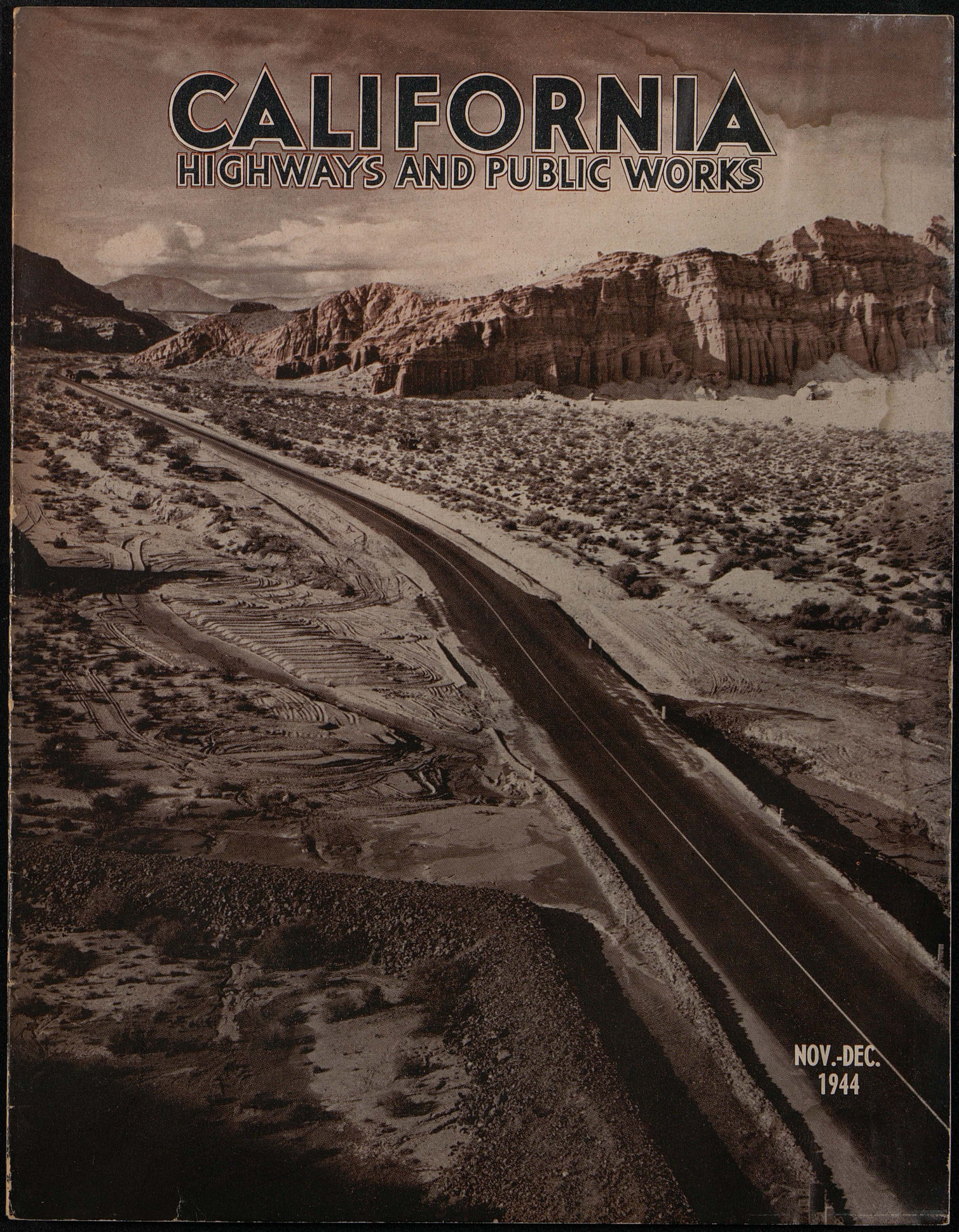
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official Journal of the Division of Highways, Department of Public Works, State of California

[PRINTED IN U.S.A.]

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California Highway Commission Adopts Second Wartime Budget Based on $68,000,000 Revenues

THE California Highway Commission meeting in Los Angeles on November 16th adopted its second wartime budget.

Budget allocations for the 1945-1947 biennium are based on estimated revenues of $68,000,000 for the biennial period. State Highway Engineer George T. McCoy informed the Commission that he anticipates $56,500,000 of gas tax income, $8,450,000 of Motor Vehicle fees, $3,000,000 of Use Fuel tax (Diesel) and $50,000 of caravan fees.

"The restrictions imposed on motor transports by reason of the war and the lack of any dependable information with regard to changes in those restrictions, preclude any accurate estimate of revenue to the State highway fund during the Ninety-seventh and Ninety-eighth Fiscal Years," McCoy said.

"From the information available to us at this time it appears that it is unlikely that there will be any more drastic restrictions imposed on motor transport during the war. It is a fact, however, that considering the entire Nation the replacement of motor vehicles at this time is not keeping pace with the retirement. The effect of this net loss in motor vehicle units will become apparent in fuel tax receipts and registration fees in due time unless more replacement units are made available. There is no accurate information as to this net loss in total vehicle units available.

"In California the situation is more indefinite because of the lack of factual data with regard to movement of foreign vehicles into and out of the State. Information from the Motor Vehicle Department indicates at this time that the total registrations in California during 1944 will exceed the 1943 registrations by a small margin.

"It appears also at this time that the restrictions on motor transport now in effect will not be relaxed so as to permit more travel until after the war.

"The estimate of revenue for the next biennium, therefore, is based on a continuation of motor vehicle travel and registration at the current 1944 level."

San Francisco-Oakland Bay Bridge Budget

THE following tabulation shows in detail the estimated cost of operation and maintenance of the San Francisco-Oakland Bay Bridge for the Ninety-seventh-Ninety-eighth Fiscal Years, as set forth in the 1945-1947 highway budget.

The present physical damage insurance on the bridge runs until September 1, 1946, and the premiums have been paid to that date. The insurance premiums heretofore have been paid on the basis of five-year terms. On the basis of the present rates, the premium on a five-year policy is approximately $576,000 and has been paid in advance.

The maintenance and operating costs are on the basis of the continuance of present salaries with normal increases.

The painting of the bridge during the war has fallen well below normal requirements, because of the inability to employ a sufficient number of painters for this work. It is estimated that during the coming biennium it will be necessary to employ, if available, 80 painters, which is approximately 50 more than are being employed at the present time.

	Biennium 7-1-43 to 6-30-45		Biennium 7-1-45 to 6-30-47
Administration (including accounting, general office expenses, and retirement and compensation insurance for all employees)	$252,940		$288,880
Toll collection	394,870		402,900
Ordinary maintenance	229,050		296,450
Painting			
Labor $116,250		$416,900	
Materials and supplies 15,250		90,000	
New scaffolds 35,000		50,000	
Total painting	166,500		556,900
Tow car and emergency service	83,760		88,870
War damage insurance	54,000		
Total, excluding physical damage insurance premium	$1,181,120		$1,634,000
Premium on physical damage insurance (due September 1, 1946)			576,000
Totals	$1,181,120		$2,210,000

Note.—The premium on physical damage insurance on the San Francisco-Oakland Bay Bridge has been paid in advance to September 1, 1946.

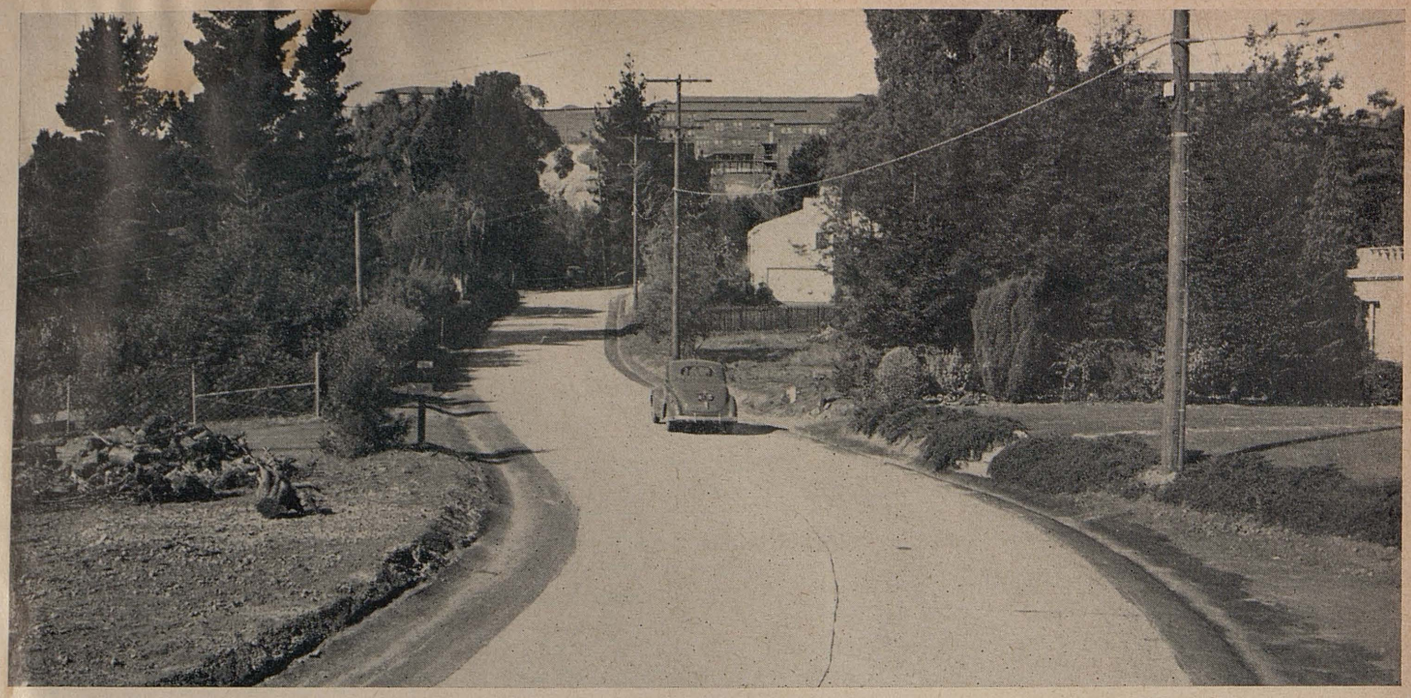
C. H. Purcell, Chairman of the Commission and Director of Public Works, said that tentative budget allocations would be as follows:

Administration, $3,997,762; traffic engineering and special investigations, $352,238; maintenance, $19,470,000, of which $19,420,000 is for general maintenance and $50,000 for the Carquinez and Antioch bridges; highway planning survey, $200,000; new equipment, $417,500; major city streets (¼ cent gas tax allocation), $7,062,500; State highways within cities (¼ cent gas tax allocation), $7,062,500; all other functions, reconditioning, resurfacing, construction, engineering, right of way, joint highway districts, and contingency and reserve $29,437,500.

Under the Breed act, Purcell said, there is set up for primary highways in the north, $9,898,800; and for secondary highways, north, $9,125,000; for primary highways in the south, $8,351,200; and for secondary highways, south, $9,125,000, or a total of $36,500,000. This total includes $7,062,500, the estimated amount of ¼ cent of gas tax for State highways within cities.

The allowance for general maintenance is increased approximately $576,000 and replacement projects $226,000 although the overall increase in the budget is only about $315,000.

"Construction and reconstruction has been at a minimum during the last three years," Purcell explained. "There has been no reduction in the tonnage of heavy loads using the highways, in fact, in many areas heavy hauling has increased. The highway surfacing has reached a condition where either increased continuous maintenance or specific repair is required on a considerable portion of the mileage if the investment is to be conserved. The estimated requirements for major slide removal is reduced $490,000 as compared with the current period. This is a result of reduction in major construction. The opening up of heavy cuts on new work always involves large expenditures for slide removal and correction work for a period of two or three years."



Alameda Access Road to San Leandro Naval Hospital in Oakland. View shows concrete pavement on heavy grade. Hospital building in background

Highway District IV Felt Impact of War

By JNO. H. SKEGGS, District Highway Engineer

FROM the time of the declaration by the President that a National emergency existed until our actual entry into the war on December 7, 1941, the State Highway organization generally and District IV in particular had been in the process of formulating plans for the action that all could see was coming. The war, however, came a little too soon for completion of plans to provide an adequate road service for the tremendous increase of industrial and military activities around San Francisco Bay.

The biggest headache was the Richmond area where that peaceful little city of 24,000 awoke one morning to find a population of about 94,000, with many more thousands employed in the shipyards and other war industries located there. These additional thousands had to find living quarters in Oakland, Berkeley, Alameda or anywhere they could and then get to work by automobile or bus. A scheme for handling the traffic had been tentatively worked out but was still in the "conference and correspondence" stage. Jap bombs crystallized those plans and broke all the red tape.

