIRED

"But let no one think these things are as easy to do as to say them. The devoted work of scores of citizens is required to make such great enter-

prise. I have perhaps had more opportunity than most to observe that service. The work of your finance committee, Mr. Leland Cutler, Mr. Robinson, Mr. Cameron and Mr. Knowland, the backing by Governors Young, Rolph and Merriam, by Lieutenant Governor Hatfield, by Earl Kelly, by Mayors of all the municipalities, all stand out.

"That this is the greatest bridge yet constructed in the world requires no repetition by me. Its construction also spans the whole advance in industrial civilization—our discoveries in science, our inventions, our increasing skill. It is the product of hundreds of years of cumulative knowledge.

#### DAILY RISKED LIVES

"But above them all are the engineers and workmen right here who combined all those centuries of knowledge with courage and imagination—your own chief engineer, Charles Purcell and his able assistants, Charles Andrew and Glenn Woodruff, are men whose courage and whose knowledge combine not only the product of these generations of ideas but from their own genius designed and built this bridge.

"Deserving high credit with them are the manufacturers, the contractors. But not the least was the part of these courageous men who daily

risked their lives in its construction." Governor Merriam concluded the speech making. As he took his place before the microphone on the speaker's stand, a thousand pigeons were released from cages back of the platform and soared into the air with a din of drumming wings.

The Governor said it should be a matter of gratification that the bridge was constructed for less than the estimated cost and completed far ahead of schedule.

"This bridge," the Governor said, "belongs to this generation. We built it and we shall pay for it. But in a broader sense it belongs to the generations that are to come. When the youths of today become the citizens of tomorrow they will use it without cost. Accordingly we dedicate it today to our own use and to theirs, hoping that they will receive it as a legacy of great worth and an indication of our desire to serve."

The Governor concluded his dedicatory speech by reading a poem by Evelyn Simms lauding the builders of the bridges of the world.\*

When the State's Chief Executive concluded, he left the platform and with Director Kelly and Chief Engineer Purcell crossed the plaza to the toll stations where, stretched across the lanes of traffic was a heavy golden chain.

#### CHAIN BARRIER SEVERED

An acetylene torch was handed to the Governor who applied its searing flame to the center links of the chain. Overhead, two hundred navy planes in perfect mass formation roared by, huge bombs burst high in the sky releasing parachutes with American flags, sirens and whistles in Oakland and the East Bay cities added to the bedlam of noise, and the chain barrier fell apart.

The eastern end of the bridge was open to the traffic that soon was to flood over it to San Francisco.

Hastening to automobiles, the Governor and his official party sped across the bridge to the San Francisco approach, where another chain barred their way.

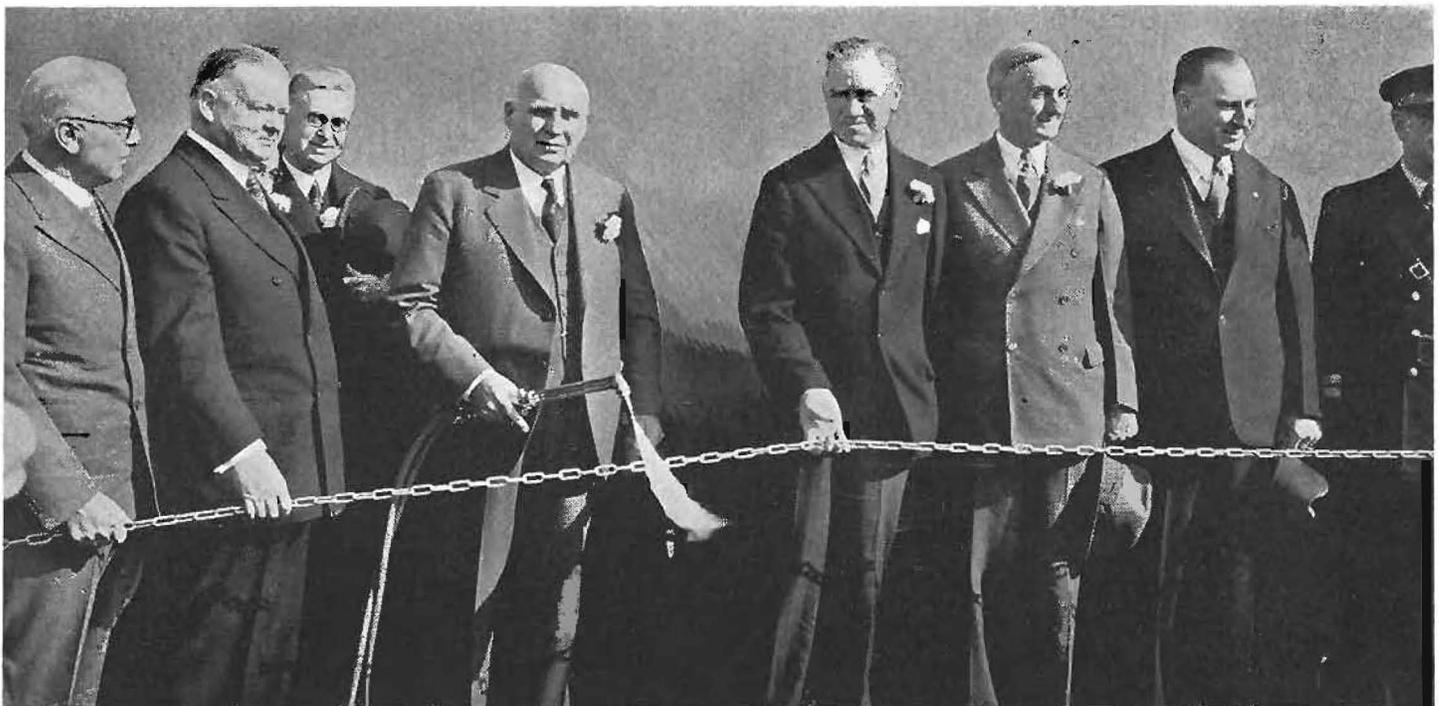
The Governor alighted from his car and surrounded by his party again wielded a blow torch, severing this second golden chain.

#### IMPRESSIVE MARINE PARADE

In the bay, far below the center towers of the bridge, several hundred yachts, fishing boats and other water craft, brilliantly beribboned and with flags flying, were passing in the greatest marine parade San Francisco ever has witnessed.

\* See Governor's speech in full on page 14.

(Continued on page 9)



While notables who participated in the dedication ceremonies look on, Governor Frank F. Merriam severs the golden chain barrier at the San Francisco end of the San Francisco-Oakland Bay Bridge. Left to right: Charles H. Purcell, Chief Engineer; former President Herbert Hoover; Mayor W. J. McCracken of Oakland; the Governor; Charles Henderson, Director of Reconstruction Finance Corporation; Senator William G. McAdoo, and Earl Lee Kelly, Director of Public Works.

# Chief Engineer Purcell Tells Construction Story of the Bridge

BY C. H. PURCELL

Chief Engineer and State Highway Engineer

FOR 85 years San Franciscans dreamed of a great bridge that would bring closer to them the East Bay Empire and the vast and wealthy hinterland which speeded the progress and development of the prosperous cities of Oakland, Berkeley and Alameda.

Long ago men of brains and money joined with a madman "Emperor" Norton in visioning a giant structure across their beloved bay.

It was William Walker, a militant San Francisco newspaper editor, who, as early as 1850, proposed the construction of a causeway from his city to Contra Costa County. He had in mind as a precedent the famous 2000 foot Clay Street wharf, some of whose foundations reached a depth of 40 feet.

## SHERMAN REVIVED IDEA

His plan was received with enthusiasm, but nothing came of it. Six years later, General William Tecumseh Sherman of Civil War fame, then a youthful banker in San Francisco, revived the idea.

In 1869 when the continent was spanned by the Central Pacific and Union Pacific railroads; Edward Stanford, later United States Senator from California, joined San Franciscans in urging his railway associates to do something about bridging the bay.

These bridge proponents were practical men, but even before some of them gave serious thought to the great idea, the mad "Emperor" Norton, worshipped for his eccentricities by fun-loving San Franciscans, had demanded of the Central Pacific that it build a suspension bridge from San Francisco to his "summer capital" in Oakland.

## TUBE PLAN CONSIDERED

It was not until 1921 that definite plans for a San Francisco-Oakland Bay Bridge began to take form. In

that year the San Francisco Motor Car Dealers Association contributed money to defray the cost of an engineering report on the feasibility of building a combined tube and concrete causeway which would connect the City by the Golden Gate with its East Bay neighbors.

Seven years later the Board of Supervisors of San Francisco had before it thirty-five proposals for different kinds of bridges and tubes submitted by corporations and individuals. In 1928 a bill was introduced in Congress authorizing San Francisco to construct a bridge across the bay and delegations from San Francisco and the East Bay cities headed by James Rolph Jr., then mayor of San Francisco, went to Washington to urge passage of the measure.

## ARMY AND NAVY OBJECTED

Objections raised by Army and Navy officials defeated the plan.

It became apparent that the bridge would have to be built by the State of California and in 1929 the legislature created the California Toll Bridge Authority. In June, 1932, Congressional approval of a loan from the Reconstruction Finance Corporation to the State was obtained and thirteen months later actual construction of the San Francisco-Oakland Bay Bridge began.

On July 9, 1933, first ground was broken for the bridge.

On November 12, 1936, the structure was opened to automobile and truck traffic.

The three years and five months intervening were full of intensive and interesting work for all of us who have had the honor to be connected with the construction of this gigantic span.

The project on the whole progressed smoothly according to schedule and without serious delay.

For example, on July 6, 1935,

spinning was started on the first strands of the north and south cables of the West Bay Crossing. The steel arch girders of the tunnel were being placed, while on the East section steel work was in process of erection only as far as E-33 to E-23.

## SEVENTEEN MONTHS RECORD

This means that in seventeen months the cables were spun, the steel erected, paving placed, and the structure painted for the two miles of the West Bay Crossing on two decks; the tunnel, largest bore ever attempted, was lined with concrete, excavated, the flooring of the decks placed, and the upper deck roofing relined with tile; while on the East side the cantilever span, unequalled in length by any in the United States, was erected; and the entire East side paved and painted.

Simultaneously the San Francisco approaches and all of the East Bay approaches were completed from University Avenue on the north to Cypress Avenue and Seventh on the south and 38th Avenue and Market Street on the East.

It was a gigantic task, and one necessarily coordinated to have brought about the completion of this bridge at the designated time. For this thanks are due to the cooperation of Governor Frank F. Merriam; chairman of the California Toll Bridge Authority; State Director of Public Works Earl Lee Kelly; Bridge Engineer Charles E. Andrew; Design Engineer Glenn B. Woodruff; our fine engineering staff; and our contractors and their able workmen.

## TWO CAISSONS TIPPED

Aside from the tipping of the caissons W-6 and W-4 in the earlier stages of the work in constructing the foundations, we had no mishaps that caused delay other than those provided for in our schedule.

Picture of Chief Engineer C. H. Purcell reproduced through courtesy of California Magazine of Pacific Business.

Probably the only other one occurred in September, 1935, when the 23d cable strand of the south cable became twisted and had to be respun.

Toward the middle of October, 1935, the spinning of the north cable of the West Suspension spans (between the San Francisco and Center Anchorages) was completed. On the following week spinning of the south cable was completed (October 16, at 8.30 p.m.) and equipment erected at the Yerba Buena Anchorage for work on the East Suspension Spans.

In the same week all of the steel girders of the tunnel were erected and the last concrete of the roof was poured.

#### A HAZARDOUS TASK

Meanwhile work was progressing on the East and West cantilever arms of the East Bay Crossing, with the hazardous task of erecting the 1400-foot cantilever span itself imminent.

Scarcely one month after the spinning of the cables had been completed on the west suspension spans, the cables of this section were squeezed and bound every three feet. That same week work started on the spinning of the mile long cables on the east suspension spans from the Center Anchorage to Yerba Buena Island.

Actual starting time of the spinning of the south cable of this section was at 8 a.m., November 12, 1935, exactly one year from the time the bridge is open to traffic.

Six days later the entire core of the great tunnel had been excavated.

On December 9, 1935, the Folger Avenue Underpass was completed, one of the features of the Berkeley approach to the bridge.

#### FIRST SUSPENDERS PLACED

On December 16, 1935, the first of the suspended cables was placed and lifting struts were rigged up preparatory to erecting the deck steel.

Four days after the New Year (January 5, 1936) the first of the deck steel was erected for the suspension spans. In the same week the second panel of the East cantilever arm was placed.

At 10 o'clock, the morning of January 20, 1936, the spinning wheel made its last trip over the north cable of the east suspension spans, completing all spinning six and one-half months after operations were first started. In this time 17,464

wires had been placed in each cable, having a total length of 70,815 miles.

On March 2, 1936, cable wrapping first started at a point between the San Francisco Anchorage and Pier W-1, while on the East Bay Crossing the gap between the east and west arms of the cantilever span was slowly lessening.

The last main unit of the deck steel between Pier W-1 and the Center Anchorage was erected on March 10, 1936, approximately four months after the first truss was lifted in this section.

#### CANTILEVER SPAN CLOSED

Early on the morning of March 21, commuters were startled to see tiny spider-like figures dangling on the suspender rope, hundreds of feet above the Bay. These were painters applying the first coat to the suspenders at spans W-1 and W-2.

On that same morning only two panels remained to be erected on the East Bay Crossing before the cantilever span would be closed.

On March 25, 1936, at 4.30 p.m., the cantilever span was closed, although to the public the first eyebar thrown across the gap early Monday morning on March 24 achieved the purpose.

Next to the sinking and anchoring of the caissons, the closing of the cantilever was probably the most ticklish job in the construction of this world's largest bridge.

First, it was the longest cantilever to be suspended and the heaviest; 1400 feet in its total length; it weighed 21,000 tons. Second, changing weather and tidal conditions made the closing of the gap difficult to calculate to a nicety.

#### DIFFERENCE OF FOUR INCHES

At one time during the closing, for instance, with a cold wind blowing through the Golden Gate on the west and a warm sun on the east, one side of the structure was as much as four inches longer than the other.

From Tower E-2 near Yerba Buena Island and from Tower E-2 east of it, traveling derricks had moved slowly toward each other, lifting steel members from barges approximately 195 feet below. Week after week bridge-men fitted these steel members and bolted them into place until 625 feet of steel, weighing around 10,000 tons,

were suspended from each tower. It remained then to close the gap of 96 feet.

It was the eyebars of the lower chord that were slipped into place early one morning which the commuters considered closed the gap, but not so spectacular but even more exciting to engineers and certainly more exacting was the completion of the final closure.

Following the placing of the lower eyebars and steel members (such as horizontals), sufficient to give the structure support but the minimum weight, four steel pins—about one-half ton in weight and three feet in length—were to be driven and the upper chords placed and bolted.

#### BRIDGE MOVED BY JACKS

Here eight giant hydraulic jacks, each exerting a "push" of 500 tons, which had been temporarily installed for just this purpose, came into play. Four of these jacks were located at the top of the split steel bent on Tower E. With these it was possible to push or pull an entire half of the bridge east or west. It was these horizontal jacks, 1200 feet away, that jockeyed the eyebars into position so that the steel pins could be driven through, thus securely fastening the lower chords.

The four remaining jacks with a longitudinal action had been placed at each end of the upper chords of the cantilever arms.

It was now necessary to bring these into operation to adjust the arms of the cantilever so that the upper chord could be slipped into place and bolted. This was done just as we had calculated, and not until then was the bridge closed.

Operations during the entire procedure were directed by engineers stationed with a full view of the project through telephonic communication to operators on the jacks several hundred feet away.

#### WORK PROGRESSED STEADILY

After the closing of the cantilever, work continued there with the erection of additional steel members and the winding up of all riveting on the East Bay Crossing. Meanwhile, the placing of paving on both decks had been under way for some weeks over that area which had been completed east of the Island and west of the bridge head.

Work progressed on the West Bay Crossing steadily but less sensation-



This night photograph shows the excellent visibility afforded under all weather conditions by the new sodium vapor lighting system.

ally as the lifting of deck trusses continued. At the same time construction of the San Francisco viaduct was nearing completion while work elsewhere was continuing at the San Francisco anchorage, Yerba Buena anchorage and viaduct, the Yerba Buena spans, East Portal of the tunnel and the San Pablo Underpass, arterial of one of the three principal East Bay approaches.

First light standards were erected as early as April 18, 1936, when poles were placed on the north and south railings of the San Francisco approach.

Erection of major steel for the continuous spans on the West Bay Crossing was completed April 14, 1936.

At two o'clock Monday afternoon, April 20, the last of the main units of the stiffening trusses of the suspension spans was lifted, carrying its

American flag, symbol of work completed.

On May 27 the first machine was driven across the lower deck of the East Bay Crossing, with the curing of the last concrete to be poured in that section.

Last concrete of the entire East Bay Crossing was placed on the upper deck on June 1, approximately three months after the closing of the cantilever.

First concrete of the upper deck of the suspension spans of the West Bay Crossing was poured just after sunrise on June 18, two weeks after the completion of concreting operations, on the east side.