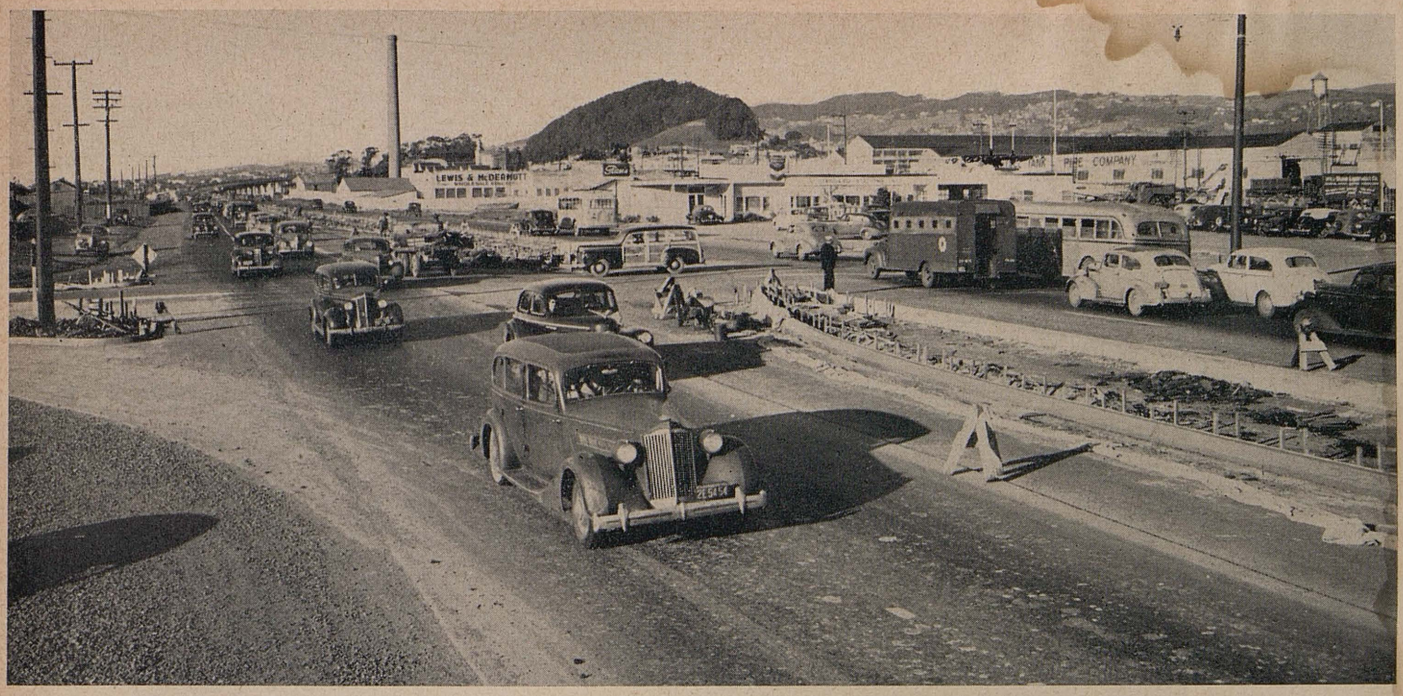
The primary cure for the congestion of the East Shore Highway traffic (1941 count 37,332) was the construction of the so-called Richmond Access Road from the El Cerrito Hill overhead, on Route 69, to Cutting Boulevard in Richmond. Bids for the first contract were opened in the District office on March 17, 1942 and the contract was awarded to the Macco Construction Company whose bid of $310,-800 was the lowest of the seven received.

Advertising and bid opening on that project was, we believe, unique in the history of the Department. By telephone, most likely and best equipped contractors were invited to bid on this pig in a poke involving construction over marsh lands of extremely doubtful character. Specifications were being written and plans were being drawn with neither available to prospective bidders and only six days for them to think it over! The integrity of the department, the contractors' faith in that integrity and an approximate list of items involved constituted the sole basis for bids!

Surveys and plans were done at the same general rate that characterized the advertising and taking of bids and yet were surprisingly complete when studied in the calmer moments after the contract had been awarded and construction started.

That is a sketchy history of the first war-time access road project of the 25 that have been constructed since.

The vital military and industrial nature of the Bay area with its Mare Island Naval Yard, Ports of Embarkation, shipyards, oil refineries, rail terminals, bridges and the myriad other and, perhaps, equally important industries offered a prime target for enemy action by air attack from Jap carriers, especially in view of the disaster that fell on such a large portion of our fleet at Pearl Harbor. Immediately the need for more air bases close to vulnerable points was dictated. Military authorities were busy enlarging existing bases and developing new ones. Their overtaxed resources needed some help so they called upon us to construct a fighter plane base right on the coast near Halfmoon Bay. Construction was started on August



Intersection of East Shore Highway and Gilman Street, showing island in process of construction. Automatic signals will be installed at this point

31, 1942 and a usable 7,000-foot flight strip was ready by February 9, 1943 at a cost of about $460,000.

Types of construction involved in the access road program ran the whole gamut from resurface of existing city streets to major highway grading and paving jobs, including reconstruction of a narrow mountain road (Naval Net Depot, Tiburon), new city streets and an airfield. The entire program to date has required construction on, or of, approximately 28 miles of road or street and 7,000 feet of flight strip in 25 projects at a total cost of approximately $3,100,000. Of the total projects, eight are in Richmond or serve that city and they have absorbed one-third of the money spent.

A total of nine access road projects were constructed in Contra Costa

Marin Access Road to Dry Dock Training Center and Naval Net Depot on Tiburon Peninsula. View is looking north

Fourteenth Street in Richmond. Looking north from near entrance to Shipyard No. 1

County. It is interesting to note that that county has experienced a population growth in excess of 100 per cent since 1940 with the increase distributed in a fairly uniform manner over the entire county which embraces many large war industries in addition to those in Richmond. It is believed that the rate of increase is the greatest in the United States.

The expansion of Mare Island Navy Yard required a wide spreading area to house the workers. Nearby Napa County was called on to carry its share, thereby placing an impossible burden on the available two-way highways. It therefore became necessary

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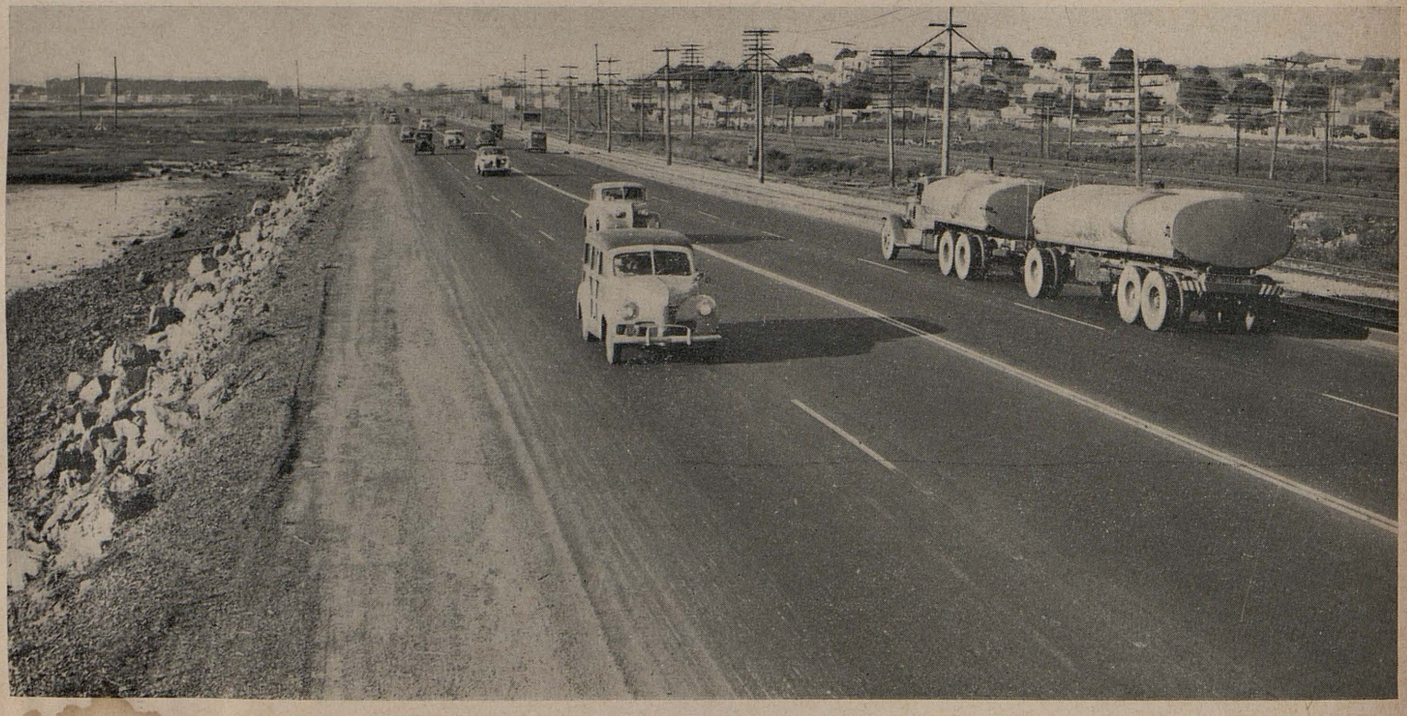
Richmond Access Road. Looking north from El Cerrito Overhead. Construction is across deep marsh. Trolley tracks on right were constructed by the Maritime Commission to serve ship yards. Southern Pacific main line is to the right of trolley tracks



Origin of Sections, Townships and Ranges Goes Back to Colonial Days

BEFORE the American Revolution the colonies had for years disposed of their lands under two distinct systems, based on different physical and economic conditions.

These two land systems, which were developed in America during the Colonial Period, have been called the New England System, and the Southern System.

The New England System was based somewhat on the county, town or parish systems, which had existed in England for a long time. There, a township was an irregular area or district surrounding a town or village. In fact, the district was itself frequently called a "town." And in New England we find the settlers following this custom by laying out "towns," or townships, where there were no actual towns or villages. These towns (or tracts where they hoped towns would be), were laid out preceding private ownership and there could be no title to land outside a town or township. Within the township the land was divided into tracts by the colony, or the proprietors. These tracts were definite in amount, and plats were prepared and bounds recorded. Surveys of such tracts almost always preceded settlement.

The towns were responsible for the accuracy of the surveys, and the officers saw to it that the bounds were accurately determined. Townships were sometimes laid out in tiers, or ranks, or ranges, although usually in distant locations. The favorite size was six miles square. This, no doubt, was because few persons had, at that time, realized the desirable qualities of the decimal system. People still thought in terms of dozens and half dozens. And the townships were not larger, because the influence of a village in those days could hardly extend more than a few miles.

FIRST TOWNSHIP INCORPORATED

As early as 1652 we find the town of Chelmsford, Massachusetts, incorporated as a rectangle of 36 square miles. In 1741 a 12-mile square township was set out in Wadchuset. And in 1656, Marlborough, Massachusetts, was laid out six miles square, although not in a meridional, or north and south, direction. Probably the first six-mile-square township located north and south, was that of Bennington, New Hampshire, established in 1749. Thus gradually during a period of more than a century, New England developed and became strongly attached to its system, the germ of which was the early Anglo Saxon township, or tunscrape, similar, you will see, to landscape. A tun was a tract enclosed in a fence or wall.

The Southern System differed from the New England System in that the land was taken up by location of warrants and concessions, for separated tracts of any size or shape, on any unappropriated land. Surveys were to be made by public surveyors, but were usually executed by deputies of little experience, and errors were frequent. The Virginia System of 1729 called for warrants, caveats, and grants, while the New England System called for a simple deed. The Southern System was also used in North Carolina, as well as in the territories of Kentucky and Tennessee.

TWO SYSTEMS DIFFERENT

The difference between these two systems is apparent. Under the New England plan, protection was provided against overlapping surveys and title disputes; and the town was the guarantor for the accuracy of the survey. This system of "discriminate location" tended toward compactness of a free population, and was a protection against the savages, and a mutual help during the severe winters. Also in New England, the waste land in the local communities was laid out by local committees, and plats were recorded at once to prevent the possibility of overlapping claims. An individual could not horde the best land for himself; the proprietor or townspeople shared in each division of the unappropriated land. This system afforded security of title, and orderly settlement of new lands.

On the other hand, the Southern System required only individual initiative. A person selected a desirable portion of vacant land, and had it laid off by a Government surveyor under his direction. No relation of other pieces of property to his own was shown. This was called "indiscriminate location."

The surveys were often incorrect; recording was carelessly done; natural bounds were used; and this often re-

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INTRODUCTION

WE know that there exists in some of the States of the Union, a system of land description unlike that found in the other States, or in any other part of the world. We know that this system is of recent development, and that in the history of modern, medieval, and ancient nations, no similar system ever existed. Since the days of the clay tablet deeds of Babylon, land had always been described by boundaries, and ownerships were irregularly placed. Lands were always settled first and surveyed afterwards. Somebody hit upon the idea that this process should be reversed; that land should be regularly surveyed before settlement, and the settlers be compelled to conform to such survey; and that land descriptions would be greatly simplified, and controversies minimized, by laying out the public domain into a gigantic gridiron of sections, townships and ranges.