#### CONCRETE RECORD SET

This work continued rapidly, with a new record for concrete pouring established on August 20, when 750 feet of paving was placed in one day.

On August 28, the last steel floor beam of the west bridge was erected at the west end of the San Francisco anchorage, completing all major steel work.

The last batch of concrete on the entire structure was placed in the lining of the upper deck of the Yerba Buena tunnel. The bridge was ready to take care of vehicular traffic on November 12.

There remains only the installation of electric railway facilities and the erection of the terminal in San Francisco for train traffic. This in itself is a mammoth task, which we expect to finish in the spring of 1938.

The engineers and those connected with the construction of this great bridge have worked long and hard during these past three years. We now turn the structure over to the people for their use.

# President Roosevelt Switches on Signal Starting Traffic

(Continued from page 5)

Meanwhile, the great siren on the Ferry Building and hundreds of factory whistles throughout San Francisco were adding to the chorus of thousands of cheering San Franciscans gathered at the Fifth Street plaza between Harrison and Bryant streets.

The ceremony of severing the second barrier finished, Governor Merriam led his party to a speaker's platform erected at the western end of the plaza.

Here Leland Cutler, president of the Golden Gate International Exposition of 1939 and vice president of the Finance Advisory Committee, presided and, after an invocation delivered by Monsignor Ramm, introduced Mayor Angelo Rossi of San Francisco.

## SYMBOL OF PROGRESS

"This bridge," said Mayor Rossi, "is a sample of the West to come, a signal for renewed civic effort, a proof that the pioneer spirit of San Francisco still lives. This magnificent structure will serve to unite us more closely with our friendly neighbors across the bay and means progress for all of us."

Lieutenant Governor George J. Hatfield said that to him the great structure looming up majestically before him is "the greatest triumph in bridge engineering the world has ever seen—an opening gateway to a new Manhattan of the Pacific—a splendid, miraculous realization of the California of today."

And United States Senator William Gibbs McAdoo said:

"This bridge is a bridge of national implications—an imposing tribute to the genius of our people and the progress of our times—a great miracle."

## REMEMBER MARTYR WORKERS

Walter Gaines, assistant bridge foreman and worker, wearing the steel helmet which he wore daily during the years the bridge was under construction, urged San Franciscans not to forget the men who died in the performance of their duty while engaged in work on the great span.

"Regard this bridge as a tribute to the American working man, both skilled and unskilled," he said.

Other speakers, including Governor

Merriam, Director of Public Works Kelly and Chief Engineer Purcell, cut their speeches on the San Francisco side short due to the imminence of the moment when President Roosevelt would press the electric button in Washington which would throw open the bridge to the public.

The Governor read a number of telegrams from prominent national

## Statistical Facts of Piers, Towers, Spans and Cables

San Francisco-Oakland Bay Bridge has:

Two west bay towers of 474 feet and two of 519 feet.

Six west bay piers of 100 to 240 feet depth, and 22 east bay piers of 50 to 242 feet depth.

Two 2310-foot center suspension spans and two 1160-foot side spans in the west bay crossing.

Center anchorage 300 feet high.

Vertical clearances of 200 feet at center span and 218 feet at anchorage.

Two 28½-inch cables, each containing 17,464 wires.

Cantilever span of 1400 feet in the east bay crossing.

Two decks—a six-lane upper deck for fast traffic; a lower deck of three truck lanes and two interurban track lines.

Tunnel carrying the decks through Yerba Buena Island, 76 feet wide by 58 feet high.

labor leaders in which the latter sent their felicitations and expressed their pleasure over the amicable relations which existed between labor and the bridge builders throughout the period of construction.

## DRAMATIC ACT BY PRESIDENT

With one eye on his watch, Governor Merriam concluded his remarks with these words:

"At this minute the President of the United States is seated at his desk in the White House. In a few seconds he will press an electric switch.

Turn around all of you and look at the signal tower. Soon the red light will turn to orange and then to green. Ah! There it goes. I now declare the San Francisco-Oakland Bay Bridge officially opened."

It was a dramatic moment. A dramatic, stirring scene. As the light on the signal tower flashed from orange to green cheers from thousands of throats swelled into the air, whistles and sirens screeched and down on navy row big guns boomed a salute.

Governor Merriam and his party hastened from the platform, crossed the plaza to their waiting cars on the western approach, where Chief E. Raymond Cato of the California Highway Patrol, and Captain Charles Goff of the San Francisco police traffic department and their men were holding back the eager motorists who wished to make their first bridge crossing.

## AN UNFORGETTABLE SIGHT

The Governor and his party entered their cars and flashed away toward Oakland, followed by a stream of cars that steadily throughout the day and night mounted into the thousands.

On the Oakland side a similar flood of machines at that identical moment was sweeping over the eastern approaches, headed for San Francisco.

It was an unforgettable sight when the two streams of automobiles met and passed on their respective lanes in the middle of the giant structure that is the San Francisco-Oakland Bay Bridge.

Governor Merriam and party proceeded from the eastern terminus to the Hotel Oakland where they were guests at luncheon of the City of Oakland under the auspices of the Junior Chamber of Commerce.

## BRIDGE BATHED IN LIGHT

The night of November 12 in San Francisco ever will be a memorable one.

When darkness fell the huge bay bridge that had loomed up in the dusk as a great silvery span across the bay suddenly became aflame with light as the sodium vapor lamps spaced along the upper deck from the Oakland plaza to the curving ramps of the San Francisco approaches burst into fire.

(Continued on page 24)

# Construction Records Made by Perfect Coordination

BY CHARLES E. ANDREW, Bridge Engineer  
San Francisco - Oakland Bay Bridge

**T**HE FIRST and major stage of construction of the San Francisco-Oakland Bay Bridge is now a reality. More than 200,000 automobiles passed over its roadway during the first 84 hours of operation in orderly fashion and without mishap.

It is a wonderful satisfaction to the engineers and contractors who have toiled with untiring energy for several years to bring this great project to completion at a cost well within the first estimates made in 1929, and several months ahead of contract schedules.

The general public can not possibly realize the great amount of detail, hard work and long hours necessary in the planning and execution of such a structure.

We are proud of the fact that the world's greatest bridge has been wholly designed and constructed under the supervision and direction of employees of the Department of Public Works of the State of California. No finer or more efficient organization has ever been assembled. Too much credit can not be given to every member of the staff. All have worked long hours when necessary and have given their best.

They have (so to speak) been out in the front line trenches. Coordination of effort, both on the part of engineers and contractors has been the secret of success. Engineers have constantly exhorted and assisted contractors to keep their work planned to the minutest detail and the contractors have responded with the finest equipment and skill ever before assembled on a bridge project.

Some 15 major contracts have been so synchronized that each one has been completed in such unison as to cause practically no delay to the succeeding contract.



C. E. ANDREW

Such proper sequence is only arrived at by careful scheduling of contract dates and correct estimation of time required followed by almost exact performance on the part of contractors.

The bridge as it stands today is evidence of almost perfect performance on the part of all engineers and contractors.

Mabel—Do you think it is right to kiss a boy friend goodnight?

Marie—It is if there isn't any other way to get rid of him.

Mrs. Gabber—I've had such a cold I was unable to speak for three whole days.

Mrs. Blabber—Why you poor dear. How you must have suffered.

## First Batter-leg Towers on Major Suspension Spans

**A**DDING a new chapter to the history of bridge construction, the towers supporting the double suspension span forming the San Francisco-Yerba Buena section of the Bay Bridge are the first "batter-leg" towers ever used in a major suspension bridge.

Each tower leg inclines inward toward the other and tapers toward the top. In designing them, the engineers were faced with the problem of flexibility. Under extreme load conditions, there will be a longitudinal movement of the bridge—either east or west—of six feet, six inches at the top of tower W-2, near the western end of the bridge. With such movement, a flexible tower was required.

### WALL CELLS IN TOWERS

As designed and built, the towers consist of two columns joined by diagonal bracing. They are 109 feet wide at the base, tapering up to 78 feet in width at the top. Each tower leg covers a cross-shaped area of 32 by 19 feet at the base, and contains 21 small wall cells, or rooms, separated by silicon steel plate. The number of cells is reduced to nine just below the top.

Stresses in the towers were calculated for transverse loading, from a 90-mile-an-hour wind and from earthquake. Transverse stresses from earthquakes are comparatively small in a suspension bridge. Experts have said there is no need for fear that the bridge ever will be seriously damaged by earthquake.

### ALLOWANCE FOR SWAY

The roadways over the truss spans of the bridge are attached to the towers by means of anchor arms, allowing for the required play. A rectangular slot in the lower roadway strut in each tower provides for a wind resistance connection to the span.

The two outer towers, those proximate to Rincon Hill in San Francisco and Yerba Buena Island, rise 474 feet from the top of their concrete piers, which in turn are 40 feet above the bay waters. The inner towers, on either side of the great center anchorage, are 519 feet high.



This view looking east on the bridge from the Fifth Street Plaza in San Francisco shows auto traffic coming and going over main western approach.

## TRAFFIC DISTRIBUTION IN SAN FRANCISCO NOW CENTERING AT FIFTH STREET PLAZA

**N**OT THE least of the problems confronting the builders of the San Francisco-Oakland Bay Bridge was that of getting traffic on to and off the structure on the San Francisco side.

Western approaches had to be constructed through a large industrial district and the building of "on" and "off" ramps was a big task in itself. Projected rights of way were occupied by many types of buildings, from frame dwellings to four-story concrete and brick buildings. All had to be demolished and the property upon which they stood acquired. In all two hundred and sixteen separate parcels of real estate had to be purchased, and the acquisition of some of them required litigation.

A number of streets had to be realigned, Rincon Hill was razed, railroad and street car tracks moved and viaducts built.

The San Francisco distribution center is in a plaza embracing an area of 121,000 square feet at Fifth Street, between Harrison and Bryant streets. All of it will be landscaped, sixty-four thousand feet of it being planted to grass.

Two roadways lead to the bridge, one diagonally to the main roadway from the corner of Fifth and Bryant streets, and the other completing a triangle from Fifth and Harrison, with Fifth Street as the base.

The main approach is a single-deck structure on a 3.6 per cent grade from ground level to bridge level and

consists of a series of 51 concrete two-girder spans, varying in length from 50 feet on Rincon Hill to 93 feet over Second, Third and Fourth streets. The roadway width is 58 feet throughout.

An "on" ramp and an "off" ramp constitute two branches from the main approach for vehicular traffic.

The "on" ramp leaves ground level on Fremont street just south of Harrison, its 20-foot roadway curving on easy grades upward on twenty-one 45-foot spans to a juncture with the main approach approximately at Sterling Street.

Leaving the main approach at span 46, or Rincon Street, the "off" ramp curves downward to First and Clementina streets.

# Bridge a Mighty Symbol of California Genius and Vision

BY EARL LEE KELLY, State Director of Public Works

**T**O ME the San Francisco-Oakland Bay Bridge is a mighty symbol of California achievement and a great State's faith in its splendid future.

It has been a tremendous project, unequalled by anything of its kind in the world and its successful completion is due to the combined efforts of the communities of San Francisco, and the East Bay, the State of California and the Federal Government.

The whole State, I am sure, feels as much pride in this great bridge as do the cities of the Bay area, for it must be regarded as an important part of our State's highway system and as such is of paramount interest to every citizen; particularly because it is built without one dollar of cost to the taxpayers.

## VAST PUBLIC PROJECT

While the proposition of spanning the Bay was discussed long before any of us can remember, nothing much was ever done about it because it was naturally a public project, too big to be handled by any private interests. Yet when the possibility of its construction began to crystallize into definite form a few years ago, we had about thirty-five propositions from private corporations and individuals who wanted franchises, but it was realized that none of them could successfully carry out such a vast undertaking.

So the big job was laid in the lap of the State and became a problem of the Department of Public Works and while we are rejoicing that the broad expanse of San Francisco Bay has at last been bridged, let us look back briefly at some of the historical events that led to this epochal accomplishment.

While the idea of bridging the Bay seems to have been a topic of conversation among San Franciscans ever since the city existed, it was not until the spring of 1929 when the State legislature created the Califor-

nia Toll Bridge Authority Act "to authorize and direct the Department of Public Works to build, purchase, condemn, or otherwise acquire for the State of California, toll bridges, toll highways, crossings and approaches thereto across waters within the State \* \* \*" that Califor-



EARL LEE KELLY

nia as a whole became a party to the project.

## JOINT COMMITTEE APPOINTED

The passage of this act was followed by the appointment of a joint Federal-State committee in the fall of the same year, which reported after intensive study that a bridge could be built at a cost not too great to be paid off by tolls with interest over a period of twenty years.

This committee, known also as the Hoover-Young commission, recommended the general design, specifications and route of the bridge. These have been altered somewhat in the completed plans of the present bridge but they provided a very definite basis upon which to proceed.

The cities of San Francisco and Oakland appropriated money toward test borings; the Army and Navy withdrew objections to the bridge as a bar to navigation and a menace to defense; and on February 20, 1931, Congress granted the State of California the right to construct a bridge from Rincon Hill, San Francisco, to Yerba Buena Island to Oakland.

## ROLPH SIGNED APPROPRIATION

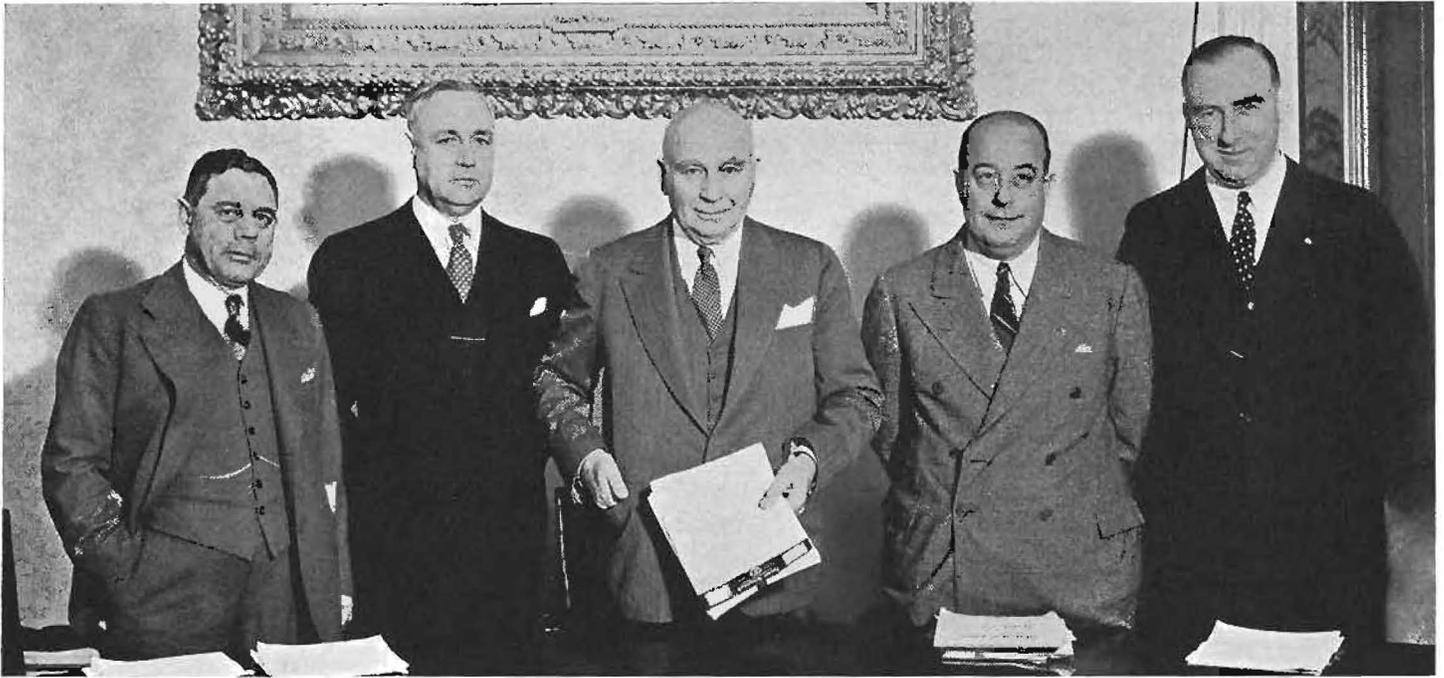
Governor James Rolph, Jr., signed amendments to the California Toll Bridge Authority Act to provide for the financing of state-owned bridges by revenue bonds on May 25, 1931, and simultaneously signed an appropriation of \$650,000 for the creation of the San Francisco-Oakland Bay Bridge Division of the State Department of Public Works.

This division got down to business on September 15, 1931, when it opened offices at No. 500 Sansome Street, San Francisco, which its staff after over five years of hard and anxious labor will vacate when their work is accomplished.

Charles H. Purcell, state highway engineer, was appointed chief engineer of the bridge, and to Mr. Purcell and his fine work, sincere tribute must be paid.

## NAVY GRANTS DEED

Next of importance was the permit to cross Yerba Buena Island granted the State in January, 1932, by the secretaries of War, Navy and Commerce, and the presentation of a deed to the right of way to Governor Rolph by Rear Admiral William Carey Cole, on February 25.



These men as members of the California Toll Bridge Authority, direct the affairs of the Bay Bridge. Left to right: Harry A. Hopkins, chairman California Highway Commission; Arlin E. Stockburger, State Finance Director; Governor Frank F. Merriam; Lieutenant Governor George J. Hatfield; Earl Lee Kelly, Director of Public Works.

Our next problem was the old one—money. The private bond market was gloomy, because the depression had dealt it a bad blow. After much negotiation with the Reconstruction Finance Corporation it agreed on October 10, 1932, to purchase \$61,400,000 of California Toll Bridge Authority bonds for the construction of the bridge proper, providing that the State would maintain the bridge and build the approaches.

Bids for the first contract were opened on February 28, 1933, by Governor Rolph in Sacramento. The R. F. C. announced the money available on April 27, 1933, and ground was broken on July 9, 1933.

#### AMAZING CONSTRUCTION PROGRESS

Thus in three years and five months the world's greatest bridge has been built and, considering the magnitude of the task and the engineering pioneering required, its quiet, steady progress has been indeed amazing.

It can not be said that the bridge is entirely completed because the electric railway system and the terminal have yet to be finished. This work will be ready by March, 1938, it is estimated.

The bridge will have an automobile capacity of 16,000 vehicles an hour without congestion. More than

30,000,000 passenger cars and trucks can pass over it a year without straining its capacity to handle traffic. The engineers have designed the bridge to accommodate a traffic volume of motor vehicles and interurban trains and passengers far beyond the estimated requirements in 1975.

#### 65,000,000 PASSENGERS IN 1950

By 1950 we estimate the bridge will be carrying 12,600,000 automobiles and trucks, 25,000,000 motor vehicle passengers and 40,000,000 interurban train passengers.

It will save the interurban train passengers at least 15 minutes a trip, and automobile passengers a half hour or more. This time saving alone would make the bridge worth while. Figure out the amount of time saved by a commuter, multiply it by the number of passengers a year, and then try to figure out the total amount of time saved in a year. The result will be almost an astronomical figure.

Yes, the bridge will be a great break for the commuter from the time standpoint, and that alone would make it worth while. Surely the Bay commuters deserve this break.

Time saving is not the only advantage the commuter will eventually reap from the bridge, however.

There is the financial advantage. It will save commuters and motorists hundreds of thousand dollars in lower fares and tolls. Keep this fact also in mind as supremely important—the bridge is being built without one dollar of cost to the taxpayers. It will be paid for out of revenue only.

The flat rate toll has been fixed at 65 cents per car and 5 passengers. This, however, may be adjusted according to revenues. A larger volume of traffic than we anticipate would most likely result in lower toll charges.

But according to our most careful estimates, the bridge should pay for itself in about 20 years.

After that it will become a **FREE BRIDGE!**

When I say that its construction will not cost the taxpayer a dollar, I am, of course, referring to the bridge proper; the approaches will be paid for out of northern California's share of the State gasoline tax allotment. But this amounts to only \$6,600,000 and will be repaid out of bridge revenues.

The importance of this great new bridge unit as a connecting link of our State Highway System is emphasized by a glance at the map re-

(Continued on page 20)

# Governor Merriam at Dedication Pays Tribute to Workers and Looks Forward to a Free Toll Bridge

Two addresses were delivered by Governor Frank F. Merriam in the dedication exercises, the first at the Oakland terminus and the second at the San Francisco end.

In his Oakland address, the Governor paid tribute to the civic leaders, government and State officials and the army of workers who made the bridge possible. He looked forward to the time when the great structure will be owned by the people of California and be toll free.

The Governor in San Francisco emphasized the great strides made in the development of California and expressed his gratification that the bridge had been constructed for less than the estimated cost and ahead of schedule.

## Governor Cites Ideals In San Francisco Speech

Governor Merriam said in San Francisco:

We have assembled upon this occasion to celebrate the completion of this great bridge. In so doing, we are following a custom that has marked the progress of highway construction throughout the Nation. The building of bridges has always stimulated the interest and aroused the enthusiasm of our people. But never had any group a greater incentive for celebration than have we because we are dedicating a bridge of stupendous construction, magnificent design, marvelous beauty, amazing strength and, withal, a capacity for unlimited service.

Our meeting today will do more than celebrate the completion of this project. In a broader sense, we must recognize this as a day of commencement rather than a day of attainment. In the past we have been interested in its construction, in the future we shall be interested in its use.

### HARD WORK STRESSED

For more than three years engineers, construction corporations and workmen all under the Department of Public Works of the State of California, have been working together in this building program. This gigantic structure required the best thought and concentrated effort of some of the leading engineers of our State and Nation. It involved the formation of fiscal policies that demanded the highest ingenuity of outstanding financial leaders. Moreover, it required the devoted service of thou-



GOVERNOR FRANK F. MERRIAM

sands of men who labored daily in placing the materials and in operating the machinery.

This, then, is a monument to the combined efforts of governmental authorities, construction experts, architectural engineers, skillful workmen and a cooperative people. It is the result of the broad vision and the heroic efforts of courageous men.

### TWO THEORIES CITED

We can not dedicate this bridge without noting the remarkable ad-

vancement of the last 300 years. In reviewing that history we discover that our progress has evolved out of the common struggles of men. In the records covering these few centuries we find two threads of philosophy that run through the whole fabric of American life. The one expounds the theory of isolation, the other extols the ideal of cooperation.

In the formation of one of the early communities on the Atlantic Coast, the local government assumed the responsibility of providing every person with a musket, one pound of powder, twenty bullets and two fathoms of match, with sword and rest and bandoliers. This was in a period when the rivers, marshes and mountains served as barriers of protection and security. Throughout the centuries they had stimulated the organization of the clan, the tribe or the village.

### CREEDS BECOME STATIC

Obviously people living under such circumstances were deprived of the stimulus that comes from contact with other people and other races. This ideal of isolation prevented the extension of knowledge and the development of the spirit of service. Creeds, customs and conventions became static. Even habits of thought and the expression of ideas became stilted and circumscribed.

In striking contrast to that type of civilization we survey our own. In analyzing the qualities and characteristics of this great bay area we discover many factors that create common interest among the residents. They are held together by bonds of education, religion, government and



Section of huge crowd attending Bay Bridge dedication ceremonies on Oakland side, with Administration Building in background.



Scene at Fifth Street Plaza in San Francisco where thousands of enthusiastic persons gathered to hear dedication speakers.



Speakers platform in Fifth Street Plaza on dedication day. Lieutenant Governor George J. Hatfield is addressing throng of citizens.

social service. They share the advantages of great community enterprises, projected and maintained through public leadership and the use of public funds. This bridge which we dedicate today stands as a symbol of cooperative achievement for the residents of this local community, the State and the Nation. We have learned that isolation stimulates fear while cooperation inspires confidence. Isolation never advances commerce, business, industry and culture. It curtails rather than impels a feeling of community consideration.

#### EMBLEM OF FRIENDSHIP

Accordingly we dedicate this great structure as a part of the highway system of California to the use of the people in an emblem of friendship and neighborly association—an ideal which is beautifully and emphatically portrayed in the words of the poet when he said:

'I like a bridge—  
'It cries "Come on  
'I'll take you there from here and here  
from there.  
'And save you time and toil."  
'I like a bridge—  
'It breathes romance;  
'There's new adventure on the further  
side  
'And I will help you cross.  
'I like a bridge—  
'It makes me think  
'That when a worry comes, my mind will  
find  
'Somewhere a friendly bridge.

### Workers, Engineers Are Praised In Oakland Talk

Governor Merriam, in his speech at the Oakland end of the bridge, said:

We are privileged today to celebrate the completion of the greatest bridge yet constructed and to place it at the disposal of the multitudes who will cross and recross it as the years come and go. Never in the events of recorded years has such a bridge been built to span so great a stretch of water. The secrets of Nature, the science of their use, the art of construction and the inventive genius of man, have all contributed to this tremendous enterprise. San Francisco, Oakland, the adjoining communities, California, and the Nation may well be proud of this world renowned structure.

This bridge is not the product of a day. In the early years men gazed out upon the waters separating the peninsula from the mainland and ad-

vocated building a bridge upon which traffic might pass at will, successively a dream, a vision, a subject of scientific research, the definite engineering plans, governmental approval and financing, and finally the builders, realization—we are assembled here to inaugurate its service to mankind who may travel this way.

#### MANY TOOK PART

Nor has the bridge resulted from the activities of a single individual. A myriad of thinkers and workers have, through their individual and combined efforts, carried their share of the responsibility and have added their part to this great undertaking. Without the earnest cooperation of many minds and hands, this magnificent structure would not stand, at once, as the result and the instrument of modern progress.

#### PRESIDENTS PRAISED

Presidents Hoover and Roosevelt generally contributed to the enterprise; President Hoover in the initiation of planning and financing, and President Roosevelt in the support and aid which made possible its completion.

Governors Young and Rolph worked without reserve in promoting the enterprise—Governor Young in approving the act establishing the Toll Bridge Authority, the organization which has had immediate charge of the financing and supervision of its construction and Governor Rolph in enthusiastically carrying forward the executive activity during his term of office.

#### COMMISSIONS LAUDED

Two commissions, one appointed by President Hoover, the other by Governor Rolph, rendered splendid service. The first special committee, usually designated as the Hoover-Young Commission, was named to select a site, determine the route and to negotiate with the war department regarding these and other important items. The second, known as the Financial Advisory Committee, was instrumental in financing and convincing the Reconstruction Finance Corporation of the soundness of such an investment and in arranging for the sale of the revenue bonds. Both of these commissions gave generously and gratuitously of their time and ability in the advancement of the project.

Many others should be commended. Everyone, in any way connected with

the work, was most zealous in his effort to be helpful. The contractors, the workmen who labored with their hands and those who operated the machinery, must all be commended for their skill and diligence. Director of Public Works Earl Lee Kelly and Chief Engineer Charles H. Purcell, rendered outstanding service in their particular lines of activity, as did their associates.

These bridge builders have looked forward with enthusiastic anticipation to this hour. In all of the processes of construction they followed a plan that had been inspired by the commanding ideal of service.

They now enjoy the results of their handiwork. Through the authority vested in the state they offer it today to the public as a masterpiece of architectural and engineering skill, a roadway between two great communities.

#### FINANCING CITED

While we extol the achievement of its building, and sing the praise of those who have accomplished its completion, the utilitarian and practical features which induced investors to finance the project should not be passed unnoticed. It was this decision which finally insured success.

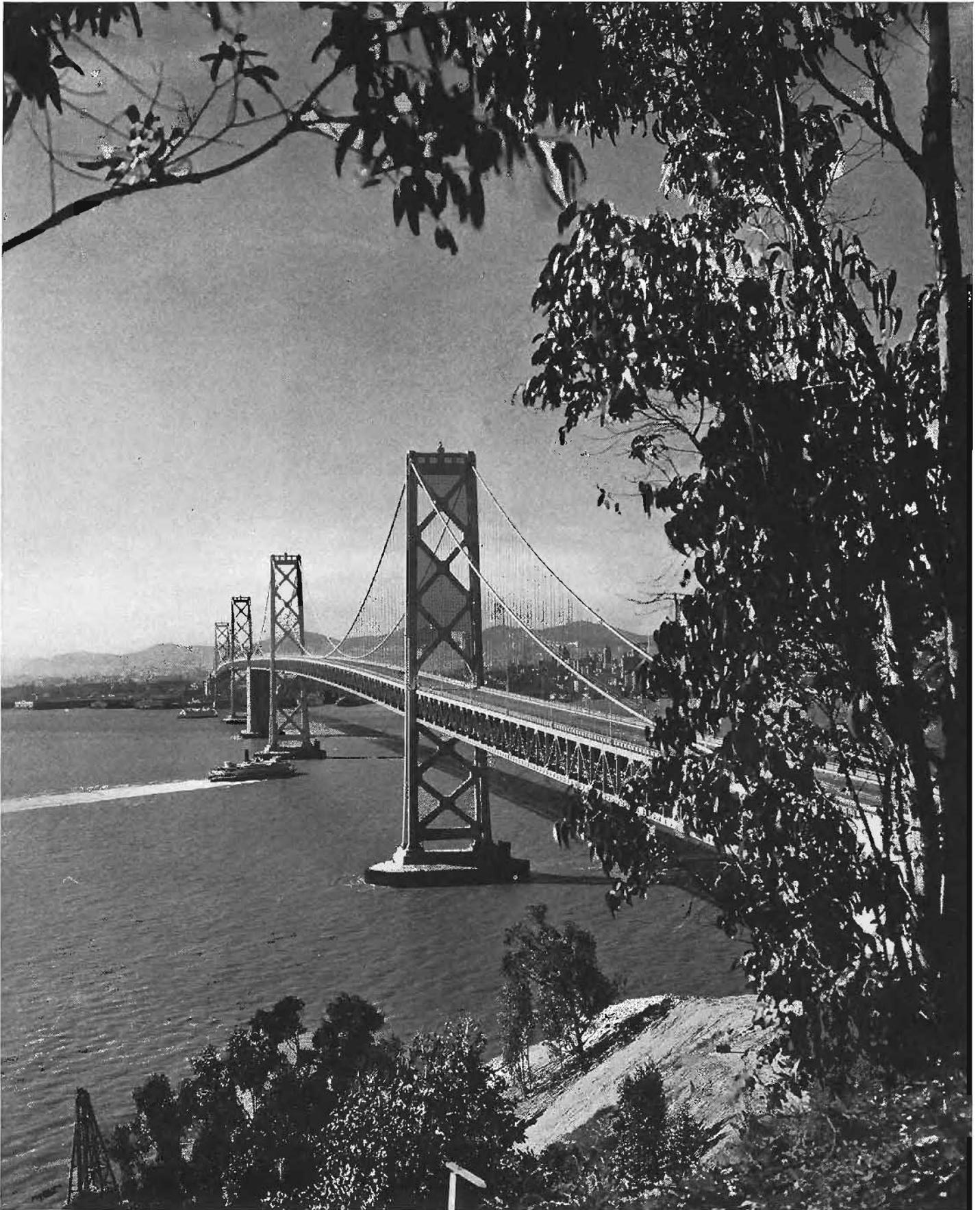
The financing of the undertaking is as bold in the field of investment as is the project in engineering and construction. Self-liquidating, the \$55,000,000 in bonds, already issued, and the \$15,000,000 or \$20,000,000 additional necessary to provide interurban electric car service over the bridge, are guaranteed, only by the revenues derived from its operation. The receipts and income must pay the indebtedness incurred. The taxes and credit of the cities, counties and even the State are in no wise pledged for the satisfaction of the bridge obligations. When the bonds and indebtedness have all been paid, the bridge becomes the property of the state, to be operated toll free as part of the highway system.

#### COST IS REDUCED

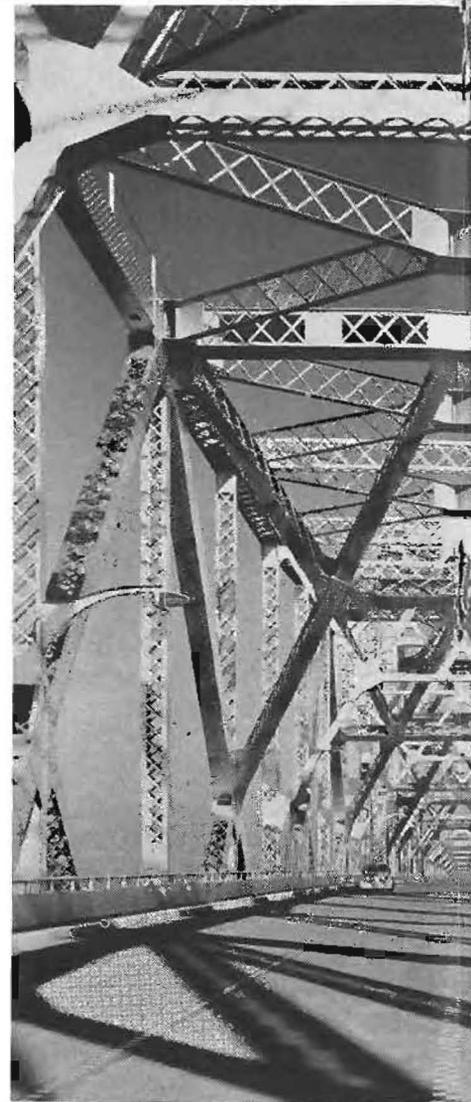
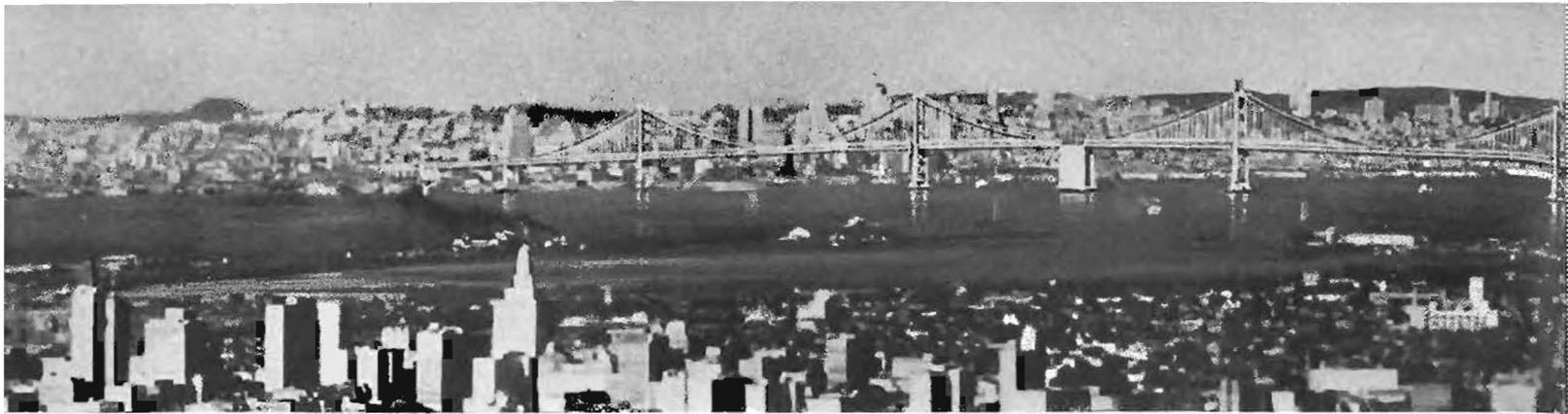
It is a matter of gratification that the bridge has been constructed for less than the estimated cost and completed in less than the time allotted under the contract.