Who invented this system? Why was it invented? And where did the inventors get the idea? Why are sections six miles square and why the back and forth numbering? It is believed that the story of this, the first improvement in land plotting since the dawn of history, will prove interesting to Highway Engineers and Right of Way Agents, whose daily work is the handling of these tracts of land.

The accompanying article by Frank J. Cordes is the first of two installments.

CALIFORNIA MISSIONS

By KENNETH C. ADAMS, Editor

San Luis Rey de Francia June 13, 1798

WHILE the Mission San Luis Rey de Francia is the second of the 21 Franciscan missions stretching from San Diego to Sonoma in the north, it was the eighteenth one founded.

During the period of its prosperity, it was the grandest of all the missionary establishments in California and was called by Father Zephyrin Engelhardt, noted mission authority, "King of the Missions."

In the early days of the Mission San Diego de Alcala, the need for a station between it and Mission San Juan Capistrano was felt. The distance separating the two could not be covered in a day, which made traveling hazardous, and, furthermore, the overworked Fathers in San Diego often had to go to intervening rancherias to attend upon sick Indians.

The first move to locate a site for a mission between San Diego and San Juan Capistrano was made on July 23, 1795, when Governor Diego Borica sent out an exploring party with which went Father Juan Mariner. The latter recommended the rancheria Pale, but this site was deemed to be too far off the Camino Real and in 1796 Fr. Presidente Lasuen, himself, selected the present site which Father Juan Crespi in July, 1769, passing there with Portola, had reported to be an ideal location for a mission and had named San Juan Capistrano. This place following the founding of Mission San Juan Capistrano, had been called San Juan Capistrano el Viejo, or Capistrano, to distinguish it from the mission of the same name.

TRAGIC HISTORY

On June 13, 1798, Fr. Lasuen formally established the mission. Viceroy Branciforte had chosen the patron saint, St. Louis IX, King of France, hence the name San Luis Rey de Francia. On that same day, the good Father Presidente baptized 54 Indian children. Under such propitious circumstances did the new mission start and on August 29, 1798, Fr. Lasuen proudly reported to Governor Borica that 147 Indians had been baptized and 28 couples married.

The story of San Luis Rey is the most tragic in the history of California missions. It ascended to heights of success and grandeur attained by no other mission and its destruction, brought about by years of strife between the Church on the one hand and greedy civil officials and politicians and the military on the other, remains a blot on the annals of early California.

Under Father Antonio Peyri and his assistants, the mission steadily grew in size and prosperity, these missionaries proving themselves to be great builders. Troubles with the military which began in 1810 would seem to have been prophetic of the end of San Luis Rey. In that year Fr. Peyri several times was forced to complain officially against encroachments upon mission lands by the soldiers and from then on the tribulations of the priests increased.

NEW CHURCH BUILT

During 1810, the Indian population at the mission increased from 1,121 to 1,571 and 432 converts were received. All these had to be fed, housed and clothed and placed in gainful occupations by the Fathers. More accommodations were required and in 1811 Fr. Peyri laid the foundations for a new church, which is the mission of the present day. It was completed and dedicated on October 4, 1815. Meanwhile, a chapel and granary had been constructed at Pala and by 1818 the chapel had been enlarged and another granary built. Improvements continued until 1832. In 1826 some 2,869 neophytes were enrolled at San Luis Rey. Four years before, Father Peyri officially reported that the mission had 20,500 sheep, 12,000 head of cattle, 500 horses and 150 mules.

The revolt in Mexico against Spain in 1810 brought additional grief to San Luis Rey and other missions. No goods for the missions nor pay for the soldiers in California came from Mexico, with the result that the military demanded that the Mission Indians support the soldiers and their families, and furnish equipment and cash payments. Following Mexican independence, Fr. Peyri contributed heavily in money to the territorial government and this drain on the mission increased steadily and rapidly.

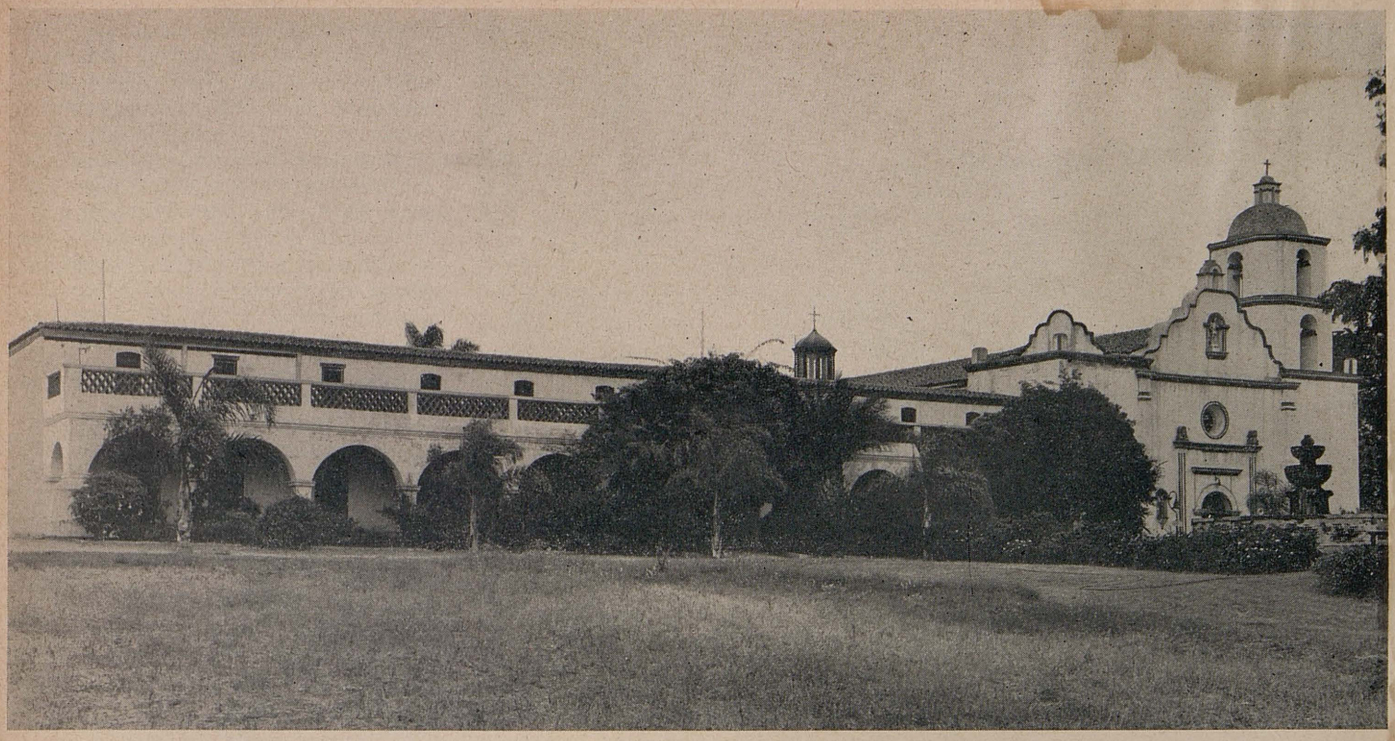
Mission Meccas

California's famous old missions with their historical and romantic background annually attract thousands of visitors. Twenty-one Franciscan missions were founded by the Reverend Fray Junipero Serra and his colleagues, extending from San Diego to Sonoma. On his way north from San Diego, Father Serra and the mission padres who came after him followed a course which became known as El Camino Real, "The King's Highway." El Camino Real retains to this day its original name and is designated U. S. 101. Along this highway and short distances from it, the founding padres established their missions. U. S. 101, the old "King's Highway," now extends from the Mexican border into northern Washington.

Present day State highways lead to all the mission sites. When the war is ended and California again welcomes tourists from all over the world and there are no longer restrictions on automobile travel, it is believed that the missions will be popular meccas for visitors to the Golden State.

Anticipating this traffic, the Division of Highways will publish in California Highways and Public Works brief histories of the missions with directions on how to reach them over State highways. For the purpose of this series, the missions will be taken up in the order of their locations from south to north, rather than in the sequence of their founding.

This is the second of the series.



This recent photograph shows the pleasing architectural design of Mission San Luis Rey de Francia, on which considerable restoration work has been done

The ruination of San Luis Rey is placed by Father Engelhardt largely upon the shoulders of Territorial Governor Echeandia and Pio Pico, civil administrator of the mission following secularization of the California missions, and later Governor. He condemns them in language that is strong for a priest.

PADRE HEARTBROKEN

Worn out by his long battle to save his mission and protect his Indians and their lands, Father Peyri, at the age of 70, sailed from San Diego January 17, 1832, for Spain, heartbroken and ill. Tradition has it that 500 of his converts on horseback hastened to San Diego to bring him back, but arrived as the father's ship was sailing. They rode their horses into the sea begging him to return. Peyri took home with him two Indian boys who idolized him.

In December preceding his departure, the official report on San Luis Rey showed that 2,819 Indians lived at the mission under his care, that there were 26,000 head of cattle, 25,500 sheep, 1,200 goats, 2,150 horses, 250 mules and 300 pigs. A total of 5,298 baptisms had been administered, mostly by Father Peyri.

The wealth of San Luis Rey and other California missions excited the cupidity of the Spanish Government and as early as 1813 a decree confiscating all American mission property was issued. This order was not confirmed for seven years and enactment was delayed twelve years longer, at the end of which time the Congress of Mexico issued an edict secularizing all the missions.

MISSION SEIZED

On July 15, 1833, Governor Figueroa ordered all qualified neophytes at San Luis Rey freed from missionary control, publishing his Regulations for the Emancipation of the Mission Indians, and on August 9, 1834, directed seizure of all the property of the mission. Formal confiscation was completed when the mission was surrendered to Pio Pico and Pablo de la Portilla, commissioners named by Governor Figueroa, on August 22, 1835.

The civil government took over the mission buildings, church, all property, including sacred vessels, vestments, etc., and six ranchos owned and operated by the padres and their Indian converts. The total value of the property seized was placed at $203,737.37, and outstanding debts were listed at $9,300.87.

On this date the death knell of Mission San Luis Rey was sounded. Salaried administrators took complete charge. Through the terms of a succession of such administrators, the mission padres bravely tried to protect the rights of the Indians and endured with them the hardships and starvation that followed civil control. The missionaries who had been founders and guardians of the mission and the neophytes became mere tenants and barely were tolerated as such.

Many of the converts fled to the mountains and reverted to their savage ways. Others refused to work and became shiftless and troublesome. Those who remained with the mission became little more than slaves.

"Such at this time," says Father Engelhardt, "was the situation at San Luis Rey, which down to the arrival of Echeandia eight years before, sheltered a happy and contented family of more than 2,000 Indian converts."

MISSION IS SOLD

Stirred to action by the misery of the Indians, Governor Alvarado on January 19, 1839, appointed William Hartnell, an Englishman, inspector of missions, and directed him to prepare a report on conditions. Hartnell, credited with being sincere and honest, tried to help Mission San Luis Rey.

Courtyard of Mission San Luis Rey de Francia. Photo by Byron Dome

On July 5, 1840, he removed Pio Pico as administrator and appointed Jose Antonio Estudillo of San Diego to succeed him. Pico, however, continued intrigues to gain possession of the Indian ranchos.

In March, 1843, Governor Manuel Micheltorena reinstated the Franciscans and on April 22d Mission San Luis Rey was turned over to Fr. Jose Maria Zalvidea. Peace came again to San Luis Rey, but lasted only two short years. Pico conspired successfully against Micheltorena, drove him from the country and himself became Governor. He was determined to wipe out the missions. He brought San Luis Rey to the verge of bankruptcy and on May 18, 1846, illegally sold the mission to Jose A. Cot and Jose A. Pico, including the Rancho Palo, for $2,000 in silver and $437.50 in grain. After American occupation this sale was nullified by the United States Supreme Court.

Under American Army control, San Luis Rey received kindly treatment. Pico fled to Mexico in August, 1846. Successive American Indian agents brought a measure of prosperity back to the mission and bettered conditions for the Indians. On March 18, 1851, President Abraham Lincoln returned the California missions to the church. Mission San Luis Rey possesses the original decree of return signed by Lincoln.

Neglected and abandoned except for various military occupations for half a century, pillaged by vandals, San Luis Rey by 1892 was in a sorry state of ruin. In that year, two Franciscan friars from Mexico asked and received permission from Bishop Francis Mora to establish a novitiate, erected a two-story frame building across from the church and on May 12, 1893, the mission was rededicated. Through the untiring efforts of Rev. Fr. Joseph O'Keefe, who devoted 19 years to his task, Mission San Luis Rey was restored to its present beautiful form. In 1913, the Sisters of the Precious Blood opened a school for girls there and today the educational institution near the mission represents an investment of $200,000.

Mission visitors leaving San Diego for San Luis Rey may follow the splendid State highway through the attractive communities of La Jolla, Del Mar, Cardiff, Solano Beach, Encinitas, La Costa and Carlsbad to Oceanside, "Gateway to San Diego County," and 38 miles from the City of San Diego. Or they may follow El Camino Real, main State highway, U. S. 101, over the new Rose Canyon route. Four miles up the San Luis Rey River from Oceanside is the famous Mission San Luis Rey. This old station of the padres is situated on an eminence which commands a splendid view of the surrounding country.