This bridge was designed and has been constructed to improve transportation facilities, to make travel less expensive, to save time and to provide convenience, safety, and com-

(Continued on page 28)



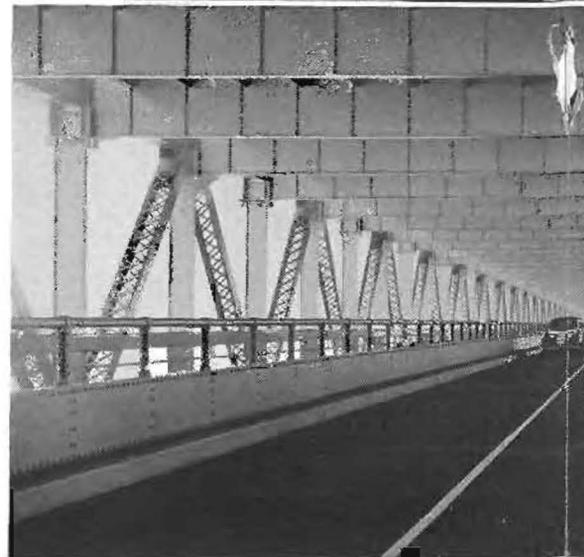
Entrancing view of Bay Bridge showing majestic lines of structure, with San Francisco in background.

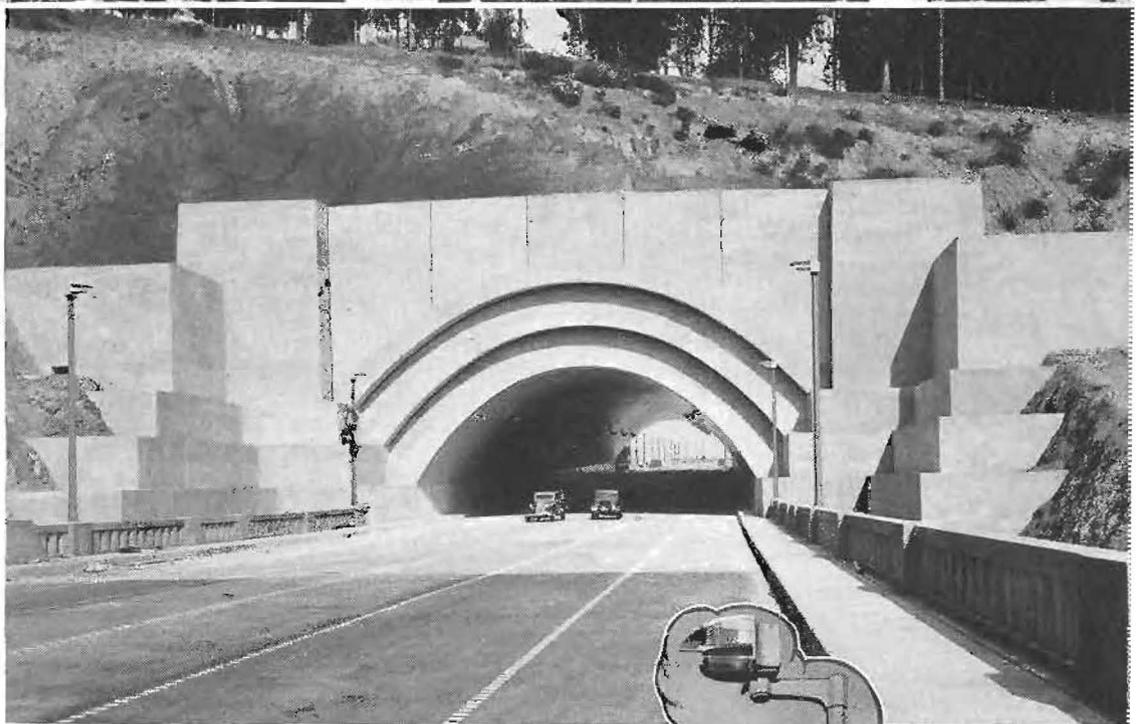


AT TOP  
Panorama of  
entire bridge  
looking toward  
Golden Gate.

AT LEFT  
Cantilever span  
and approaches  
and below,  
east  
suspension span  
approaching Yerba  
Buena Tunnel.

AT RIGHT  
View of  
lower deck  
showing  
three  
truck  
lanes.

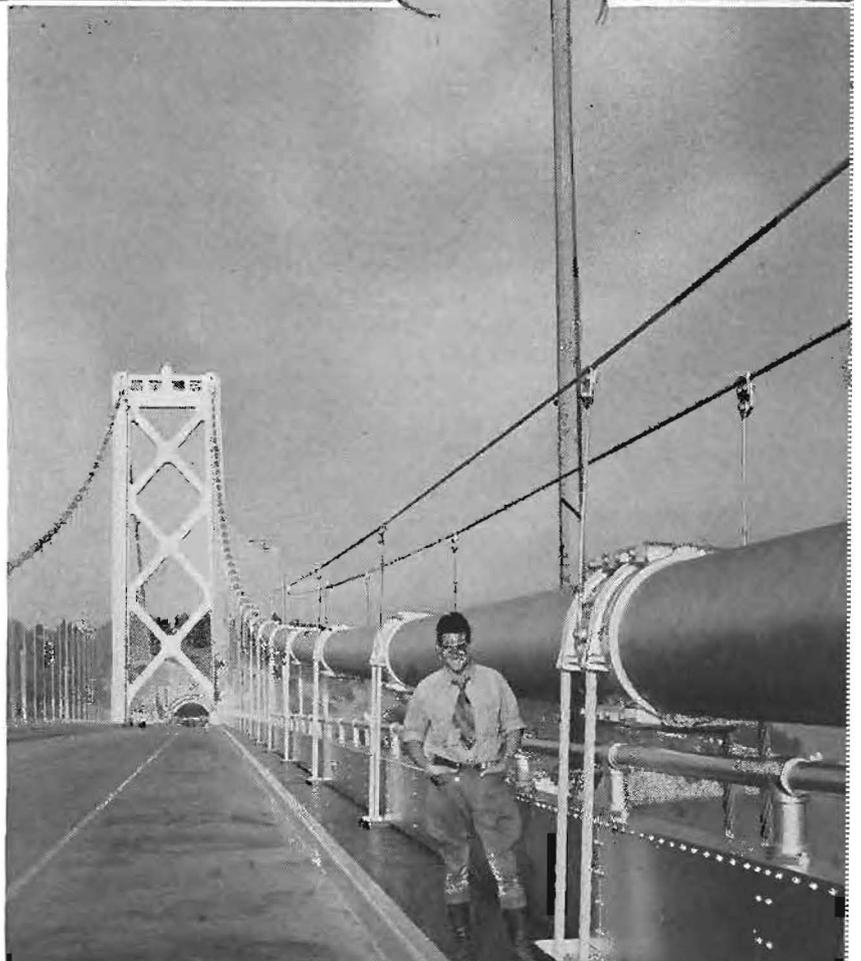




**IN CENTER**  
Auto traffic passes through an arch of steel on top deck of cantilever spans.  
**AT RIGHT, ABOVE**  
View of upper deck through the Yerba Buena Tunnel.



**AT RIGHT**  
Close up of main cable of east suspension span showing suspender cables and Fresnel light standard and lamp.



# Main Highway Arterials Lead to Bay Crossing

(Continued from page 18)

vealing some of the traffic arterials that lead to it.

## NEW HIGHWAY CONNECTION

First, there is the new East Shore highway, a portion of which was rushed to completion for the opening of the bridge. This highway, designated State Route 69, intersects with United States 40 which is also State Highway 14, in El Cerrito and traverses the tide flats to connect with U. S. 48 (State Highway Route 5) near Emeryville. It extends also southward to join Seventh Street and Cypress in Oakland.

This double highway, which features a ten-foot dividing strip, has been designed to be one of the safest in California.

U. S. 40 (Lincoln Highway) traverses San Pablo Avenue through Oakland and Berkeley and follows the shore of San Pablo Bay and the Straits of Carquinez, which it crosses to connect with State Highway Route 7. Route 7 is the link that carries traffic to the various roads covering the fertile Sacramento Valley regions.

Two recent improvements on this route, the American Canyon Cut-off from the vicinity of the Carquinez Bridge to Fairfield and the realignment south of Vacaville will shorten the driving time from Sacramento to the Bay region by a full hour.

## NEW TUNNEL BUILDING

Another important project that will give easier access to a prosperous region from which traffic will flow directly over the bridge is State Highway Route 75—the road to Moraga Valley and Walnut Creek. The Broadway low level tunnel when complete will replace the old narrow tunnel east of Berkeley and considerably shorten the distance.

It is easy to visualize the great activity in motor-car travel, both industrial and pleasure, which will re-

sult in the Bay Region with the creating of such an important link in our highway chain as the San Francisco-Oakland Bay Bridge.

This structure will be maintained by the State Highway Department from gas tax funds allotted to the northern counties.

## SPECIAL HIGHWAY SQUAD

Traffic regulations will be those of all State highways, with the speed limit 45 miles per hour. For the protection of motorists and to safeguard against reckless driving a special bridge detail of the California Highway Patrol has been assigned to duty within the confines of the structure operating from the Fifth Street Plaza in San Francisco to the East Bay approaches. Their quarters will be at the Administration Building. In order to expedite traffic over the bridge the Vehicle Code specifies that "on vehicular crossings" acquired under the provisions of the California Toll Bridge Authority Act, pedestrians, bicycles and animals led or driven can not be permitted.

In closing, I want to pay a tribute of appreciation and sincere admiration to the men whose brains and brawn have built this great structure. To the engineering geniuses who conceived and designed it and to the thousands of American workmen whose daring courage and skill erected it the San Francisco-Oakland Bay Bridge will be an enduring monument of steel and concrete, a memorial of high endeavor and sacrifice for future generations to gratefully contemplate.

"Say, porter, did you find a big roll of money under my pillow?"

"Yessuh. I did, soh, and I thanks you, soh, very much, suh."

Doctor: "Humph! I can't quite diagnose your case. I think it's drink."

Patient: "Oh, I see. Now, look here, doctor. Would you like me to come again when you're sober?"

# Pres. Roosevelt Starts Traffic Over Bay Bridge

(Continued from page 9)

Simultaneously, searchlights on every battleship in navy row shot great beams of light into the clear night sky and for an hour wove designs in the heavens.

Against a blue-black background of the southern horizon an endless procession of automobiles moved back and forth across the bridge, their headlights giving the impression of flaming pearls in motion on an unearthly jewelled brooch stretched across the bay.

## GREAT PYROTECHNIC DISPLAY

Many thousands of San Franciscans and visitors sat spellbound on every vantage point in the city for hours watching the gorgeous show of light. And to top it off, from a barge anchored in mid-bay, San Francisco staged such a display of fireworks as never before has been witnessed on the west coast.

It was a breath-taking scene.

To add to the glamour of the night, every large office building and hotel in downtown San Francisco was aflame with electric lights, each an incandescent, colorful pattern of its own.

On Friday, November 13, San Francisco staged the greatest parade in its history, and San Francisco ever has been a city that loved parades. The afternoon parade of that day, starting at the Embarcadero at 2 o'clock in the afternoon, consumed three hours in passing the reviewing stand in the Civic Center.

## BRILLIANT NIGHT PAGEANT

The city gave itself over to a riot of fun and celebration ending with a huge pageant of light on Saturday night, a night parade of brilliantly illuminated floats, marching troops, sixty bands and drum corps and numerous civic and military organizations.

Tired, but still joyous, citizens of San Francisco went to their churches on Sunday morning where special services in commemoration of the realization of the city's bay bridge dream were held.

# New Problems of Design Solved by Bridge Engineers

By Glenn B. Woodruff, Engineer of Design  
San Francisco - Oakland Bay Bridge

**T**HE LARGEST and deepest foundations on record, the world's largest tunnel, a new type of suspension bridge, the longest and heaviest cantilever span in the United States were among the problems that faced the designers of the Bay Bridge.

For all of these, it was necessary not only to provide a design that would be adequate when completed but to develop construction methods on which the contractors would stake their resources to accomplish what many engineers, not to speak of laymen, had declared impossible.

There was still another task, to produce such designs that this work could be accomplished within reasonable financial limits. For several parts of the work it was necessary to develop not only new designs, but also new theories of design. It is now possible to report that all these problems have been successfully solved.

## DESIGN HIGHLIGHT

Among the highlights of these designs, the following may be briefly mentioned.

The Purcell-Moran caissons used for the foundations of the West Bay piers, which not only permitted carrying our foundations to rock 240 feet below water surface but also made it possible to force the cutting edge through 25 feet of sandstone.

The false bottom caissons in the East Bay, which permitted placing foundation concrete 245 feet below water, 60 feet beyond all records other than those on the bridge.

The tunnel through Yerba Buena Island, 80 feet wide, 60 feet high, with lining, and involving the new method of completing the tunnel lining before excavating the core.

The twin suspension span West



G. B. WOODRUFF

Bay Crossing, with its immense center anchorage.

The East Bay cantilever, longitudinally anchored at one point only with provisions for taking all the expansion in a mile of bridge at one point.

No mention of this project can be complete without a tribute to the efficient staff of engineers, all of them employees of the State Department of Public Works, whose industry and ability have brought the project to its successful culmination.

## Commuters Will Save 35,000,000 Hours per Year

**W**HEN electric train service is installed on the San Francisco-Oakland Bay Bridge, bay commuters will be saved approximately 35 million hours of time a year, according to Earl Lee Kelly, Director of the Department of Public Works.

This saving, figured in dollar value of time saved by commuters, ultimately will be worth almost the cost of the bridge, in the opinion of Mr. Kelly.

### 35,000,000 COMMUTERS

At the time the bridging of the bay began to receive serious consideration in Washington, Director Kelly ordered an exhaustive survey of commuter needs between San Francisco and the East Bay district. His engineers found that 35 million persons a year used the ferryboats and that the average trip, counting waits, consumed an hour each way.

"Our studies showed that a bridge with high-speed electric trains replacing the ferryboats would save each commuter nearly an hour a day," Director Kelly said.

### ELECTRIC TRAINS PLANNED

"The next problem was that of cost to the commuter. The State's engineers and the California Toll Bridge Authority had their choice between a 'gold plate' service that would be the last word in luxury but which would be more expensive than the ferryboats, and the cheapest kind of electric train service which took no account of comfort or speed.

"The electric trains planned for the bridge are a happy medium between these two extremes. They will provide fast, comfortable service and at the same time will be sufficiently inexpensive to allow the money borrowed from the Reconstruction Finance Corporation for the interurban system to be repaid in about a score of years out of commuter fares."

Jack Tar had just arrived at the old home cottage after voyaging about for a number of years. "Well, mother," he said heartily, "how did you like the parrot I sent you?"

"Well," said his old mother dubiously, "it was nice and plump, Jack, but my! it was tough."

# Bridge Built in 40 Months With Saving of Over \$7,500,000

In his speech at the dedication ceremonies, Chief Engineer Charles H. Purcell of the San Francisco-Oakland Bay Bridge, who is also State Highway Engineer, paid a high tribute to the intelligence of American workmen whose skill constructed the great span in forty months with a saving of \$6,000,000 under estimate and over \$1,500,000 in interest on bonds. The speech in full was as follows:

## BY CHARLES H. PURCELL

Chief Engineer and State Highway Engineer

**T**HIS bridge today becomes a part of the State Highway System of California—a part of a system that has kept pace with the development of California since its establishment in 1909.

The people of California have contributed through the years to the maintenance and construction of this system which has returned to the people a service in economical transportation of the varied products of the farms, mines and industry. The highway system has done its part in lowering the cost of bringing these products to the competitive markets of the world on such a basis that California has prospered.