Motorists from the north will follow the State's unexcelled main highway, U. S. 101, from Los Angeles to Oceanside, passing en route the Mission San Juan Capistrano, third in the chain of missions stretching from south to north.

Mission San Juan Capistrano November 1, 1776

WHEN Father Junipero Serra founded Mission San Diego de Alcala it was his fond dream that a chain of Franciscan stations, each a day's travel apart, would be established extending from San Diego to San Francisco.

It was due to his ambition to fill in the gaps between the missions in San Diego, Los Angeles, San Luis Obispo, Monterey and San Francisco as rapidly as possible that the Mission San Juan Capistrano in Orange County was created in 1776. This mission is the third on El Camino Real, the ancient "King's Highway," but was the seventh of the 21 California missions founded by Father Serra and his brother friars.

Father Serra was in Monterey when, on August 10, 1775, he and Don Fernando Rivera, military commander, received from Viceroy Bucareli in Mexico authorization to launch two more missions. It was agreed that one station should be between San Diego and San Gabriel Archangel in Los Angeles near to a spot christened San Francisco Solano by Governor Gaspar de Portola in 1769. This name was not given to the new mission because the various patron saints had been chosen by the viceroy and San Juan Capistrano was next in line for honor. Hence the seventh mission was named after this saint.

INDIAN MASSACRE

Fathers Fermin de Lasuen of San Carlos de Monterey and Gregorio Amurrio of San Luis Obispo were appointed by Junipero to establish the new missionary center. Arriving at the site in advance of Father Amurrio, Lasuen erected an arbor, raised a large cross, blessed the ground and on October 30, 1775, offered up the first Holy Mass. Numerous Indians were present and welcomed the priest and his

soldiers and set about helping to build a chapel.

On the same day that Father Amurrio arrived from San Gabriel with goods and cattle, word was received of the Indian massacre at San Diego de Alcala. Lieutenant Ortega immediately set out for San Diego with soldiers, leaving a bodyguard with the fathers and urging them to make haste and follow him. Work was suspended, the two mission bells buried and with all movable goods on pack mules, the two priests hurried south.

Due to obstacles placed in their way by Rivera, Fathers Lasuen and Amurrio remained idle in San Diego for almost a year. And then Viceroy Bucareli ordered that the Mission San Juan Capistrano be established as soon as possible. Highly elated, Father Serra, himself, at once set out for the abandoned site with a small party. Arriving there he found the cross still standing. He had the bells dug up, hung them in a tree and then rang them to announce to the Indians that the missionaries had returned. The natives appeared overjoyed, assisted in building an arbor and altar and on November 1, 1776, Father Serra offered up High Mass. This date is accepted as the day on which Mission San Juan Capistrano was founded.

On December 19th, seven weeks later, in a temporary chapel, Father Amurrio officiated at the baptizing of the first Indian child. The fathers proceeded rapidly with building construction, erecting a new chapel, concerning which Father Engelhardt, mission historian, says:

Photo by Byron Dome

Exterior view of Mission San Juan Capistrano, showing garden and fountains

"In the absence of all reports to the contrary, we may confidently assert that Father Serra officiated at Confirmations in 1778 and 1783 in the still existing chapel, which was the rear half of the present structure; and that, therefore, this chapel may glory in the distinction of being the only chapel or church in California in which the founder of the California missions celebrated Holy Mass and administered the Sacraments of Baptism and Confirmation."

On his farewell visit to the mission in October, 1783, a year before his death, Father Serra confirmed 221 persons.

Ruins of original Mission San Juan Capistrano destroyed by earthquake in 1812

Photo by Byron Dome

LARGER MISSION BUILT

In 1797, the mission fathers began construction of the most pretentious of all mission buildings. More than 1,000 convert Indians lived at the mission at this time. The men were put to work bringing stones from the quarry for the structure. It is related that the Indian women and children wished to have a hand in the building and that they trudged to the quarry and back daily bringing pebbles and small stones in their aprons and hands.

The neophytes were taught weaving, carpentering and other trades as well as agricultural pursuits, and construction of the magnificent mission temple progressed steadily. It was completed

(Continued on page 21)

Bridge Maintenance Practice On California Highway System

By HARVEY D. STOVER, Bridge Maintenance Engineer

THERE are 4,636 bridges on the California State Highway System omitting culverts. Of this number 3,142 are built of steel and concrete, 1,394 of timber or steel with timber approaches and 100 are steel bridges. The estimated value of these bridges exclusive of State-owned toll bridges is $125,000,000.

The protection of this investment and the maintenance of the bridges in such condition that they will best serve the traveling public is a duty of the Bridge Department of the Division of Highways. Within the Bridge Department, maintenance work is handled directly by the Maintenance and Research Section. Methods of repair and maintenance as developed and field tested by this section over a number of years have included several practices that are worthy of note and should be of interest to the engineers and construction men engaged in this work throughout the Country.

There will be no attempt made to enumerate all maintenance problems encountered, but the more important features of the work, with illustrations, will be covered in a series of articles, the first of which will be devoted to Bridge Floor Maintenance. This subject was selected for the first article, since it is the type of work that requires the greatest maintenance cost on the average bridge.

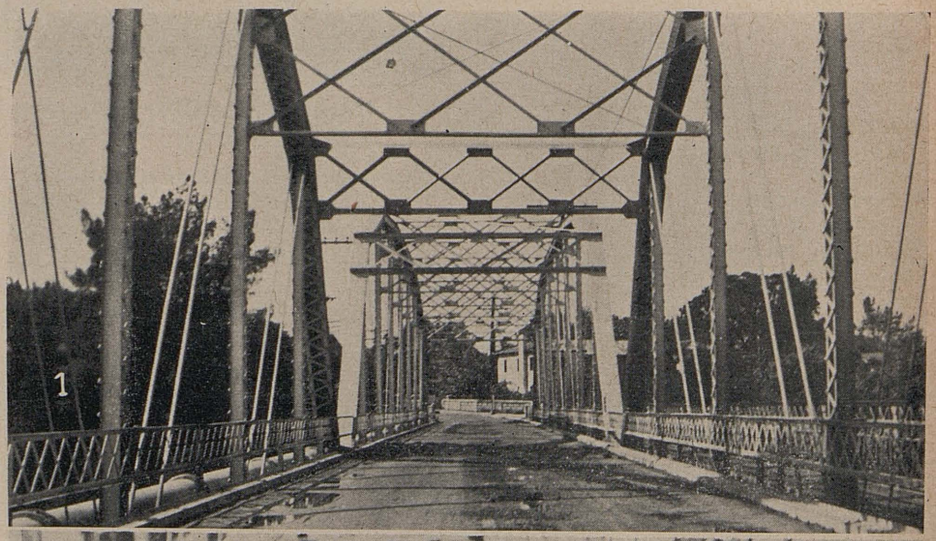
IN the maintenance of timber bridges and old steel bridges, the floor is the most vulnerable portion of the structure and requires first attention. This is due to the fact that the bridge deck is directly subjected to traffic damage, and wheel concentrations have increased beyond the original design load in many cases. Reconstruction of a bridge floor is usually governed by two major considerations; the first is the dead load which may be permitted by existing trusses or other structural members, and the second is the estimated remaining service life of the structure before complete replacement will be necessary.

In general, there are three types of floors being used on the maintenance of bridges:

1. **Reinforced concrete.**
2. **Open steel grating.**
3. **Double diagonal treated timber with a suitable wearing surface.**

A reinforced concrete floor is used where the existing structure can safely support this relatively high dead load, and the estimated remaining life of the structure warrants this type of construction. The use of open steel grating has generally been restricted to the lift spans of moveable bridges where the counter weights and machinery require that the dead load weight be kept to a minimum, and has further been restricted to those locations not subjected to the movement of loose livestock.

The treated timber floor as described above is used where light truss designs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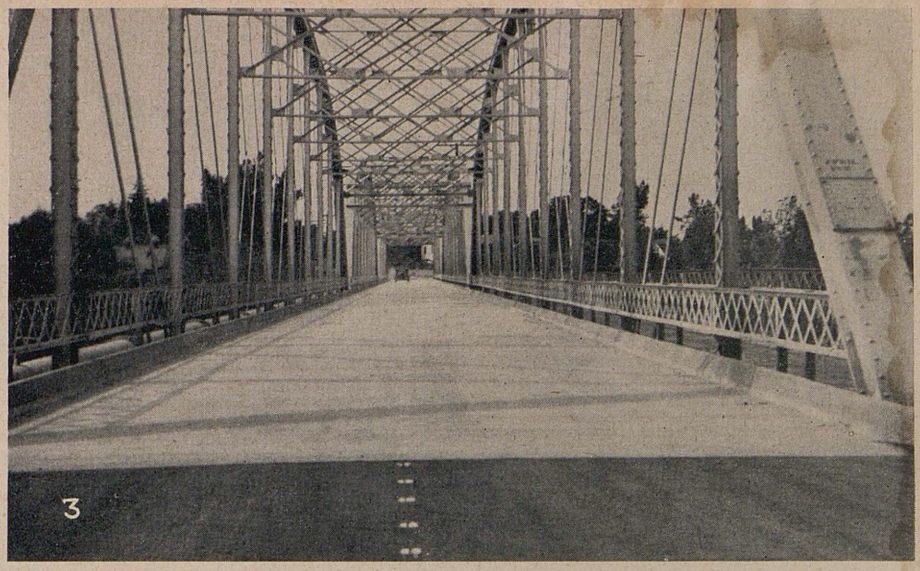
2

will not permit a heavy type floor and on moveable bridges in those locations where provisions must be made for the passage of livestock, which latter condition is generally the rule throughout the central valley and mountain regions of California. Where light design, narrow width or poor alignment of the bridge wall require structure replacement within a relatively few years, an untreated timber floor is generally used.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FLOORS ON STEEL BRIDGES

The reflooring of the Feather River Bridge at Oroville, State Route III-BUT-87-A, shown in **illustrations Nos. 1 to 3**, embraces unusual features worthy of note. The structure was built by Butte County in 1907 and had been posted for restricted loads since being incorporated into the State Highway System in 1933. Posting was required due to the light design of the floor beams and the stringers, although the truss members were adequate for legal loads.

The floor consisted of an asphaltic wearing surface on steel buckle plates riveted to the top flanges of the steel stringers. Longitudinal joints between the buckle plates were connected by rivets through a narrow steel splice plate. These splice plates were too thin to withstand the heavier wheel loads of modern traffic, and as a result rivet holes pulled out of round and the rivets worked loose, causing excessive deflections in the deck and breaking up the surfacing. This condition resulted in continual maintenance and in time would undoubtedly have resulted in complete floor failure.

A reinforced concrete floor was placed, utilizing the present buckle plates for forms. Since the truss system was adequate, it was desirable to increase the strength of the stringers and floor beams to provide for full legal loads.

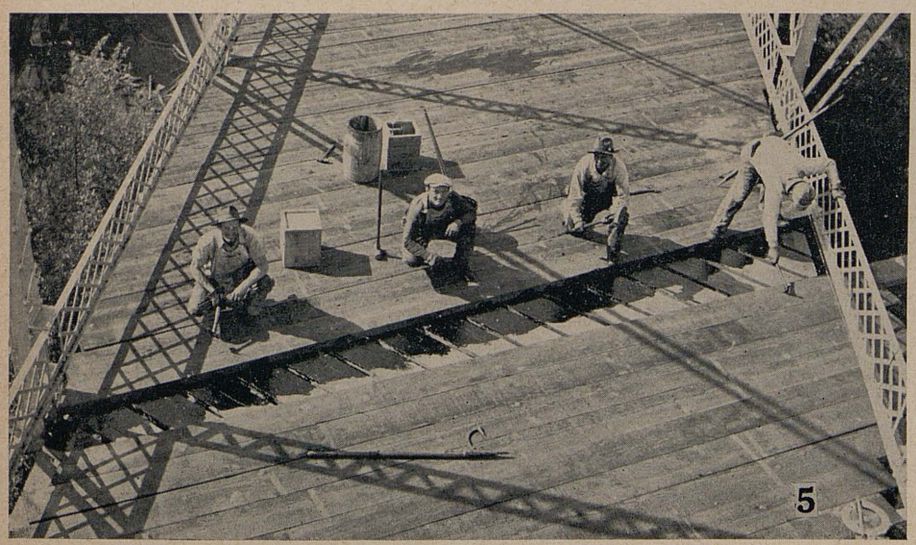
ECONOMICAL DESIGN

In order to correct the condition of the light stringer design, consideration was given to respacing the stringers and adding additional lines. This method would have required the removal of the buckle plates and forming of the complete floor area for placing the concrete. A more economical design was accomplished by removing the rivets which secured the buckle plates to the top flanges of the stringers and replacing them with bolts and double nuts, permitting the head of the bolt to extend several inches up into the concrete slab. This method provided sufficient shear connections between the steel stringers and the concrete slab to allow the deck to function as a composite.