Into this bridge have gone the results of the combined research and experience through the years of the various engineering and scientific professions. We have in this structure contributions from the metallurgists, the mining engineers, the electrical engineers, the mechanical engineers, the chemical engineers, and the civil engineers.

### TRIBUTE TO AMERICAN WORKERS

The personnel of these groups have all contributed to this structure. The rapid production of materials and the speed of assembly materials, with improved quality of workmanship, permitted the completion of this structure in the short period from July, 1933, to November 12, 1936—a period of forty months.

The intelligence of the American skilled workman, which enables a large organization to adapt itself to

the newest mechanical developments, can not be equalled in any nation, and to this great body of skilled labor on this structure I am sure that the people of California are grateful. This great undertaking

the great contracting firms who bid upon our plans and carried them through to completion with that spirit of cooperation with the engineering staff that is essential to any successful engineering project.

### SAVING OF \$7,500,000

This bridge stands completed today, ready for motor transport, with a saving of over six million dollars under the estimated authorization for its construction. It is available for the use of the public six months in advance of the scheduled completion date, with a saving in cost of interest on bonds during construction of over a million and a half dollars. Total cost of the bond-financed bridge at this stage is fifty-three million six hundred thousand dollars in cash.

I wish to pay a tribute at this time to the great staff of engineers who worked so diligently and skillfully during the past five years. Often long hours of overtime have been necessary to make today's completion date possible. No chief engineer could have had a more loyal and skillful design and field force than it has been my privilege to have on this project.

I am deeply grateful to Governor Frank F. Merriam for his kindly and sound advice and for his sincere cooperation. I am indebted to Earl Lee Kelly, State

Director of Public Works, for his untiring assistance and encouraging counsel.

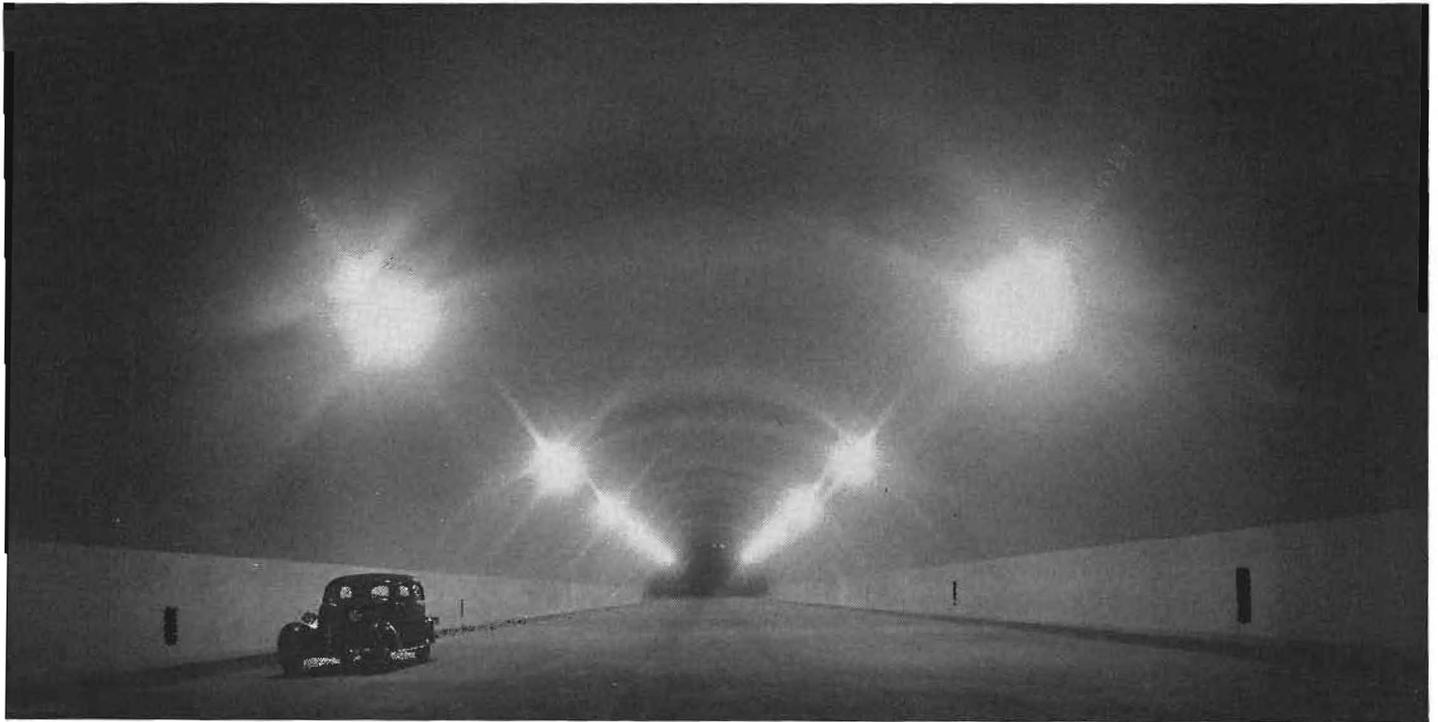
To the Board of Consulting Engi-



C. H. PURCELL

was carried on through the depression, under varying conditions, with no strike or serious labor dispute.

I feel that a word of praise is due



Night view in Yerba Buena Island tunnel of San Francisco-Oakland Bay Bridge showing excellent lighting effects of sodium vapor lamps.

neers whom I selected for this work five years ago—whom I considered outstanding in their particular fields—I am grateful for technical advice.

I am grateful, too, for the wise counsel of the Financial Advisory Board, composed of business men who gave freely of their time and money to assist in launching and guiding the financial questions which are important in a project of this kind.

Those who were appointed to membership on the original Hoover-Young Commission can look with satisfaction upon the work which they did as a basis for this structure when the location and agreements with the Army and Navy were reached and the report made to President Hoover and Governor Young on August 6, 1930.

#### COOPERATION BY RFC STAFF

The businesslike decisions on all fiscal questions and technical questions arising during the progress of this work, by the Directors of the Reconstruction Finance Corporation and Chief Engineer and legal staff have contributed largely to the rapid progress and the prompt completion of this project well within the estimates.

For the patience and the kind understanding of the people of the San Francisco Bay Area we of the engineering staff are duly grateful.

### Poem Quoted in Dedication Speech by Gov. Merriam

In closing his dedication speech at Oakland, Governor Merriam quoted the following poem:

'They have builded magnificent bridges  
'Where the nation's highways go;  
'O'er perilous mountain ridges  
'And where great rivers flow.  
'Wherever a link was needed between the new and the known  
'They have left their marks of Progress, in iron and steel and stone.  
'There was never a land too distant  
'Nor ever a way too wide,  
'But some man's mind, insistent,  
'Reached out to the other side.  
'They cleared the way, these heroes, for the march of future years.  
'The march of Civilization—and they were its Pioneers.'

—Evelyn Simms

As this bridge daily carries on the work for which it is intended, we hope it will develop a character as have the venerated old bridges of the world. We hope that in time the public in this great metropolitan area around San Francisco Bay will feel the same affection towards this that they do towards their many interesting historical spots that they now treasure.

## Governor Merriam Dedicates Bay Bridge

(Continued from page 16)

fort for the commuter and the visitor. In the realization of this service will the project fulfill the objective of its builders and the hope and expectations, not alone of the residents around the bay, but of all Californians.

This bridge belongs to this generation. We built it and we shall pay for it. But in a broader sense it belongs to the generations that are to come. When the youths of today become the citizens of tomorrow they will use it without cost. Accordingly, we dedicate it today to our own use and to theirs, hoping that they shall receive it as a legacy of great worth and as an indication of our desire to serve.

#### BRIDGE DEDICATED

May it always remain a thing of beauty and interest, an example of the genius and courage of the engineer, financier, builder and the people of California.

Cub Reporter: "I'd like some advice, please, on how to run a newspaper."

Editor: "You've come to the wrong person, son. Ask one of my subscribers."

# Legal History of the Transbay Bridge Project

By C. C. CARLETON, Chief Attorney  
State Department of Public Works

PURSUANT to an act of the 1927 Legislature, introduced by Senator Roy Fellom of San Francisco, providing for an investigation by the California Highway Commission of the operation of toll bridges in California, a comprehensive report was submitted by the Commission to the 1929 Legislature.

In the summary of conclusions in that report the following statement appears:

"A general conclusion is drawn that, due to the generally high cost of public service of privately owned toll bridges, and the extreme difficulty of acquiring them after they are constructed, at a value consistent with that for which the state or county could build and operate them, necessary steps should be taken to permit the state or counties to finance and build toll bridges on an income bond basis."

The report contains the following significant paragraphs:

"There have been a large number of franchises sought by different parties to bridge the waters of the San Francisco Bay district, all of which have been denied by the supervisors of the county having jurisdiction, they are:

#### MANY WANTED FRANCHISES

Applications for franchises to construct bridges across San Francisco Bay from the municipal district of San Francisco to that of the east bay cities. Some 33 applications have been made to San Francisco County, two to Alameda County and four to San Mateo County for such franchise. The city of San Francisco has applied to congress for a permit to build a bridge across the bay at the location proposed by its board of engineers in their report dated May, 1927."

In the year 1928 several conferences were held between State and city and county officials in which the endeavor was made to interest the State itself in undertaking the construction of such a bridge. An early legal question arose whether under the Constitution of the State of California the State, through ap-

propriate legislative machinery, could issue revenue bonds to finance the construction without submitting such a bond issue to a vote of the people.

While such bonds were not to be intended to constitute a debt or general obligation upon the State, but to be retired solely from the earnings of the structure, yet the constitutional ques-



C. C. CARLETON

tion became a vital one at the outset.

It was the first time this form of financing had been proposed to be used by the State of California, itself. However, it had been used successfully in a number of other states, notably New York, Indiana, Kentucky, Ohio and in many municipalities throughout the Nation. It was an old established method of public fi-

nancing in Europe for projects of both local and general importance.

At a meeting held by interested public officials and private citizens in the State Building at San Francisco on November 20, 1928, the legal aspects of the construction and operation of the bridge connecting San Francisco with Alameda County were discussed and a legal committee appointed to study the constitutionality of the suggested revenue bond plan of financing and to draft any new legislation that might be required to be introduced in the 1929 Legislature.

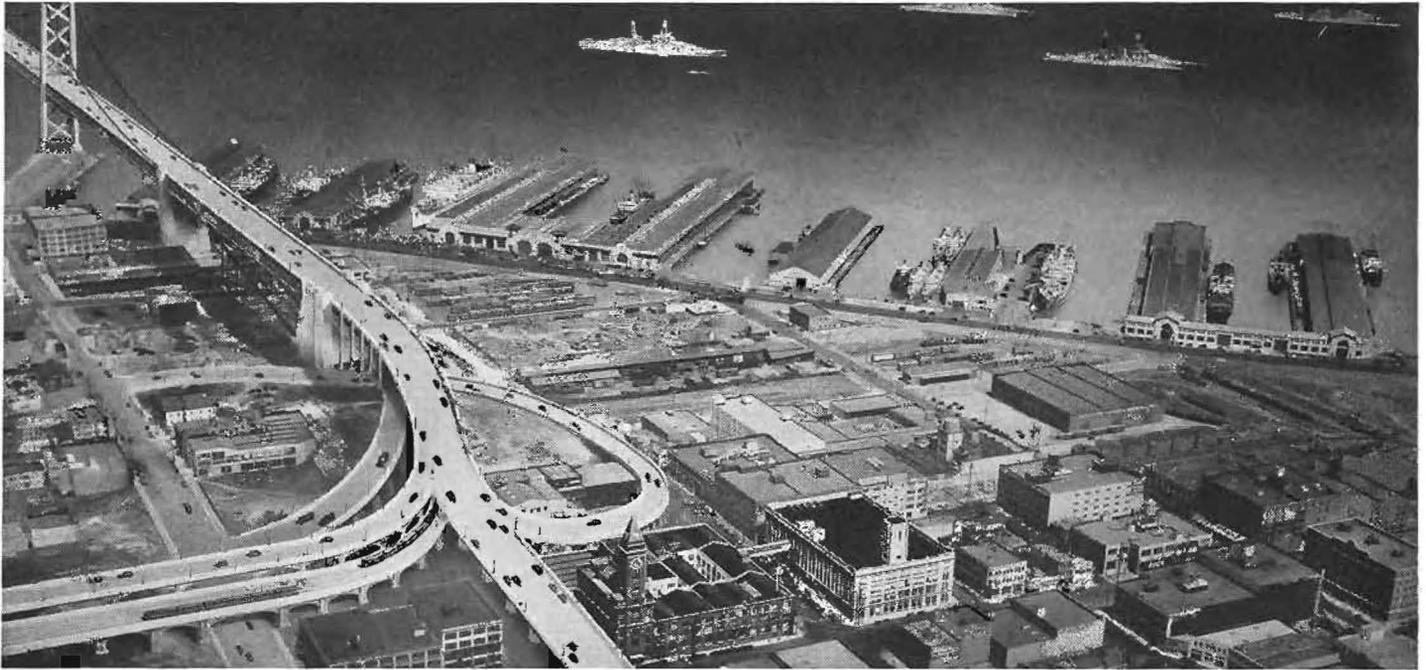
This committee was composed of Frank English, Deputy Attorney General, representing Attorney General U. S. Webb, John J. O'Toole, City Attorney of San Francisco, and John J. Dailey, his assistant, representing the City and County of San Francisco, and the writer, as legal representative of the State Department of Public Works. Judge Matt I. Sullivan, former Chief Justice of California, also advised in the legislation.

The 1929 Legislature duly passed the necessary legislation, also introduced by Senator Fellom, creating a California Toll Bridge Authority and authorized the issuance of revenue bonds to build or purchase toll bridges in the State of California.

#### LOCATION DETERMINED 1930

The first project undertaken was the San Francisco-Oakland Bay Bridge. In 1930 the location of the bridge was determined under the direction of a special commission appointed by the President of the United States and the Governor of the State of California.

Congress passed an act granting a permit for the construction of the bridge. The 1931 Legislature of California passed an act appropriating



This photograph, looking east from the Fifth Street Plaza in San Francisco, shows the on and off ramps for both upper and lower decks of Bay Bridge. In foreground is the approach to the plaza. The artist has sketched in his conception of interurban trains using the lower deck.

\$650,000 for the preparation of necessary plans and estimates.

It was determined that it would be advisable to prepare a test case in the Supreme Court of California to establish the constitutionality of the California Toll Bridge Authority Act of 1929.

#### CONSTITUTIONALITY UPHELD

The Supreme Court in the case of *California Toll Bridge Authority, et al., vs. Wentworth, etc.*, 212 Cal. 298, upheld such constitutionality.

The Authority was represented in the proceeding by U. S. Webb, Attorney General, Robert W. Harrison, Chief Deputy Attorney General, Frank English, Deputy Attorney General, and the City and County of San Francisco by John J. O'Toole, City Attorney; John J. Dailey and the writer, of Counsel.

Special credit is due John J. Dailey, now a Deputy Attorney General of California, for the valuable contributions he made toward handling legal and legislative matters during this early period.

In 1932 requests were made to the Reconstruction Finance Corporation at Washington to aid in the financing of the San Francisco-Oakland Bay Bridge, and a formal contract and formal agreement, dated December 15, 1932, for such financing was entered into between the California

Toll Bridge Authority and the Reconstruction Finance Corporation.

#### BOND VALIDITY ESTABLISHED

The Reconstruction Finance Corporation required as a condition precedent to the purchase of the bonds, that the validity thereof be passed upon by attorneys approved by such corporation.

The firm of Thomson, Wood & Hoffman, attorneys at law and nationally recognized bond experts of New York City, being acceptable to the Reconstruction Finance Corporation, was then employed by the California Toll Bridge Authority and have since served as the eastern bond counsel.

On December 15, 1932, the law firm of Heller, Ehrman, White & McAuliffe, of San Francisco, was employed by the Authority to render legal services in connection with the transactions with the Reconstruction Finance Corporation at Washington and litigation and legislation in California, and have since served as special counsel for the California Toll Bridge Authority.

#### McAULIFFE'S WORK LAUDED

F. M. McAuliffe and Lloyd W. Dinkelspiel of that firm have made numerous trips to Washington and both there and in California have rendered conscientious and conspicuous public service.

They have handled the legal work in connection with the drafting of the agreements with the railway companies for the installation of rail facilities on the new bridge.

In 1933 they also conducted the second test case entitled, "*California Toll Bridge Authority vs. Kelly*," 218 Cal. 7, where the Supreme Court of California again upheld the constitutionality of revenue bonds issued by the California Toll Bridge Authority.

Much legal work has also been handled by the regular legal staff of the State Division of Highways, Department of Public Works, and at all times the coordination of the work of the regular and special counsel has been complete and cordial.

It would be beyond the scope of this brief article to catalogue all the cases and problems disposed of by the legal advisers.

Considering the immensity of the San Francisco-Oakland Bay Bridge project, it is remarkable that it has been so free from vexatious and dilatory litigation.

In conclusion it is safe to assert that every attorney who has been associated in any manner in the initiation, development and accomplishment of this vast enterprise feels that he has enjoyed one of the most outstanding opportunities of his professional career.