Reference is made to **Illustration 4** which shows typical details for treated timber floors now being used on steel trusses. As noted in the illustration, the floor block is secured to the steel stringers with double grip spikes extending into nailing strips which are bolted to the top flange of the stringers. In many instances, the original design did not use nailing strips in which case the planks are bolted down by using short pieces of angles, which are cut to proper length and extend between the webs of the steel stringers, and thus anchor the floor to the top flange.

Other features in the design consist of spacing the bottom layer of plank sufficiently far apart to provide space for ventilation and the use of tongue and groove top layers, which to some extent prevent the surface from cracking at the joints, thus preventing moisture from entering the floor planks and stringers, all of which tend to prevent decay of the timbers. This type of floor has been used on a considerable number of bridges during the past few years and is giving satisfactory service.

Although there is little to substantiate the statement that diagonal planking provides better distribution, it does have a very definite value in reducing impact, due to the fact that both wheels of an axle do not strike the same plank at once. This type of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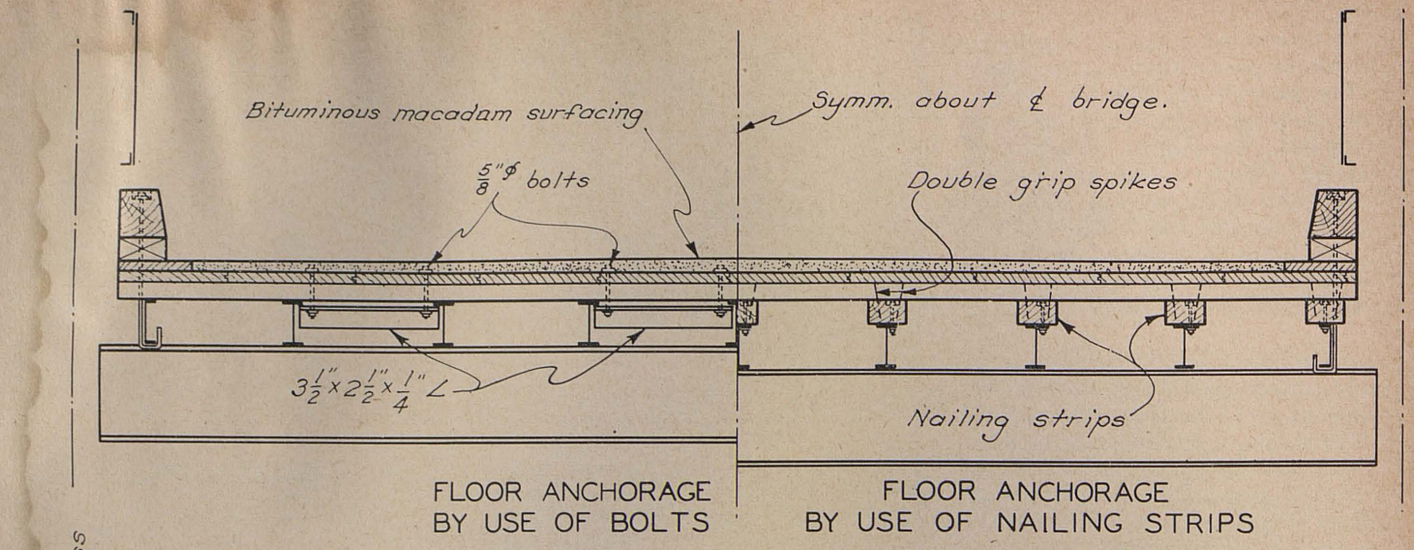
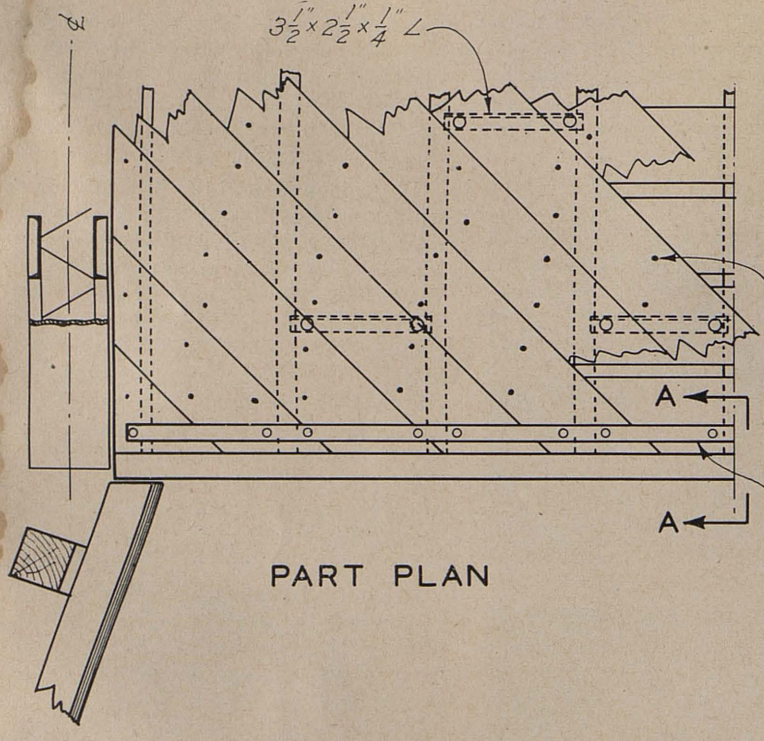


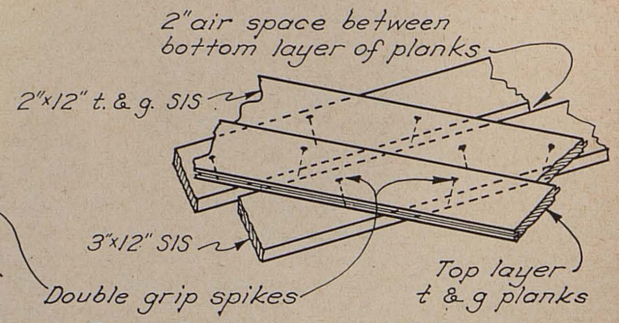
FLOOR ANCHORAGE BY USE OF BOLTS

FLOOR ANCHORAGE BY USE OF NAILING STRIPS

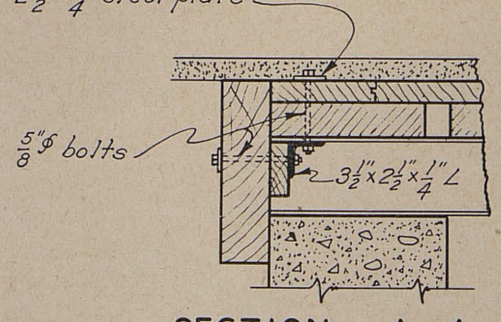
TYPICAL SECTION



PART PLAN



FLOOR NAILING DETAILS



SECTION A—A

④ TYPICAL CONSTRUCTION FOR DOUBLE DIAGONAL TREATED TIMBER FLOOR

floor is often used on old steel bridges having timber stringers, in which case the floor is nailed directly to the stringers, the latter being replaced as required at the time the floor is layed. A typical example is shown in **Illustration 5.**

The type of floors being used on timber bridges are either reinforced concrete slab or treated timber of the design above mentioned, providing the balance of the bridge is in good condition and on permanent alignment.

Due to the relatively large percentage of timber bridges in the State System, a large amount of floor maintenance and reconstruction work is required each year. During the past two year period 104 timber structures were refloored with reinforced concrete slabs cast on sheet metal forms which were nailed to the tops of the timber stringers. In addition, 32 structures were refloored with conventional

(Continued on page 17)

Improvement in Armor Coat Construction As Developed in Highway District I

By EARL WITHYCOMBE, Assistant Construction Engineer

IN the coastal areas of District I, air temperatures, because of fog and a prevailing westerly breeze from the ocean, are consistently uniform but never reach a very high degree throughout the construction season.

This condition in conjunction with the specification requirement that no bituminous binder shall be spread when the atmospheric temperature is less than 65°F, worked a considerable hardship on both the contractor and the State in the construction of armor coats on State Route 1 (Redwood Highway) between Trinidad and Little Red Hen in Humboldt County.

The contractor, being unable to definitely determine weather conditions in advance, arranged for his oiling crew to be on the job at the regular starting time each morning with the hope that the weather would permit starting operations without undue delay. Unfortunately, this was not usually the case and the crew would wait around for the sun to appear and the temperature to reach 65°F, which might be about noon.

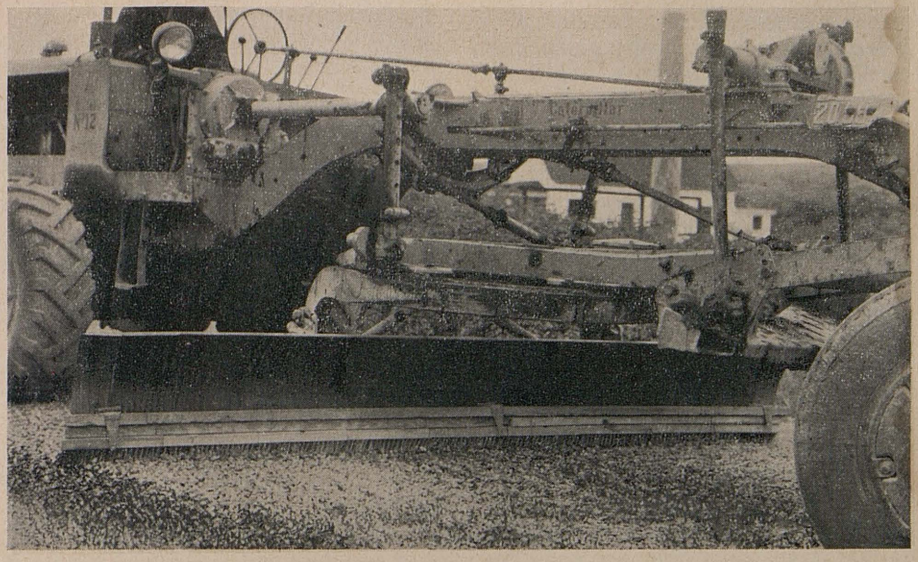
Consequently, the length of a working day was often but a few hours duration, with a resulting loss to the contractor, both in time and money, which ultimately would be reflected in higher prices to the State.

EXPERIMENT RECOMMENDED

The rigid requirement on air temperature is to insure that the hot asphalt penetrates the entire depth of screenings previously spread on the road surface; otherwise, pitting and ravelling soon develop in the finished pavement.

At the suggestion of Headquarter's Construction Department, the District experimented with splitting the spread of ¾-inch x ⅜-inch screenings into two courses, with the thought that this would insure an adequate coverage of the screenings with asphalt, even though the air temperature was below the specified 65°F.

The rate of application was specified from 60 to 70 pounds of coarse (¾-inch x ⅜-inch) screenings per square yard of surface. These were applied in the average amounts of 26 pounds and 36 pounds per square yard in the two courses. The first spread was given an application of 0.16 gallon of asphalt per square yard and the second, 0.20 gallon.



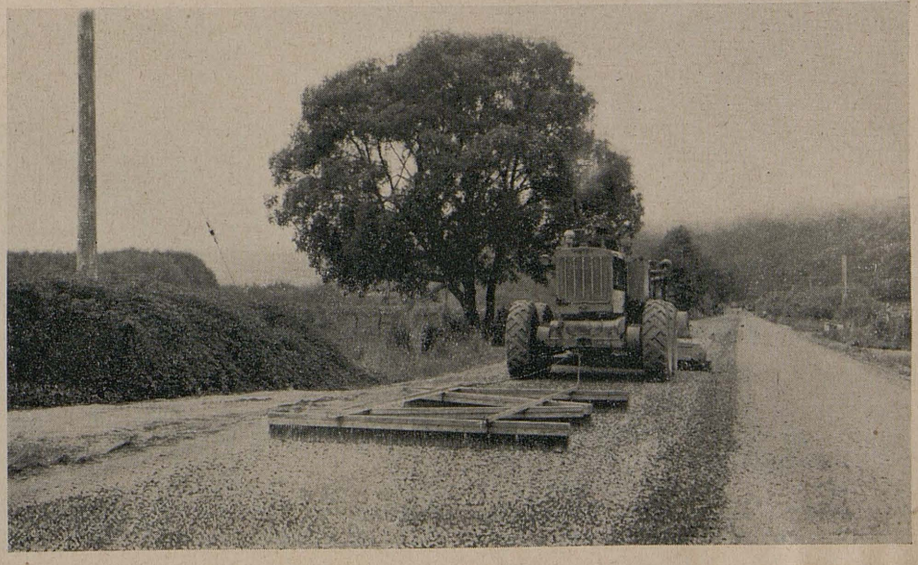
Steel broom on motor grader blade used for lighter spread of screenings

This was followed by an application of 20 to 22 pounds per square yard of medium (⅜-inch x No. 6) screenings, which were penetrated with 0.20 gallon of asphalt and covered with approximately 13 pounds of fine (¼-inch x No. 10) screenings.