# Flat Toll Rate is 65 Cents per Car Including Driver and 4 Passengers

A FLAT base toll of 65 cents per automobile, with no charge for five passengers, including driver, and a 45 cent commutation rate will prevail on the San Francisco-Oakland Bay Bridge during the first year of its operation.

These rates were endorsed by the San Francisco-Oakland Bay Bridge Financial Advisory Committee at its meeting in San Francisco on October 28th and finally approved by the California Toll Bridge Authority at a meeting in Sacramento November 6th. They compare with the established average ferry rate of 80 cents per passenger automobile that had existed for years until the ferries recently reduced their fare to meet the bridge rate and were also approved by the Reconstruction Finance Corporation, the Federal body that advanced the funds for construction of the bridge.

Truck rates were fixed at 75 cents per truck, including driver.

## RECOMMENDED BY EXPERT

The established toll rates were recommended by Chief Engineer C. H. Purcell, based on an engineering report of a thorough study of the financial requirements for amortization of bridge bonds, interest, operation, etc., made by Coverdale and Colpitts, New York traffic experts, as required by State law and an agreement between the Toll Bridge Authority and the Reconstruction Finance Corporation.

The toll schedule as adopted is as follows:

1. Automobiles, ambulances, taxis, commercial or light delivery automobiles, all with driver and not to exceed 4 (four) additional passengers ..... \$0.65  
Passengers in excess of 4 (four) ..... each .05
2. Commute: Passenger automobiles only, with driver and not to exceed 4 (four) passengers, 50 (fifty) one-way trips in any calendar month ..... 22.50

Passengers in excess of 4 (four) .....	each	\$0.05
3. Trailers drawn by automobiles .....		.50
Passengers riding trailer .....	each	.05
4. Auto trucks (with driver) .....		.75
Passengers in excess of driver .....	each	.05
5. Auto truck trailer or semitrailer .....		.75
Passengers riding trailer .....	each	.05
6. Buses with driver .....		.75
Passengers in excess of driver .....	each	.05
7. Motorcycle with driver .....		.20
Additional passengers .....	each	.05
8. Tricar with driver .....		.30
Additional passenger .....		.05
9. Vehicles not otherwise specified and traveling under special permit .....		.03 1/2
per 100 pounds .....		
10. Freight on all kinds of vehicles .....		.03 1/2
per 100 pounds .....		

## LARGE FREIGHT SHIPMENTS

**Note:** When freight from any one individual firm or company exceeds 50 (fifty) tons daily, the charge to be 3 cents per hundred pounds. If the charge on shipments of less than 50 (fifty) tons daily at 3 1/2 cents per hundred pounds makes a higher charge than \$30, this charge of \$30 will apply.

When freight from any one individual firm or company exceeds 75 (seventy-five) tons daily, the charge to be 2 1/2 cents per hundred pounds. If the charge on shipments of less than 75 (seventy-five) tons daily at 3 cents per hundred pounds makes a higher charge than \$37.50, the charge of \$37.50 will apply.

The minimum daily tonnage shall be computed as the tonnage moving between hours of 12.01 a.m. of one day to midnight of the same day.

The average cost now for an automobile entering San Francisco by ferry has been 80 cents. The flat bridge rate of 65 cents per car includes four passengers and the driver and pro-

vides free parking in San Francisco, thus eliminating the daily parking problem for hundreds of visitors and commuters.

## FREE PARKING PROVIDED

Every bridge ticket will admit the car to a large parking area under the bridge structure in San Francisco up to the limit of the area capacity, which will be about two thousand cars daily.

The monthly commutation rate of \$22.50 allows for 50 one-way automobile trips in a thirty-day period, or a round trip each day for 25 working days at the rate of 45 cents per single trip carrying five people.

The truck rates are fixed at 75 cents per truck regardless of size, except that all truck trailers are on a straight 75 cent rate, with no commutation rates applying.

In abolishing auto passenger tolls the bridge authority is following the prevailing practice on large bridges in the East where no charge is made for passengers in automobiles crossing the George Washington Bridge, the Delaware Bridge, or the Holland Tunnel. The additional charge of 5 cents for each occupant of the automobile above the number of five is largely made to discourage the development of a jitney service on the Bay bridge.

It is further believed that the 65 cent flat rate will greatly facilitate speedy movement of traffic, especially on heavily congested days. Drivers can readily hand out the fixed amount without the necessity of stopping for the counting of passengers and asking of questions, thus blocking the toll lanes. Having a flat rate for passengers and car permits an automatic count of the bulk of traffic, eliminating the personal equation.

## Building Material Quantities

The San Francisco-Oakland Bay Bridge represents:

Structural steel.....	152,000 tons
Reinforcing steel.....	30,000 tons
Cable wire.....	18,500 tons
Concrete .....	1,000,000 cu. yds.
Cement .....	1,300,000 bbls.
Lumber .....	30,000,000 ft. b.m.
Timber Piles.....	800,000 lin. ft.
Asphalt .....	45,000 tons.
Paint .....	200,000 gals.
Rock wall.....	317,000 tons
Dredging .....	4,678,000 cu. yds.
Excavation .....	1,360,000 cu. yds.

# EAST BAY DISTRIBUTION STRUCTURE INCLUDES 16 GRADE SEPARATIONS

**C**ONSTRUCTION of the distribution structure for the East Bay approach to the San Francisco-Oakland Bay Bridge involved more engineering problems than were encountered on the San Francisco side.

Two major puzzles confronted the engineers of the Division of Highways. They were solved by the building of an intricate interlacing traffic distribution structure and by a mole fill.

The structure itself is located within the city limits of Emeryville, at the point where the fill intersects the rail lines of the Southern Pacific, Santa Fe and Key Route System. It was placed there because all these rail lines had to be crossed and it was considered best to cross them all with one structure.

## DIFFICULT TRAFFIC PROBLEMS

Traffic problems which were involved and which were overcome were:

Grade separation of the bridge traffic from local streets.

Grade separation from lines of the three railways.

Separation of the various lines of bridge traffic without right angle turns on individual roadways to cover the following territory:

From the bridge to San Pablo Avenue, in Berkeley, thence downtown and crosstown into Oakland and to points south and east;

To Berkeley, El Cerrito, Richmond and points north.

Provision for traffic other than that to and from the bridge, as follows:

Crosstown and downtown Oakland to Berkeley, El Cerrito, Richmond and northerly;

Oakland waterfront to Berkeley, El Cerrito, Richmond and northerly and southerly.

## COMPLEX STRUCTURE REQUIRED

Solving of these problems resulted in the interlaced and complex structure which attracts the attention of motorists at the East Bay approach to the bridge. In all, sixteen grade separations were necessary.

The distribution structure gener-



Aerial view of intricate East Bay distribution structure showing how traffic problems were solved. The two roadways leaving the structure in the immediate foreground lead directly to the bridge approach.

ally consists of 40-foot concrete deck spans supported on concrete piers with spread footings. About 2000 feet of the whole is of steel plate girder spans, the longest girder being 148 feet, with a span of 118 feet and a cantilever overhang of 28 feet. Nearly 200 piers support the structure, the floor system of which is structural steel with concrete decks reinforced by welded trusses.

The mole fill is from Pier E-39 to the distribution structure, roughly paralleling the Key Route interurban tracks. Construction was begun April 8, 1934. Material for the fill was taken from Oakland outer harbor north of the old ship channel. Material used ran an average of 75 per cent fine sand.

In addition to this work the Divi-

sion of Highways had to build a double 9 by 9 foot concrete subway to allow passage to the waterfront of trucks of the factories in Emeryville, over whose property rights of way had to be obtained. This project cost \$26,433.50.

Both the Oakland and San Francisco approaches were financed from a \$6,600,000 appropriation voted by the legislature. This sum will be returned to the State gas tax fund from bridge tolls.

Teacher: "Where is the capital of the United States?"

"All over the world."

Fond Mother: "Well, son, what have you been doing all afternoon?"

Tough Youngster: "Shootin' craps."

Fond Mother: "That must stop. Those little things have as much right to live as you have."

# American Canyon Cut-off Opened; Will Save Hour Between San Francisco and Capital

By R. E. PIERCE, District Engineer

THE SO-CALLED American Canyon Cut-off between Cordelia and the Carquinez Bridge—opened with formal ceremonies on November 10 arranged under the auspices of the State Chamber of Commerce is only one of several realignments that have been made in this important highway extending from San Francisco and the bay area to Sacramento.

The necessity of a more direct and faster road between Sacramento and San Francisco was realized shortly after the existing route was made a State Highway, and considerable thought was given to a direct road which would be away from the present road for almost its entire distance.

This idea, however, was given up in favor of improving the present road when it was found that the direct road was very little shorter than the proposed improvement of the present route. The investment in an entirely new route would be very large and would all have to be built before it could be used, while with the plan now in effect each unit can be built and put into use as funds permit.

The first unit to be constructed was the so-called Cordelia Cut-off, completed in 1929, extending from Route 8 which runs via the Jameson Canyon to and beyond Napa. This change, 1.2 miles in length, extending from a point a short distance west of the new junction with the American Canyon Cut-off, to old Route 7, northeast of Cordelia, eliminated a narrow, crooked, slow road through the town of Cordelia, and shortened the distance about 0.4 of a mile.

Originally this road was graded and bituminous surfaced, and in 1932 was paved with Portland cement concrete, as part of the same contract which built a new cut-off extending from the end of this first job to about one mile west of Fairfield. This new cut-off shortened the distance another three-fourths mile.

The next improvement, the so-called

Orchard Line Change, southwest of Vacaville, was completed this year, eliminating the most tortuous piece of alignment on a major valley highway in the State. This cut off another three-fourths mile in distance and speeded up traffic.

The American Canyon relocation came next in time of completion, and as has been repeated a good many times, eliminates practically six miles of distance in addition to taking traffic off a considerable length of narrow, crooked streets in the city of Vallejo, and eliminates five grade crossings with railroads.

The latest project in the plan is the Vacaville By-Pass just getting under way. This unit, 2½ miles in length, starts at the east end of the Orchard Line Change and runs in a very direct alignment to the present road about ½ mile east of Vacaville.

This eliminates entirely the narrow, crooked, congested streets of Vacaville, and will be a great help in speeding up through traffic, as well as giving the local people more use of their streets with greater safety. This will shorten the distance another 0.1 mile.

The above listed projects show a total shortening in distance of 8 miles, between Sacramento and the Carquinez Bridge, which with the elimination of stretches of slow road should cut down the running time over the old route at least 25 minutes.

And this is not the end. Studies have been made of other possible changes, which if constructed, would cut off another six miles in distance and correspondingly shorten the driving time.

Changes in progress and proposed between the Carquinez Bridge and the Bay Bridge will also shorten the distance and cut the time, so that ultimately it should be an easy two-hour trip at the present speed limit between Sacramento and San Francisco.

## Transcontinental Highways Lead to Bay Crossing

OF THREE transcontinental highways converging at Salt Lake City—U. S. 30, 40 and 50—two of them, U. S. 40 and 50, lead directly to the San Francisco-Oakland Bay Bridge.

These two highways join at Sacramento with U. S. 99 stretching from the State of Washington to Los Angeles, all feeding traffic onto the great bay bridge.

The opening of the new American Canyon Highway between Cordelia and Carquinez Bridge on November 10 cuts the driving time between Sacramento and San Francisco via the San Francisco-Oakland Bay Bridge about an hour and provides the motorist with a safer and faster highway than the old route via the Napa Y and Vallejo. It eliminates about six miles of distance in addition to taking traffic off a considerable length of narrow, crooked streets in Vallejo, and also eliminates five grade crossings with railroads.

Crossing the continent, motorists have a choice of two U. S. routes from Lake Tahoe to the bridge. They may follow U. S. 40 through such picturesque pioneer towns as Emigrant Gap, Colfax and Auburn to Sacramento, or they may go via U. S. 50 through the heart of the Mother Lode country to Stockton and thence to Oakland.

From Sacramento the motorist may travel either direct over U. S. 40 via the American Canyon cut-off to the bridge or over U. S. 50 through Stockton, California's great inland port.

Bill—Why does a person always lower his voice when asking for a loan?

Sam—I suppose for the same reason he raises it when he doesn't get it.



Sweeping view of new American Canyon cut-off between Cordelia and Garquinez Bridge which effects saving of about one hour's driving time to San Francisco from Sacramento City



Above is Cordelia underpass and on right, view of big fill on cut-off



Governor Frank F. Merriam cuts ribbon barrier. Left to right: J. R. Knowland, President State Chamber of Commerce; F. J. Grumm, Division of Highways; Senator Thomas McCormack; R. E. Pierce, District Highway Engineer; H. A. Hopkins, Chairman, Highway Commission; E. C. Crowley, Assemblyman; Senator F. L. Gordon; Gov. Merriam, Luther Gibson, E. J. Neron, Deputy Director Public Works; Earl Lee Kelly, Director Public Works; Supervisor John Keema, Sacramento; Congressman F. H. Buck; Supervisor Howard Knight, Marin; T. J. O'Hara, president Vallejo Chamber of Commerce. The little girl assistants are, left to right: Sarah Gaston of Vallejo; Jacqueline Boucher and Patsy Carmody of Sacramento and Jeannie Gibson of Vallejo

# Program of Highway Officials Convention in San Francisco, Dec. 7-10

By W. C. Markham, Executive Secretary  
American Association of State Highway Officials

WHEN THE ASSOCIATION held its Annual Convention in San Francisco twelve years ago, thirteen State Highway Departments did not answer to the roll call. The East had not yet learned to travel West; and had it been attempted "overland," it would have been an almost impossible task.

This year it is a different story and Maryland is the first to register from the Atlantic Seaboard. There will be 12 delegates. Don't think they are all taking streamlined trains or the "sky route," for some of them are planning to use your highways "all the way." Other Eastern States will have to look to their laurels.

It is not the purpose of this story to dilate upon the attractions of the city which knows full well how to be a gracious host, but to bring to you in short resume the outline of the program of important subjects provided by the Program Committee for the three days of the convention to be held in the Hotel St. Francis. This committee, which has provided the literary feast, is as follows: T. J. Pattison, Wisconsin, Chairman; H. A. Hopkins, California; H. D. Barnes, Kansas; H. E. Tabler, Maryland, and C. D. Snead, Bureau of Public Roads, Montgomery Alabama.

## TWO GOVERNORS SPEAK

President Gilchrist will give the annual address and cover points he considers of vital import. Of course, this will follow an address by Governor Merriam of California.

Thos. H. MacDonald, Chief of the Bureau of Public Roads, has not been given a subject. He can be depended upon to put his finger on the proper electric button and show us something besides rules and regulations.

Wisconsin is one of the pioneers in building roads as a State, and was the first State to number the State highways as a convenience to the traveling public. Governor Philip La Follette of Wisconsin has been secured to give an oration on "The Financing of Public Works." Governor La Follette has shown keen interest in the value and need of public works and may be depended upon to take an advanced stand on this class of public responsibility, carrying an inspirational effect.

Of course, one of the outstanding events for all highway officials will be the inspection and study of the great San Francisco-Oakland Bay Bridge, built under the direction of our general chairman, State Highway Engineer C. H. Purcell, chief engineer of the bridge. This structure will have been open one month at the time of our Convention.

Mr. C. E. Andrew, Bridge Engineer of the State Highway Department of California, will give the Convention an intimate and thorough description of this \$77,000,000 project, together with many illustrations. All this before the Convention, in a body, drives over this monumental structure.

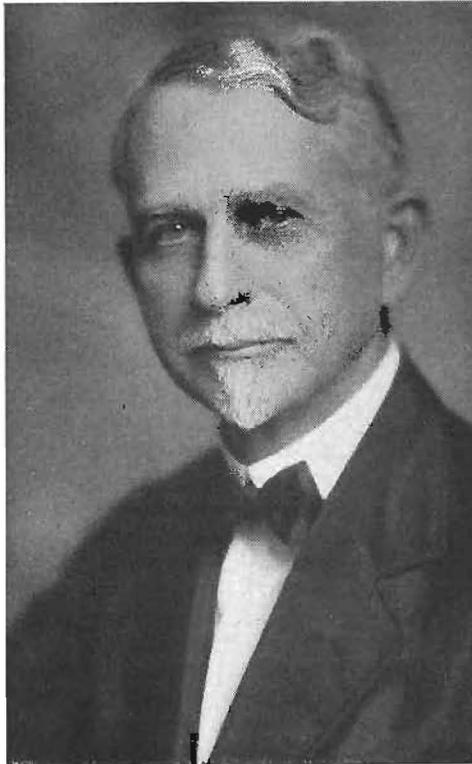
The Highway Departments are under everlasting obligations to the women of the states in helping to create the proper public opinion favorable to roadside beautification and development. In no State has greater work been accomplished along this line than in the State of Texas, and the Convention is fortunate in having Mrs. Frank W. Sorell of San Antonio, Texas, present an illustrated address on "Roadside Beautification and Treatment."

We hear much about highway safety and who is responsible for the greater number of accidents and deaths on the highways. This subject will be presented from three different angles to the Convention. Mr. R. E. Toms, Chief of Design of the Bureau of Public Roads, will discuss the subject from the standpoint of men whose responsibility is the design and construction of the highways.