PROBLEM SOLVED

The screenings used on this project were crushed from river gravel rejected over a 1½-inch screen and were

Steel drag broom being towed by motor grader



comparatively light in weight and less than the average specified weight was used. The coarse (¾-inch x ⅜-inch) screenings weighed 2,300 pounds per cubic yard, the medium (⅜-inch x No. 6) 2,100 pounds, and the fine (¼-inch x No. 10) 2,018 pounds.

After applying the tack coat of 0.12 gallon per square yard of surface, the initial spread of 26 pounds of coarse screenings was so light that each rock was in direct contact therewith, and except for spotting with additional screenings, no other work was usually required on this course.

The next application of asphalt at 0.16 gallon per square yard, effectively tied each rock to the tack coat and was immediately followed by the second spread of coarse screenings at 36 pounds per square yard.

Three to four men were then used to hand-spot, with additional screenings, any unevenly spread areas with considerable attention being directed to this detail to obtain uniformly distributed screenings.

BLADING WITH STEEL BROOM

The specified blading with pneumatic tired power graders was found to be impractical for these lighter spreads of screenings, and all blading was performed with a steel broom attached with hinges to the full length of the grader mouldboard. This grader with the attached broom and pulling a conventional drag broom, having two diagonal members and two that were transverse to the direction of traffic, leveled the spread screenings, making two trips, one in each direction. Upon completion of this leveling with steel brooms the screenings were rolled once. After rolling any depressions missed in the initial spotting were corrected by the spotting crew with additional screenings and hand brooming.

The theory of two trips with the brooming was to eliminate any tendency of the screenings to lay in one direction. It was also found that the smoothness of the final surface was largely dependent upon the care used in constructing the second course of ¾-inch x ⅜-inch screenings; the two important factors being the spotting and the two directions of brooming.

NEW SEQUENCE

The motor grader, equipped with the steel broom, was used only on the second course of ¾-inch x ⅜-inch screenings, as it was soon evident that for the medium and fine screenings, best results could be obtained with the drag

Rollers follow up the drag broom

equipped with steel brooms. To speed operations on these small screenings the drag broom was pulled by a pneumatic tired farm tractor at a speed slightly in excess of a fast walk. It was found essential to tow the drag broom with a relatively long tow rope and at a slow speed to keep the broom from forming ripples in the spread of screenings.

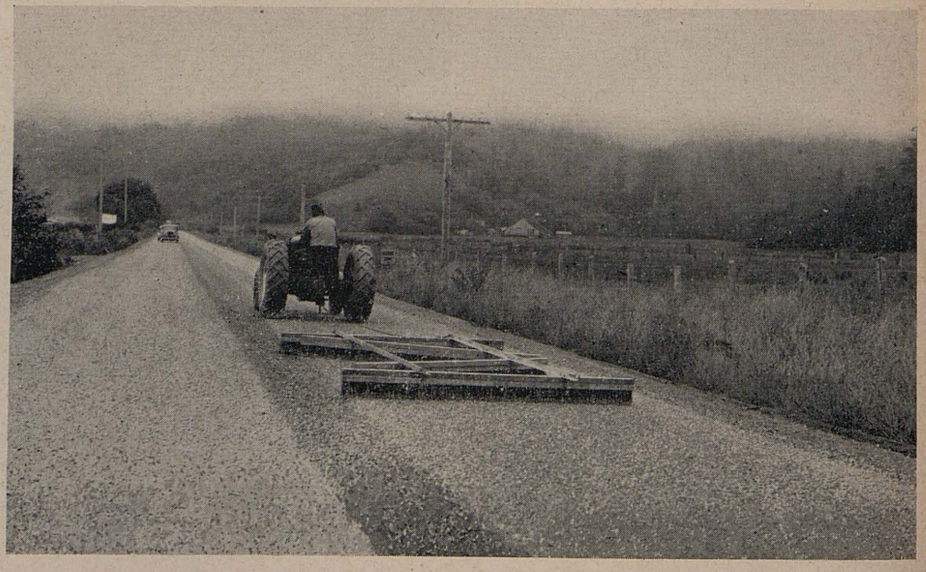
Two trips, one in each direction, were made with the drag broom over the medium screenings before rolling. The spotting crew followed the rolling and covered all spare spots or filled depressions. Upon completion of this operation the screenings were smoothed again with the drag broom in two trips, one in each direction, then re-rolled before spreading the final 0.20 gallon of asphalt.

The fine screenings were then spread, spotted, rolled, smoothed with the drag broom, then re-rolled, which is a different sequence for brooming and rolling as used on the other courses.

Traffic on this project was carried through construction under control which necessitated that where any course of screenings, except the first of 26 pounds of ¾-inch to ⅜-inch rock, was badly disturbed by traffic, it was rebroomed and re-rolled before applying the next spread of asphalt. Traffic, however, was slowed to a maximum speed of 10 M.P.H. when travel-

(Continued on page 22)

Brooming medium screenings with steel drag pulled by light tractor



Hydraulic Structure Designed by Model Experiment by State Highway Engineers

By PAUL M. HINE, Assistant Highway Engineer
and
CHARLES E. DRESSER, Assistant Highway Engineer

PROPOSED plans for the relocation and widening of a portion of the Ridge Route in Los Angeles County require the construction of buttressed fills at several locations, in order to assure stability of the roadbed. The buttresses will be placed in existing canyons at the toe of fill, which will necessitate the construction of channel changes.

At one location, where two buttresses are adjacent to each other, three methods of providing a channel change were investigated and it was found to be most economical to construct the new channel over the buttress.

From the upper buttress to the lower one the difference in grades is 40 feet in a horizontal distance of 60 feet. A trapezoidal section of 10-foot bottom width with 1½:1 side slopes was selected for this steep grade as this would require a minimum length of transition to the channel section. The theoretical velocity at the foot of the channel chute, the point of impingement, is 47 feet per second for the maximum anticipated flow of 900 c.f.s. Grades approaching and leaving the chute are such that the uniform velocities are 7 feet per second for this quantity. The high velocity of the flow in the chute would result in erosion and turbulence for a considerable distance downstream.

Turbulence is undesirable from a functional viewpoint, and erosion increases the cost of maintenance, or in extreme cases may cause complete failure of the structure. Special structures, or dissipators, are used to reduce the velocity at the point of impingement to a rate of flow which the downstream grade will support without excessive turbulence.

Application of existing data on dissipator design, which is based on rectangular instead of the more economical trapezoidal sections, indicated that for a structure 10 feet wide, sidewalls 18 feet high would be required. The calculated depth of outlet flow for this design was in excess of the downstream design depth, and it was apparent that a wider structure should be used. Widening the dissipator would necessitate an increase in the chute width, and in long transition sections.

In order to reduce estimated costs it was decided to use a dissipating basin 10 feet wide with vertical walls only 5 feet high, and 1½:1 paved side slopes from the top of the basin to a height of 8 feet above (the design depth downstream), and rely upon an increased length to accomplish the desired velocity deceleration.

The correct length of basin could not be determined analytically so it was decided to solve the problem by model experiment. The model was constructed in such a manner that the length of basin could be varied, until the most satisfactory results were obtained.

In the experiment, it was found that a basin length of 60 feet was an absolute minimum; however, there was an undesirable rise in water surface at the end of the dissipator, with a resulting drawdown or drop in water surface which produced acceleration and further turbulence downstream. It was then decided to experiment with a stepped chute in order to retard velocities. The prototype dimensions of the step risers were 1 foot 6 inches and of the treads 2 feet 3 inches.

This approach gave more desirable results and a dissipating basin length of 40 feet was adequate to confine the water within the channel. Although the water surface behavior was improved, there still was too much turbulence near the end of the basin. All experiments so far had been conducted with a sill, or basin end-wall, of 5-foot height. This apparently caused an upward deflection in flow which was too abrupt, and it was decided to make the sill in two steps of 2 feet 6 inches each.

Alterations were made in the model, maintaining the adjustable feature of

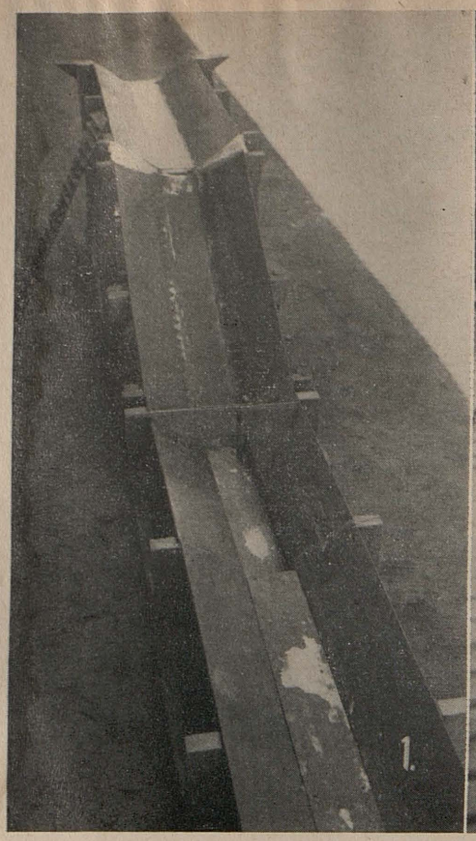
FOREWORD

A SHORT time ago Central Office instructed the districts that, insofar as district personnel would allow, someone with hydraulic experience should be designated to analyze all drainage problems and be made responsible for hydraulic design. For several years District VII had followed this policy, C. H. Parker being in charge of the hydraulic design. Also special effort has been made to have a number of men from other departments work for varying periods under Mr. Parker's direction in order that the district might become more hydraulic conscious.

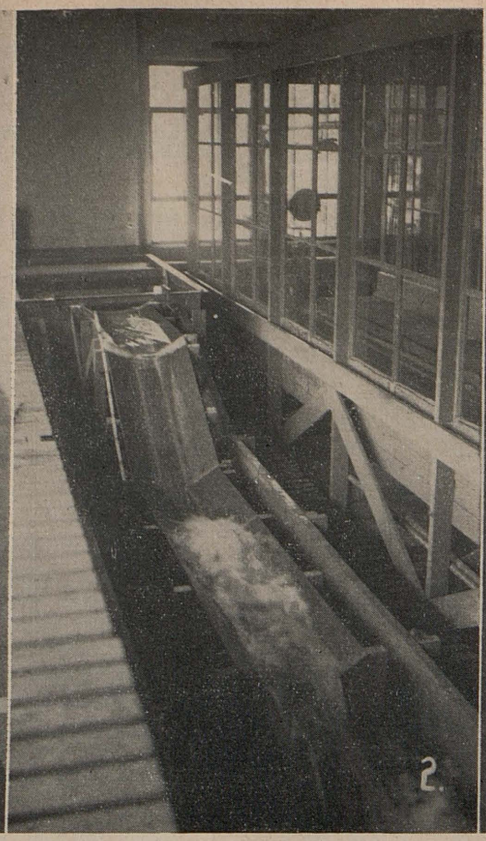
Recently when a design for a rather unusual drainage structure was required, two of the men working under Mr. Parker became so interested in the problem that they arranged for the free use of the hydraulic laboratory of the University of Southern California and, working evenings on their own time, constructed a model. The accompanying article tells of their experiments.

The University has invited District VII to make further use of their hydraulic laboratory and when problems justifying it arise, the invitation will be accepted. However, in the future it is believed that we should allow the men regular highway time for such model experimental work.

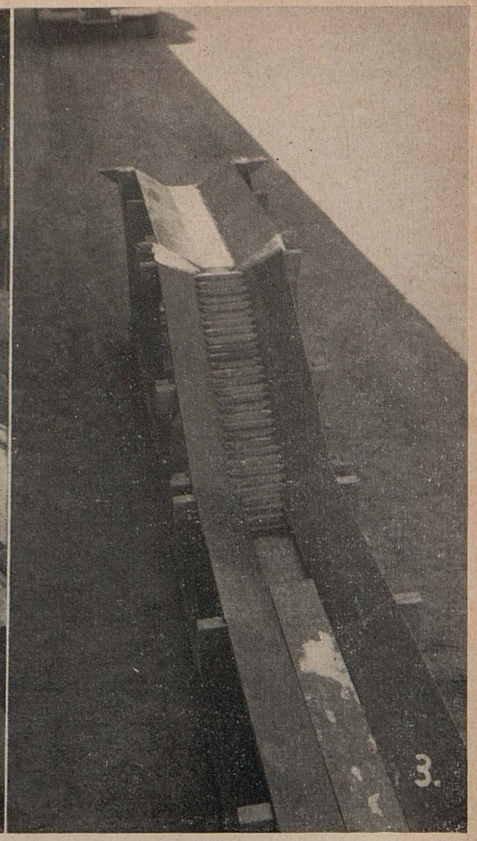
By A. N. George, District Construction Engineer



Model as constructed for first trials. Dissipating basin in prototype is 5 feet deep and 60 feet long. See Fig. 2 for flow conditions



Same structure dimensions as Fig. 1. Flow is equivalent to 900 c. f. s. in prototype. Note extreme turbulence



Final revision of model on which design of prototype was based (see Fig. 5). Flow behavior is shown in Fig. 4

both sills so that they were free to slide with respect to the channel and with each other. Experiments were made with this arrangement, and it was found that the length of the lower half of the basin need be only 8 feet and the total length of the upper half only 28 feet, or an average length of only 18 feet.