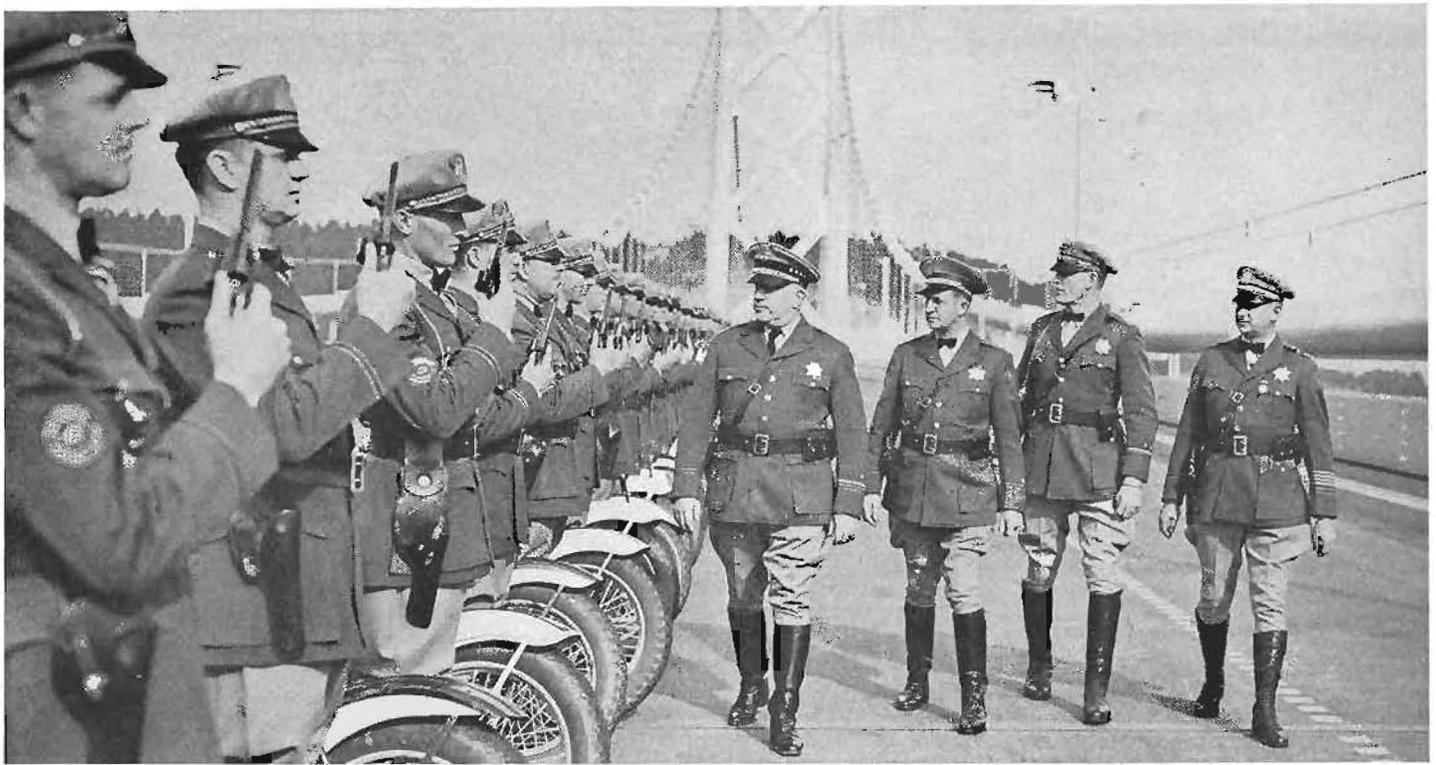
President Paul G. Hoffman of the Studebaker Corporation will submit argument from the angle of the construction of motor vehicles, and Mr. Sidney J. Williams of Chicago, representing the National Safety Council, will discuss the responsibility and control over the driver who uses the highways.

Nearly all of the states this year have begun a state-wide highway and economic survey, more inclusive than any heretofore attempted. This work is being carried on by the State Highway Departments through cooperation with the U. S. Bureau of Public Roads, and Mr. H. S. Fairbank, who has charge of this work in behalf of the

(Continued on page 34)



W. C. MARKHAM



Bridge Detail of Highway Patrol being inspected by (left to right) E. Raymond Cato, Chief of California Highway Patrol, District Inspector A. J. Ford, Captain Rudolph Schmoke and Captain A. Paquette.

## Highway Patrol of 40 Men Detailed to Bridge

By RAY INGELS, Director of Motor Vehicles

ONCE again the California Highway Patrol rides into the picture in the interest of safety upon our highways. This time the highway is the magnificent San Francisco-Oakland Bay Bridge.

A Captain, three Sergeants and thirty-six men compose the permanent detail of patrol officers who are patrolling the Bay Bridge twenty-four hours a day. The Bridge Detail, as it is commonly known in the Patrol, is commanded by Captain Rudy Schmoke, an officer with many years experience, who came to the Bridge from the position of assistant in charge of the California Highway Patrol Training School.

He reports to District Inspector A. J. Ford of San Francisco in whose district the Bridge has been placed, who is, in turn, directly responsible, of course, to Chief E. Raymond Cato, of the California Highway Patrol.

In nearly every instance the men selected for the Bridge Detail were volunteers from various counties of the State, each an experienced officer.

The thirty-six traffic officers are divided into three shifts of twelve officers and a sergeant each. There is never a moment of the day or night that traffic on the bridge is not being controlled.

The headquarters of the Patrol is located in the Administration Building on the Toll Gate Plaza. There, every hour of the day and night will be found a sergeant and a traffic officer on duty.

The movements of the men on the Bridge are regulated from the Bridge Patrol Office. There are seven beats, extending from the Fifth Street Ramp in San Francisco to the Richmond City limits on the East Shore Highway. At the present time the East Shore Highway is open only to University Avenue in Berkeley.

The men are patrolling back and forth on these beats at all times, keeping traffic moving and endeavoring to prevent accidents in every way possible. They will not allow the motorist to "poke along" on the Bridge. In order to properly move the vast number of cars over the structure, it is necessary to keep traffic flowing as nearly as possible at a uniform speed. The speed limit, of course, is forty-five miles an hour.

No bicycles or pedestrians are allowed on the Bridge and no "U" turns are to be made. Also barred are vehicles carrying explosives, oil and gasoline trucks, tanks and trailers, and vehicles which, when loaded, exceed 102 inches in width; and, of course, animals may neither be led nor driven over the Bridge.

In addition to the seven riding beats, there are five stations located at strategic points on the bridge and approaches where an officer is on duty.

# Camarillo State Hospital for 6000 Mental Patients Opened

By GEORGE B. McDOUGALL  
State Architect

**T**HE new Camarillo State Hospital was dedicated and formally opened by Governor Merriam with an appropriate ceremony on October 12, 1936, at 2 o'clock p.m.

The dedication was attended by between 1000 and 1200 people.

The arrangements for the ceremony were made by the Ventura County Chamber of Commerce. The president of the chamber, Mr. W. H. Glover, opened the exercises with words of welcome. Mr. Louis C. Drapeau, State Building and Loan Commissioner, spoke for the people of Ventura County, making particular reference to their appreciation of the action of the State in locating the institution in their county.

Music was furnished by a Spanish orchestra from Santa Barbara and Miss Harriet H. Hegstad, teacher of music at the Ventura School for Girls, sang the Star Spangled Banner. Mr. Drapeau introduced Mr. Harry Lutgens, State Director of Institutions, who presided over the remainder of the exercises.

#### PROMINENT CITIZENS INTRODUCED

Mr. Lutgens introduced numerous prominent citizens including Mr. Adolfo Camarillo, large land holder and long time resident of Ventura County in whose honor the new institution is named, also the heads of numerous State institutions and State and county officials.

Following these introductions Director Lutgens described in an interesting and very informing address the Department of Institutions and its thirteen different units but with special reference to the seven State Mental Hospitals of which the new Camarillo State Hospital is one.

At the conclusion of his address Mr. Lutgens introduced the writer, who described the buildings so far erected, also the proposed future construction.

Mayor Frank L. Shaw of the City of Los Angeles was unable to be present but was represented by Dr. George Parrish of the Los Angeles Health Department whose address

was in congratulation on the opening of the new institution. The Medical Superintendent of the new hospital, Dr. Thomas W. Hagerty, was introduced and delivered an address outlining some of the functions of the institution and indicating his earnest hope and expectation that these functions would be fully performed.

#### GOVERNOR UNVEILS PLAQUE

Governor Merriam in his dedicatory address which was delivered in the Governor's characteristic happy and effective fashion, declared "the Camarillo State Hospital is destined to be the greatest of its kind in California."

At the conclusion of his address the Governor with the assistance of Director Lutgens dedicated the new institution by unveiling a bronze plaque which is to remain permanently on the wall at the main entrance to the administration offices and which contains the following inscription:

"CAMARILLO STATE HOSPITAL  
FRANK F. MERRIAM  
GOVERNOR OF CALIFORNIA  
HARRY LUTGENS  
DIRECTOR OF INSTITUTIONS  
THOS. W. HAGERTY  
MEDICAL DIRECTOR  
GEO. B. McDOUGALL  
STATE ARCHITECT  
DEDICATED OCTOBER 12, 1936."

At the close of the exercises all those desiring to do so, looked through the new buildings.

#### LOCATED NEAR OCEAN

The Camarillo State Hospital is located on a site containing about 1700 acres of which about 1100 acres are tillable. The site is situated about two miles from the town of Camarillo, eight miles south of the city of Oxnard, seventeen miles south of the city of Ventura and about fifty-six miles north of the city of Los Angeles. It lies about five miles in a direct line from the Pacific Ocean. The climate is the typical California coastal climate, equable and delightful.

After several months of examination, investigation and careful consideration of more than two hundred suggested sites by the official site commission assisted by representatives of the various divisions of the State Department of Public Works and the University of California, the location near Camarillo was selected and is undoubtedly the best site for a mental hospital which the State has.

Following the selection of the site, representatives of the Department of Institutions and the State Architect spent a month visiting and carefully examining most of the larger mental hospitals in the states of Illinois, Massachusetts, New Jersey, Pennsylvania and New York.

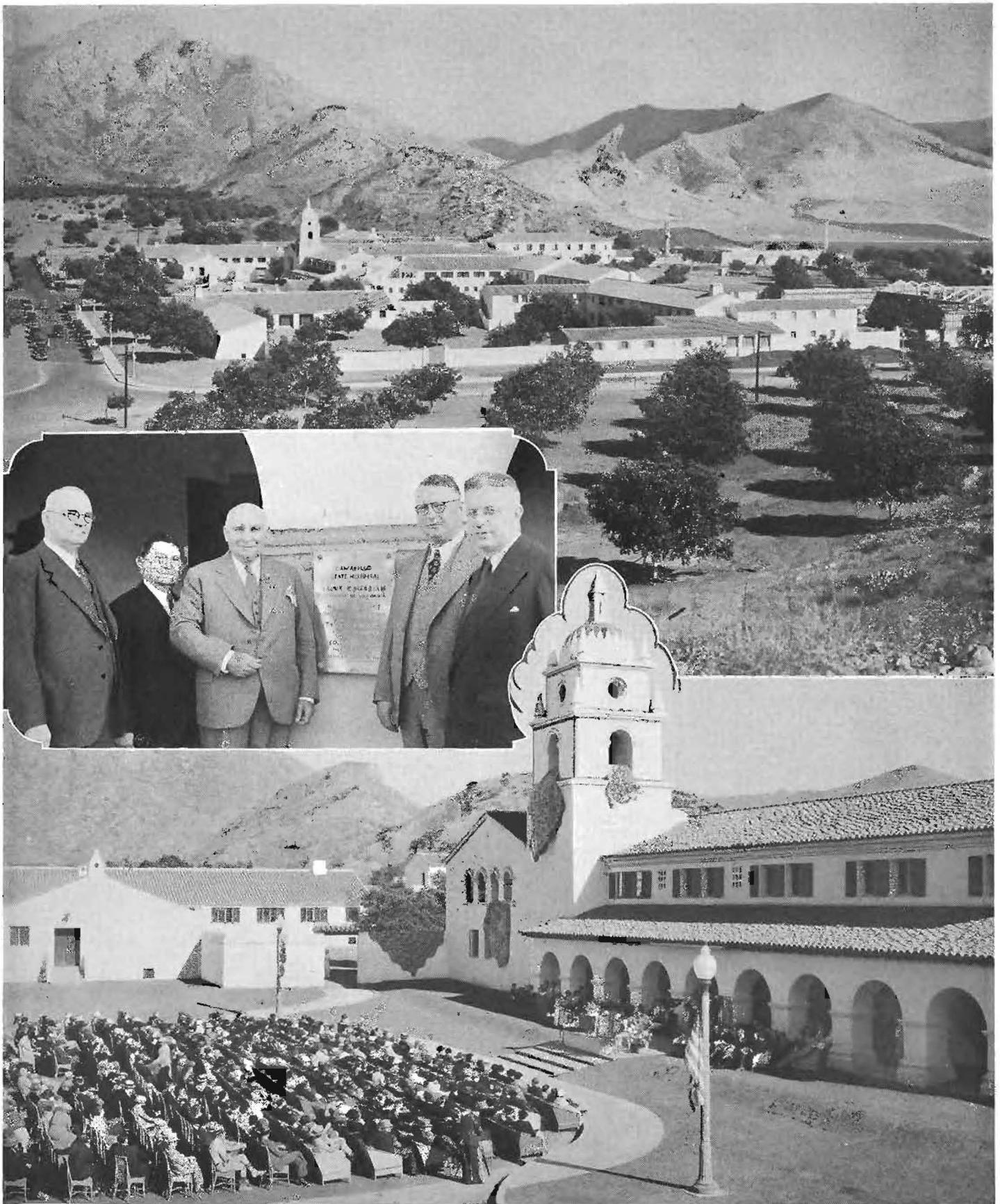
#### 6000 ULTIMATE CAPACITY

The Division of Architecture of the State Department of Public Works then developed a master plan for an ultimate institution to accommodate six thousand patients and the necessary one thousand employees. This master plan is being followed in the construction program subject to minor changes which appear desirable as the detailed development proceeds.

In the planning process the Division of Architecture had and continues to have the expert medical advice of a committee composed of Dr. G. M. Webster, Medical Superintendent of the Patton State Hospital, Dr. Edwin Wayte, Medical Superintendent of the Norwalk State Hospital, and, since his appointment early this year, Dr. Thomas W. Hagerty, Medical Superintendent of the Camarillo State Hospital.

There are to be three main housing groups in the entire institution, the group for custodial males with a capacity for 2400, the group for custodial females with a capacity for about 2200 and the group which will include the treatment or hospital unit and receiving units also the units for acute disturbed patients, for infirm patients and for tuberculosis patients, a total in this third group of about 1500.

(Continued on page 36)



Scenes at dedication of new Camarillo State Hospital. Upper—Some of buildings and grounds of institution. Center (left to right)—State Architect George B. McDougall, Adolfo Camarillo, Governor Frank F. Merriam, Dr. Thomas W. Hagerty, Medical Superintendent; Harry Lutgens, Director of Institutions. Lower—Entrance court of administration unit where dedication ceremonies were held.

# Program of Highway Officials Convention

(Continued from page 30)

bureau, will discuss this important subject before an open session of the Convention.

## MOUNTAIN ROAD CONSTRUCTION

"Interesting and Unusual Mountain Road Construction" is of itself attractive to all delegates of this Association. The Western Group of engineers are especially experienced along this line and their experience and observations will be pictorially exemplified by Mr. L. V. Murrow, Director of Highways in Washington.

Everybody knows there is no one in the country more fully informed on highway research problems than Mr. H. S. Mattimore, Engineer of Tests in Pennsylvania, who for many years has been Chairman of the Committee on Materials of this Association. Mr. Mattimore will bring to the Convention some observations on the most recent developments in highway research.

The space allotted us to give a short outline of the program has been exhausted and we haven't even mentioned the group meetings of fourteen very important groups of the Association, who will handle important subjects in their studies on both Tuesday and Wednesday of the Convention week.

The program in detail is as follows:

## MONDAY, DECEMBER 7, 1936

### MORNING

#### General Session

GIBB GILCHRIST, Texas, President, Presiding  
8:30—Registration of Members and Official Visitors.

10:30—Prayer: Rt. Reverend Monsignor John W. Brockhage, Pastor, Holy Cross Church, San Francisco.

Address of Welcome by Governor Frank F. Merrillam.

Response and President's Annual Address by Gibb Gilchrist, State Highway Engineer, Texas.

Address by Earl Lee Kelly, Director of Public Works, California.

Presentation of Testimonial to Past President A. W. Brandt, New York, by F. E. Everett, State Highway Commissioner, New Hampshire.

Memorial Service.

Annual Report of W. C. Markham, Executive Secretary.

Roll Call by States.

### AFTERNOON

#### General Session

W. F. CALLAHAN, Massachusetts, Vice President, Presiding

2:30—Address: Thomas H. MacDonald, Chief, Bureau of Public Roads, United States Department of Agriculture, Washington, D. C.