Water surface behavior was further improved by a slight change in the sills. A triangular prism was placed on the face of the sills, which served to partially deflect the flow from the center of the channel toward the sides. This equalized the depths of flow over the sill, whereas before the depth was greater at the center than at the sides.

It was now considered that the results obtained were satisfactory. Any further improvements would be of slight advantage, and at the sacrifice of economy.

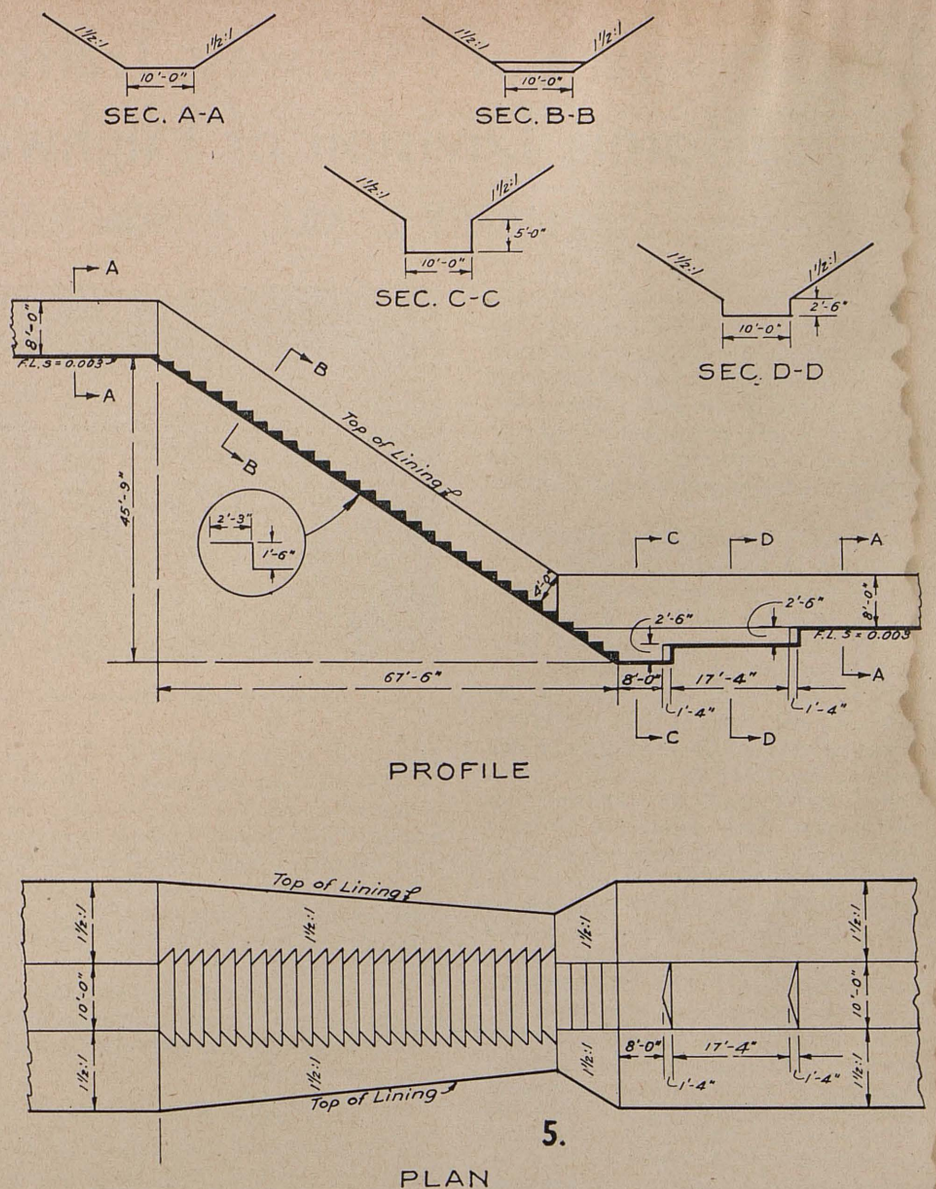
After the design was fixed, by adjustment and revision of the model, rocks equivalent to 2-foot boulders in prototype were fed into the channel to study their effect on the flow. Due to the force at the foot of the chute all

Same dissipating basin dimensions as Fig. 3. Flow is equivalent to 900 c. f. s. in prototype

rocks were carried over the first sill and deposited on the floor of the upper basin. The upper basin was filled to capacity with gravel, and additional rocks placed in the channel were washed out of the model, yet there was not, at any time, an indication that the prototype flow would be adversely affected by such bed loads. It may appear from these results that the upper basin was unnecessarily long; however, the experiments had fixed the adopted length as a minimum.

The advantages of hydraulic model study, for structures departing from conventional design, justify the small cost connected therewith. Such study indicates whether or not the design is adequate, thereby averting the possibility of failure, with resultant damage many times the first cost of the structure: on the other hand, it will suggest economies if the designer has been too conservative. In addition, the use of models is a very expedient means of design in that possible improvements can be made and their actual effect observed in much less time than required for a mathematical analysis which frequently is laborious or impossible. Wherever possible, such structures are used; however, due to the wide variation of local conditions, both topographical and hydrological, this is, in many cases, not feasible functionally or economically.

The experiments were conducted at the University of Southern California, and the writers are indebted to Dr. Robert E. Vivian, Dean of the College of Engineering; Prof. H. J. Miles of the Hydraulic Department; John C. Guillou, Graduate Laboratory Assistant, and Gerald Cimolino, Student Laboratory Assistant, whose cooperation made these experiments possible.



5.

Plan and Profile of Prototype based on model dimensions

Bridge Maintenance Practice on California Highway System

(Continued from page 12)

diagonal timber construction, the choice of type being governed by the condition or estimated remaining service life of the structure. This work was required in some instances due to the decay of the original timber floor, but in the majority of cases, replacement was necessary as a result of failure under the pounding of a large volume of heavy traffic. An average of 20 per cent of the stringers in the above noted work required replacement which had failed in diagonal shear or as a result of a poor grade of lumber at the time of installation.

REINFORCED CONCRETE BRIDGE FLOOR MAINTENANCE

A considerable number of the floors of concrete bridges in the highways system have required attention. Uneven riding surface resulting from plastic flow of the concrete is the most common cause, which is corrected by placing a leveling course of bituminous macadam surfacing.

In certain localities, concrete bridge floor failure has occurred as a result of frost action, spalling the surface resulting in unsatisfactory wearing surface and in some instances exposing the reinforcing steel. Maintenance in these instances, has been taken care of by use of bituminous macadam wearing surface, properly placed to provide a true riding surface.

Boy—Life was just one big desert until I met you.

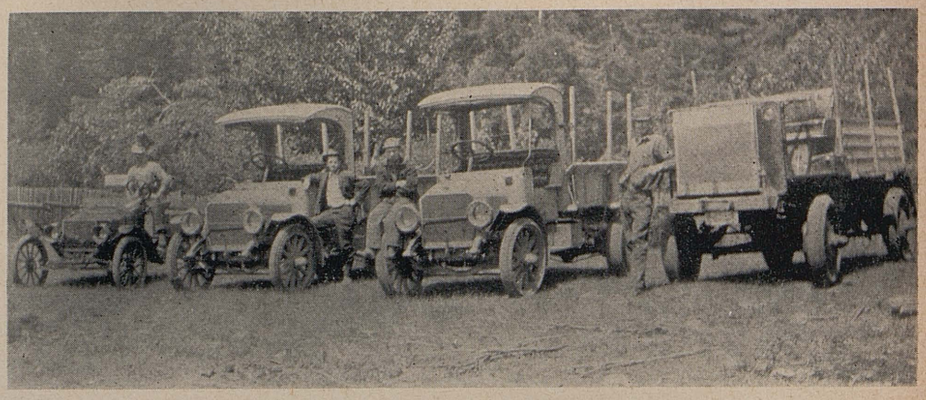
Girl—Is that why you dance like a camel?

Development of Highway Traffic Data By California Division of Highways

By HARRY L. KILE, Assistant Traffic Engineer

THE records of the California Division of Highways show that from its earliest beginnings there were those among its staff who did not wholly subscribe to the rather commonly accepted procedure of simply accepting the opinions of supposedly informed persons concerning highway needs.

It could, of course, be admitted that the roads throughout the State were for the most part inadequate to properly serve either the type of traffic or the volume of traffic which had been brought about by the development both of the State itself and of the motor vehicle. But, at least, to the few it was not enough to know only in this general way that there was unquestioned traffic need for highway improvement. They wanted to *measure* these needs; to know where this traffic was, what kind, and how much. So actual field traffic counts were made. The first regularly adopted form for these counts of which we have record was used in 1913. This form and the instructions which accompanied it are of real interest, even though somewhat amusing in the light of changes in the character of vehicles which have come during the past 30 years.



These are types of motor vehicles tabulated in early day traffic counts

OLD TRAFFIC COUNT

Record was made of all vehicles passing a given location for a period of 14 hours each day for the full seven days of a week, the counts beginning at 7 a.m. and ending at 9 p.m., broken down into two-hour periods. Vehicles recorded were classified under the following groups:

Single Horse	**Light Vehicle** **Heavy Vehicle**
Two or More Horses	**Light Vehicle** **Heavy Vehicle**
Automobile	**Runabout** **Touring Car** **Motor Trucks** **Motorcycles**

"Light Vehicle" was defined as meaning "a buggy, democrat wagon, or any vehicle other than an automobile which is used usually for pleasure or light business purposes." "Heavy Vehicle" meant "a farm wagon, milk wagon, dump wagon, grocery or provision wagon or any vehicle except an automobile, which is used for carrying heavy loads." "Runabout" was defined as "an automobile built to carry but two people."

It is to be noted that the information sought concerned *rural* traffic, no provision being made for recording pedestrians or bicycles.

REGULAR PROGRAM ESTABLISHED

What direct use was made of the information derived from these actual counts is problematical. However, they *were* made; and as the State Highway System was gradually brought into being and construction of its various elements completed under the three principal bond issues, a more or less regular program for traffic enumeration on all routes of the system became established.

By 1924 counts were being made regularly at approximately 200 locations on the system, which then consisted of some 6,300 miles. For a time counts were taken during each of the four seasons, spring, summer, autumn, and winter, but by 1926 a program calling for semiannual counts had been settled upon and was continued without radical change until 1934. Counts were taken in mid-January and mid-July of each year during two successive days, Sunday and Monday, for the 16-hour period from 6 a.m. to 10 p.m., the traffic totals being shown for each hour. At the same time at a certain few representative stations widely spread throughout the system the counts were continued for a full seven-day period to determine daily variation. Certain counts also were taken for the full 24 hours of the day in order to develop necessary factors for expanding the regular 16-hour records.

COMPREHENSIVE SURVEY

In the latter part of 1933 the Division of Highways prepared plans for the organization and conduct of a comprehensive survey of highway transportation in California. Arrangements were made for the cooperation of the Civil Works Administration in furnishing the many thousands of field recorders needed for simultaneous recording of all road and street traffic throughout the entire State. The outcome of this was the "California Highway Transportation Survey, 1934," which has since served as the basis for all subsequent traffic studies carried on by the Division of Highways. This survey was truly state-wide in that actual field counts were made on all of the road systems, State, county, and city.

The mileage of the State Highway System had by this time increased to approximately 14,000 miles, of which about 12,500 miles were outside the limits of incorporated municipalities.

STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION

TRAFFIC RECORD

191

OBSERVING STATION NO.....
DATE.....
LOCATION OF STATION.....
DIV. ..... COUNTY ..... ROUTE ..... SEC. ..... STA. .....
SIGNATURE OF OBSERVER

KIND OF VEHICLE		7 A.M. TO 9 A.M.	9 A.M. TO 11 A.M.	11 A.M. TO 1 P.M.	1 P.M. TO 3 P.M.	3 P.M. TO 5 P.M.	5 P.M. TO 7 P.M.	7 P.M. TO 9 P.M.	TOTALS
SINGLE HORSE	LIGHT VEHICLE								
	HEAVY VEHICLE								
TWO OR MORE HORSES	LIGHT VEHICLE								
	HEAVY VEHICLE								
AUTOMOBILE	RUNABOUT								
	TOURING CAR								
	MOTOR TRUCKS								
	MOTOR-CYCLES								
TOTALS									
WEATHER CONDITIONS									

OBSERVER WILL NOT WRITE IN THIS SPACE

(SEE INSTRUCTIONS ON OTHER SIDE)

STATE OF CALIFORNIA—DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS—TRAFFIC CENSUS

Day..... Date.....
Station Description.....
No..... Town..... Leg.....

TYPE	A. M. HOURS 12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8
PASSENGER AUTOMOBILES CALIFORNIA REGISTRATION 20									
40									
60									
80									
100									
120									
140									
160									
180									
200									
220									
240									
260									
280									
300									
SUBTOTAL									
FOREIGN CARS									
BUSES									
TRUCKS LIGHT									
HEAVY									
TRAILER									
TRAILER COACHES									
OTHER PASSNGR. CAR TRAILERS									
TOTAL									

In the days when horse drawn vehicles predominated, the traffic record form shown on the left was used by the California Highway Commission. The form on the right is used by the Division of Highways today

During this survey approximately 1,000 traffic count stations were established on the rural portion of the system. The very large majority of these were at intersections, with traffic being recorded on each of the various legs and the stations themselves so located as to provide the basis for an accurate traffic profile.