Introduction of Official Visitors from Canada and Mexico.

### EVENING

7:00—Buffet Supper on San Francisco Bay as guests of the State Highway Department of California. Tickets will be issued to delegates and members of their families, who are cordially invited.

## TUESDAY, DECEMBER 8, 1936

### MORNING

#### General Session

JAMES D. ADAMS, Indiana, Vice President, Presiding

9:00—Address: "San Francisco-Oakland Bay Bridge," C. E. Andrew, Bridge Engineer, California Highway Department.

Address: "Roadside Beautification and Treatment," Mrs. Frank W. Sorrell, San Antonio, Texas.

#### Group Meetings

NOTE: Group meetings begin at once, according to room assignments in the St. Francis Hotel, indicated in this program. In addition to topics listed, which will be open for general discussion, other topics may be taken up if desired. All delegates are cordially invited to attend the meetings of their choice and participate in the discussions. These meetings will be presided over by Chairman of regular Standing Committees.

Conclusions concerning the discussions held are reserved for the Executive Sessions of the various Standing Committees which meet Wednesday morning.

#### ADMINISTRATIVE PROBLEMS—Room 220

H. A. HOPKINS, California, Presiding

#### LEGAL AFFAIRS—Room 278

CHARLES ROSS, South Carolina, Presiding

#### TRAFFIC CONTROL AND SAFETY—Room 266

W. F. ROSENWALD, Minnesota, Presiding

#### UNIFORM ACCOUNTING—Room 270

H. D. BARNES, Kansas, Presiding

#### PUBLIC RELATIONS AND PUBLICITY—Room 274

J. D. ADAMS, Indiana, Presiding

#### BRIDGES AND STRUCTURES—Room 214

A. L. GEMENY, Bureau of Public Roads, Presiding

Some Problems of General Interest to Bridge Engineers in Connection with the Construction of the Trans-Bay Bridge at San Francisco. Discussion by C. E. Andrew, California.

Working Unit Stresses for Concrete Bridge

Design in Their Relation to the Physical Properties of the Concrete and Steel. Discussion opened by G. S. Paxson, Oregon.

The Esthetics and Design of Handrails and Curbs for Highway Bridges. Discussion opened by Morris Goodkind, New Jersey.

The Present Limitations on the Use of Welding in Steel Bridge Construction. Discussion opened by O. J. Eldmann, Kansas.

#### MATERIALS AND RESEARCH—Room 270

H. S. MATTIMORE, Pennsylvania, Presiding

#### ROAD DESIGN—Room 280

O. L. KIPP, Minnesota, Presiding

#### ROAD CONSTRUCTION—Room 267

E. C. LAWTON, New York, Presiding

#### MAINTENANCE—Room 227

R. H. BALDOCK, Oregon, Presiding

#### ROADSIDE PLANTING AND DEVELOPMENT—Room 268

JOHN L. WRIGHT, Connecticut, Presiding  
Means of Reducing the Maintenance Costs of Improved Roadside Areas. (General and main topic.)

### AFTERNOON

#### General Session

GASTON SCOTT, Alabama, Vice President, Presiding

2:00—Address: "The Financing of Public Works," Honorable Philip F. La Follette, Governor of the State of Wisconsin.

Address: "State-wide Highway Planning Surveys," H. S. Fairbank, Chief, Division of Information, U. S. Bureau of Public Roads, Washington, D. C.

#### Group Meetings

The Group Meetings will be a continuation of the morning session, with the same meeting places and the same presiding officers. All delegates are urged to attend and take part in the discussions.

### EVENING

No session. The evening is left open at the pleasure of the delegates.

## WEDNESDAY, DECEMBER 9, 1936

### MORNING

#### General Session

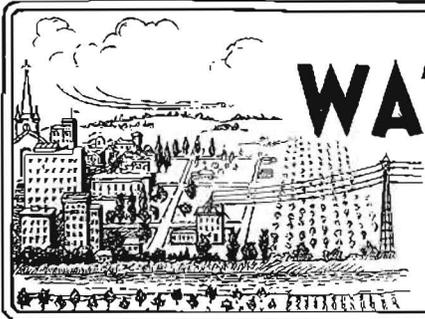
L. V. MURROW, Washington, Vice President, Presiding

9:30—Address: Highway Safety Exemplified:

(a) By Properly Designed and Constructed Highways. R. E. Toms, Chief, Division of Design, U. S. Bureau of Public Roads, Washington, D. C.

(b) By the Construction and Supervision of the Motor Vehicles Which Use the Highways. Paul G. Hoffman, President, Studabaker Corporation, South Bend.

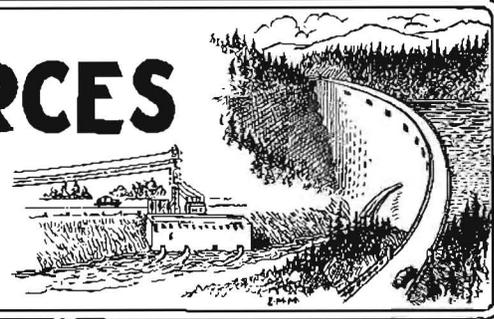
(Continued on page 36)



# DIVISION OF WATER RESOURCES

OFFICIAL REPORT  
FOR THE MONTH OF  
**October, 1936**

EDWARD HYATT, State Engineer



Construction work on the cooperative State-Federal bank protection program providing for permanent bank protection on the Sacramento River is progressing rapidly. Work on the program was started on October 1st by the United States War Department and to date projects have been approved for construction which it is estimated will cost approximately \$200,000.

This bank protection program is being carried out by the United States War Department in cooperation with the Division of Water Resources. Due to the lateness of the season it was not possible to permit the work being let by contract and therefore it is being done by day labor with Government equipment.

There are at present employed about 150 men, the equipment consisting of 6 drag line machines, 2 clam shell dredgers, 2 bulldozers, 3 tow boats, 12 barges, 2 floating pile drivers, 5 quarter boats, 10 dump trucks, 5 flat rack trucks, a number of small express trucks and several automobiles.

## IRRIGATION DISTRICTS

Following approval by the Districts Securities Commission, the Pacheco Pass Water District held a second election on September 25, at which a bond issue in the amount of \$180,000 was voted for constructing a storage dam and irrigation works on Pacheco Creek. The district comprises an area of 5395 acres in San Benito and Santa Clara counties.

South Fork Irrigation District in Modoc County has completed construction of West Valley Dam on a tributary of South Fork of Pit River. The reservoir created will provide storage for irrigation of 12,400 acres within the district.

At the regular monthly meeting of the Districts Securities Commission held in San Francisco, October 9, favorable action was taken on the following district petitions: Fair Oaks Irrigation District's request for an expenditure of \$4,600 from the general fund for a pipe replacement project in cooperation with WPA was granted. West Side Irriga-

tion District was permitted to waive the statute of limitations on certain outstanding warrants. Grenada Irrigation District's proposal to expend \$1,800 for purchase and installation of wood stave pipe on its main pumping lift was approved.

## FLOOD CONTROL AND RECLAMATION

### Relief Labor Work

During this period a relief labor crew of about 20 men has been engaged in clearing in the flood channels of the Feather River north of Marysville and in the Butte Slough By-pass.

Two WPA projects have been approved, as follows:

WPA Project No 165-3-5504, approved October 1, 1936, for clearing and removing obstructions in the American River flood channel; Federal funds, \$13,648.

WPA Project No. 165-03-5014, approved September 15, 1936, for Feather River clearing; Federal funds, \$22,646.

From present indications the amount of relief labor to be made available on flood control this winter will be very considerably less than was employed last winter. This is brought about partly by the fact that the demand for labor in private employment is substantially increased, and partly because the number of men to be placed on relief will be limited by definite county quotas. We expect to have available approximately one-third of the number of men that were employed last winter.

### Bank Protection Program

The U. S. War Department is progressing rapidly on the construction of bank protection works under the State-Federal cooperative program. This work commenced actively on October 1st, and projects at particular sites have been approved which will cost approximately \$200,000.

Two projects have already been completed. On the left bank of the Sacramento River immediately north of the Colusa weir, the bank has been protected for a distance of 800 feet with selected cobble pavement on the bank and a woven lumber mat below the low water line. On the right bank of the Sacramento River at Hamilton Bend, about four miles above Colusa, similar protection has been constructed for a length of 820 feet, except that quarry rock has been used for bank paving instead of cobbles. Work is now under way and almost completed at the Campbell-Dwyer ranch, three miles below Colusa on the right bank of the Sacramento River, where rock paving and timber mat

bank protection is being installed for a length of 2400 feet. A second plant is now working on the right bank of the Sacramento River below Sacramento at the Alaska Packers Association headquarters in Reclamation District No. 900. At this place a woven lumber mat will be installed and the bank paved with rock for a distance of 1400 feet. This work will be completed shortly after which the plant will be moved for work near the Standard Oil dock near Walnut Grove.

## CALIFORNIA COOPERATIVE SNOW SURVEYS

With snow in the mountains due at any time, arrangements have been completed for the continuation next winter of all snow surveys regularly made by the many cooperating agencies.

The organization that formerly made the snow measurements in the Mono and Bishop Creek basins is this year discontinuing its snow survey work and new arrangements have been made for the continuation, in these areas, of several of the crest course surveys, desired for forecasts of run-off of the San Joaquin and Kings rivers on the west side. Yosemite Park rangers will survey the snow courses at Tioga Pass and Dana Meadows, while the Forest Service, through its rangers of the Inyo National Forest, will take over the courses at Bishop and Piute passes with the crest course at Agnew Pass to be surveyed by rangers of the Mono National Forest.

On the divide between the Cosumnes and Mokelumne rivers, four new courses have been established during the past month at the following locations: Tragedy Springs, Corral Flat, Lumberyard Ranger Station, and Hams Station. The annual surveys at these new courses will be made by rangers of the Eldorado National Forest.

## CENTRAL VALLEY PROJECT

The United States Bureau of Reclamation continued work during the month on the preparation of plans necessary for starting construction on the initial units of the project. Preliminary investigations and exploration work have been continued at Kennett and Friant dam sites as have the surveys along the Contra Costa Conduit and Friant-Kern Canal. Appraisers are working in the field evaluating lands and necessary rights of way to be acquired.

# Highway Convention Program

(Continued from page 34)

(c) By Responsibility of and Control Over the Driver on the Highways. Sidney J. Williams, Director, Public Safety Division, National Safety Council, Chicago.

**MEETINGS OF STANDING COMMITTEES**  
Immediately following the addresses, there will be Executive Sessions of Standing Committees in rooms indicated under list of Committees, as follows:

**WEDNESDAY, DECEMBER 9, 1936**

**AFTERNOON**

Trip to San Francisco-Oakland Bay Bridge.

**EVENING**

7:00—The Members of the Association will be dinner guests of the California State Highway Department at the St. Francis Hotel.

**THURSDAY, DECEMBER 10, 1936**

**MORNING**

*General Session*

GIBB GILCHRIST, Texas, President, Presiding

9:00—Address: "Interesting and Unusual Mountain Road Construction," L. V. Murrow, Washington, Director of Highways.

Address: "The Most Recent Developments in Highway Research," H. S. Mattimore, Pennsylvania, Engineer of Tests.

*Business Session—Committee Reports*

GIBB GILCHRIST, President, Presiding

**AFTERNOON**

*Business Session—Continued*

Installation of Officers,  
Adjournment.

**EVENING**

7:00—Film, "California Highways."

9:00—Chinatown Pageant.

**FRIDAY AND SATURDAY, DECEMBER 11 AND 12**

Through the courtesy of the California State Highway Department, two caravan trips are offered to the members of the Association, as follows:

1. Starting Friday morning, transportation will be furnished delegates to Los Angeles taking Friday and Saturday for the trip, going via Big Trees, Del Monte, and Santa Barbara. Delegates taking this trip will be expected to pay all expenses except transportation.

2. A caravan limited to 60 people, all expenses paid, over the North Redwood Highway. This trip is especially advantageous for those returning via Portland and Grant's Pass, Oregon. Parties desiring to return to San Francisco or Sacramento will be taken there.

Full particulars in reference to these two trips will be given by the California State Highway Department.

# CAMARILLO HOSPITAL OPENED

(Continued from page 32)

One underlying principle of the plan is that it makes the out-of-doors as easily accessible to all the patients as possible at the same time making it practicable to classify the patients into a considerable number of different groups which can be kept separate from one another. The patients' buildings are one and two stories high, two-thirds of the patients being in the first stories and one-third in second stories.

There will be a separate kitchen and dining room unit in each of the three groups. Each of the three groups has all its units connected and under roof. This makes the structures of a group more compact than they would be if separated and also provides access under roof for all patients and employees to the various parts of the group including the dining rooms.

In the matter of separation of the patients into groups for purposes of classification the various wards are independent of each other. In the group for custodial males there are twelve different enclosed courts, the plan being so arranged that two and in a few cases three wards have separate access to each court.

## LARGE CENTER COURT

In addition to the twelve smaller separate courts just described, there will be a large center court surrounded on four sides by the structures of the group. This center court has an area of 6½ acres and will be available for mass recreation of the patients. It will be properly landscaped and have areas developed for various games, band stand, etc. A similar arrangement as to courts will be provided in the group for custodial females. In the third or medical group there will be the smaller courts only.

The treatment and receiving units will have a total capacity for 500 patients.

Provision is being made for housing on the grounds about one-third of the employed personnel the remainder to live elsewhere in the neighborhood of the institution.

A dairy to have an ultimate capacity for milking 425 cows daily is being constructed.

There are laundry, bakery, cold storage, commissary and shop units.

## CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director  
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 14      NOVEMBER, 1936      No. 11

There will be a poultry plant ultimately to care for approximately 10,000 birds and provision for carrying approximately 600 hogs.

All services are provided including a most modern sewage treatment plant the effluent from which will be used for irrigation, a steam plant, water service, gas and electric service, flood control system, roads, walks and landscaping.

The buildings are entirely of reinforced concrete, fire, earthquake and deterioration resisting to the highest practicable degree. The style of architecture is the California adaptation of the Mediterranean styles of Spain and Italy. The whole institution in plan and design takes into account the fact that the right physical surroundings have definite therapeutic value and so supplement the efforts of the Medical Superintendent and all his helpers in their work in the best interests of the State's wards committed to their care.

The institution is not only destined to be the greatest of its kind in California, as Governor Merriam said in his dedicatory address, but it is entirely safe to say there is no other such institution for the mentally ill in the entire country.

There is at present provision for 1100 patients and structures now under way will add capacity for 1400 more. So far there has been appropriated for all purposes in the construction of the institution including the cost of the site about \$3,600,000 and the ultimate institution will probably involve a further expenditure of \$5,500,000 more or a total of about \$9,000,000.

STATE OF CALIFORNIA

# Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

FRANK F. MERRIAM-----Governor

EARL LEE KELLY-----Director

EDWARD J. NERON-----Deputy Director

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PHILIP A. STANTON, Anaheim  
H. R. JUDAH, Santa Cruz  
PAUL G. JASPER, Fortuna  
WILLIAM T. HART, Carlsbad  
JULIEN D. ROUSSEL, Secretary

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G. T. McCOY, Assistant State Highway Engineer  
J. G. STANDLEY, Principal Assistant Engineer  
R. H. WILSON, Office Engineer  
T. E. STANTON, Materials and Research Engineer  
FRED J. GRUMM, Engineer of Surveys and Plans  
C. S. POPE, Construction Engineer  
T. H. DENNIS, Maintenance Engineer  
F. W. PANHORST, Bridge Engineer  
L. V. CAMPBELL, Engineer of City and Cooperative Projects  
R. H. STALNAKER, Equipment Engineer  
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding  
CHARLES H. WHITMORE, District III, Marysville  
JNO. H. SKEGGS, District IV, San Francisco  
L. H. GIBSON, District V, San Luis Obispo  
R. M. GILLIS, District VI, Fresno  
S. V. CORTELYOU, District VII, Los Angeles  
E. Q. SULLIVAN, District VIII, San Bernardino  
S. W. LOWDEN (Acting), District IX, Bishop  
R. E. PIERCE, District X, Stockton  
E. E. WALLACE, District XI, San Diego

General Headquarters, Public Works Building, Eleventh and  
P Streets, Sacramento, California

## DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division  
J. J. HALEY, Jr., Administrative Assistant  
HAROLD CONKLING, Deputy in Charge Water Rights  
A. D. EDMONSTON, Deputy in Charge Water  
Resources Investigation  
R. L. JONES, Deputy in Charge Flood Control and Reclamation  
GEORGE W. HAWLEY, Deputy in Charge Dams  
SPENCER BURROUGHS, Attorney  
EVERETT N. BRYAN, Hydraulic Engineer Water Rights  
GORDON ZANDER, Adjudication, Water Distribution

## DIVISION OF ARCHITECTURE

GEORGE B. McDOUGALL, State Architect, Chief of Division  
P. T. POAGE, Assistant Chief  
W. K. DANIELS, Administrative Assistant

### HEADQUARTERS

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C. H. KROMER, Principal Structural Engineer  
CARLETON PIERSON, Supervising Specification Writer  
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W. H. ROCKINGHAM, Principal Mechanical and Electrical  
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