LITTLE CHANGE IN MILEAGE

There has been but little change in the total mileage of the State Highway System since that time and the traffic stations then established have, with the exception of a minor number of necessary modifications, been regularly occupied during all the intervening years. In this way it has been possible to develop and maintain exact comparisons with the comprehensive data established by the basic 1934 Transportation Survey.

The practice of recording traffic only semiannually in mid-January and mid-July provided no adequate guide as to seasonal trends. The January counts for the most part simply indicated the minimum traffic movement and the minimum is of little interest in traffic matters. July traffic on the other hand quite generally approximates the peak movement. With this in mind it was decided to retain the mid-July annual count at all of the 1,000± regularly established stations but to discontinue the similar count in January. And in order to obtain desired information as to seasonal trends and thus be able to accurately estimate the yearly traffic volume from the state-wide base of the July census, "monthly count stations" were established in 1936.

Certain selected ones of the regularly established annual count stations were also occupied for a full 24-hour period on the mid-Monday of each month throughout the year. These served to indicate seasonal variation and to provide those data necessary in developing expansion factors which when applied to the overall July annual count would make possible a close approximation of traffic for the entire year. Some 40 locations widely scattered throughout the State Highway System were picked as being generally representative for the indication of seasonal traffic variation in their several surrounding areas. The final estimates of traffic arrived at by means of these various actual field counts have been found to consistently check within remarkably close limits independently-arrived-at estimates based upon net gasoline consumption.

SEASONAL VARIATION

The original monthly stations were chosen with the idea in mind of determining seasonal variation for the State Highway System as a whole, and as noted the selections then made proved in actual use to be truly representative

for this purpose. Increasing interest and resulting demand for factual traffic information to be used as a determining guide in various activities of the several highway districts pointed to the desirability of supplementing the group of monthly stations to make possible not only the determination of seasonal variation for the State as a whole but also to provide corresponding seasonal factors for each of the eleven districts separately.

Accordingly, the number of monthly stations was approximately doubled in 1939, and these have since been maintained so that at the present time some 80 locations are regularly occupied on the mid-Monday of each month throughout the year.

As previously noted, all monthly counts covered the full 24-hour period. However, at the close of 1940, after a careful study of the hourly variations developed during the previous years, it was decided that these monthly counts could safely be reduced to the normal 16-hour period 6 a.m. to 10 p.m., which corresponds with the regular annual July count. By use of factors developed in the study, this 16-hour count could be accurately expanded to produce the full 24-hour traffic. Monthly counts since that time have been for 16 hours only.

7-DAY COUNT

In order that a strict control may be kept on the various expansion factors needed to produce a yearly traffic total, a full 7-day count is made at each of the regular monthly stations at the time of taking the annual July count. And during four of these seven days, namely, Friday, Saturday, Sunday, and Monday, the counts also cover the full 24 hours of the day. In this way we have been enabled to reaffirm or to modify previously determined factors for hourly and daily variation as well as the seasonal variation which is revealed by the monthly records.

In the organizational setup of the California Division of Highways the Districts—of which there are 11—are to a large degree independent units. For this reason it is quite desirable that there should be definite knowledge of the extent and character of traffic with which each of them has to deal. Recognition of this prompted the establishment of the additional monthly traffic stations in 1939. Each district in itself is sufficiently large to include areas of divergent seasonal trends and the supplementary stations were located with a view to adequate coverage of these varied conditions. With the establishment of these monthly stations, arbitrary boundaries were determined upon for each district, delimiting the areas of influence for the individual stations, thus creating "traffic subdistricts" within the several Highway Districts. In this way, by having quickly available factual information of the main elements of traffic content and volume characteristic of and applicable to any or all of the individual road sections within these comparatively small subdistricts, it is possible to reach prompt decisions with respect to a large majority of contemplated highway projects in so far as the traffic elements of the project may be decisive in the conclusions to be reached, without the necessity of conducting special traffic surveys in each individual case.

VALUE OF COUNT

While the knowledge of traffic provided by this continuous and regular program of field recording is basically invaluable for the proper direction of the activities of the highway organization, there is, of course, the need in many instances for special knowledge of further details which may be of peculiar and deciding influence in the review of individual projects. This is *always* true of intersections if anything other than the most minor or elementary treatment is involved.

Subject to such modifications as may be apparently desirable due to conditions unique to the location being studied, the normal intersection survey records traffic by both type and direction in 15-minute-interval totals, special forms being used for these counts.

Another of the elements of traffic besides those of volume, vehicle type, and direction of movement is the very important one of speed. In recognition of this, state-wide speed surveys are conducted to establish practices and trends of traffic in general, and special speed studies are also made in connection with single projects or abnormal situations. During the present war emergency period overall speed checks to determine general trends have been made at some 70 or 80 locations throughout the system. The locations chosen were at points on the highway where no legal restriction on speed existed and where physical conditions were such that the traffic speeds noted would reflect normal driving habits. Speed studies had been conducted at all of these stations during previous years, so that direct comparison with past practice was possible and can continue to be made in the future as need arises or more current knowledge is deemed desirable.

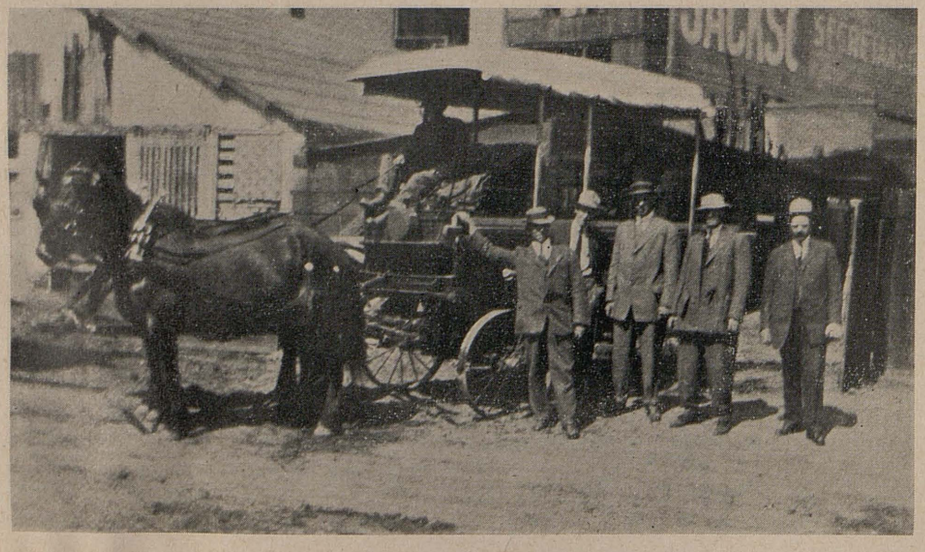
STANDARD FORMS

The standard forms employed by field recorders in taking the regular traffic census provide for the following breakdown of vehicle types.

California Passenger Cars
Out-of-State Passenger Cars
Busses
Trucks—Light
Trucks—Heavy
Truck Trailers
Trailer Coaches
Other Passenger Car Trailers

(Continued on page 23)

State highway crew starting for work in 1913



CALIFORNIA MISSIONS

(Continued from page 9)

October 18, 1806. Meanwhile numerous adobe houses had been built for the Indians and their families. Old records show that in 1809 the fathers had constructed an aqueduct to bring water to the mission. By 1812 the mission was prospering wonderfully. And then an evil fate undid the labor of years.

On the morning of December 8, 1812, while early Mass was being held, a terrific earthquake hit San Juan Capistrano, leveling the beautiful new church that had been nine years in the making and killing 40 Indian worshipers. There were only six survivors.

MISSION SACKED BY PIRATES

Except for removal of debris and necessary repairs, the heartbroken mission fathers undertook no rebuilding until 1814. In 1818 they suffered another tragedy when two Argentine privateers seized Monterey, demanded that the Californians renounce Spain and join the Argentine revolutionists, looted the place and then landed at San Juan Capistrano, where they sacked the mission and burned some buildings.

As early as June, 1821, friction developed between the military and civil authorities and the fathers of San Juan Capistrano. Repeated demands for cash and the products of the mission fields were made by the civil government and the priests came to feel, and quite justly, it would seem, that they and their Indian charges were being imposed upon.

Their troubles increased with the coming of Jose M. Echeandia, the first native Mexican to become Governor of California. One of Echeandia's first acts was to order Fathers Barona and Zalvidea of San Juan Capistrano to swear allegiance to the new Constitution of the Federal States of Mexico. This the priests, both of whom had taken the oath of the Independence of Mexico from Spain, refused to do, as did nearly all the Franciscan missionaries.

ENEMY OF PADRES ACTS

An avowed enemy of the priests, Echeandia set to work to destroy San Juan Capistrano mission. On July 25, 1826, he issued a proclamation emancipating the mission Indians of California. This action proved disastrous to the San Juan Capistrano natives. They became shiftless and disorderly. The Governor and his political associates had their eyes on the mission lands and cared not what became of the mission converts.

Upper—View of interior of chapel at Mission San Juan Capistrano. Lower—Courtyard of this mission, showing old mission bells. Photos by Byron Dome

Political upheavals, which resulted in the ousting of Echeandia and his return to power after a successful revolt against Governor Victoria, added to the woes of the mission fathers. In 1833, Governor Figueroa emancipated all the Indians at San Juan Capistrano. He followed this by confiscating all mission lands, part of which was divided among the neophytes and the remainder granted to friends. A mayordomo took charge of the mission. Aged Father Zalvidea, ill and grief stricken, remained to be near his converts.

(Continued on page 23)

Highway District IV Felt Impact of War

(Continued from page 4)

to widen the main highway between Vallejo and Napa to four lanes. Due to many calls on District IV personnel the planning and supervision of the District IV portion of this highway in Napa County was taken over by District X. This construction was fully described in the last issue of this magazine.

In addition to the pure access roads the District's activities on the State Highway System have been carried on as an integral part of the war effort. Many miles of the strategic network are included in the Bay counties and these, too, are in the same light as access roads as regards service to the armed forces and war industries.

Fourteen major projects have been undertaken and completed since December 7, 1941 and have involved construction on approximately 46 miles of State highways at a cost of approximately $3,850,000. These projects consisted of new construction along the coast road in San Mateo County (Tunitas to Lobitos) and between Watsonville and Rob Roy Junction in Santa Cruz County. The balance were in the nature of widening or reconstruction of existing highways to high standards.

To forestall complete destruction of existing pavements a total of 31 blanket jobs or minor improvements have been completed since the war put a stop to the major reconstruction program. These 31 projects have repaired approximately 94 miles on all types and classes of State highways and have called for the expenditure of about $1,600,000.

The access road program is now nearing completion and the District's planning is being concentrated on postwar projects. Of the program approved by the California Highway Commission for primary consideration for construction in the postwar era, nine of the original fourteen projects have been prepared and the balance are in process of design.

The District's construction program has been seriously handicapped by loss of 35 of the engineering personnel to the armed service, a loss of approximately 25 per cent of the normal staff. This loss has lately been offset to a considerable degree by the transfer of men from other districts.

Unit of Former State Employee Cited for Valor

WHEN H. L. Grayson, who was a member of the maintenance crew of the State-owned Carquinez Bridge, took a military leave from the Division of Highways to enlist in the Fortieth Construction Battalion of the Seabees he really joined a fighting outfit. Among the souvenirs he will have after the war will be a copy of a presidential citation for his unit awarded for outstanding performance in the Admiralty Islands, which reads as follows:

"The Fortieth Construction Battalion, United States Navy, is cited for outstanding performance of duty in action against the enemy on Los Negros Island, Admiralty group, on March 2, 1944. This unit landed during a critical situation when the holding on the harbor and airstrip against overwhelming enemy forces was precarious.

"Notwithstanding the fact that the area was still under enemy fire, the battalion immediately on landing assumed its assigned work in clearing and repairing the airstrip. During the progress of their work it became commonplace for the operators to be fired upon by snipers, and for the operators to return the fire while continuing their work.

"It soon became evident that cavalry patrols operating against the enemy required fire lanes into the jungle to permit concentration of automatic weapons against the enemy and the Fortieth Construction Battalion had no sooner learned of this need than they turned their bulldozers into the jungle, cut the required fire lanes in superb disregard of the enemy fire and established adequate areas for the control of the enemy.

"During the hours of darkness the members of the battalion were continuously harassed by infiltrating enemy patrols, and for their own preservation operated effectively as combat troops.

"After working all day and fighting all night, small parties of the construction battalion personnel still found time during their few hours of leisure off duty to rout out small bands of the enemy, locate and report pillboxes and otherwise carry the offensive to the enemy's positions.

"The cheerful and uncomplaining attitude of these engineers and the outstanding spirit was noticeable to all associated with the unit and gave great encouragement to the troops in contact.

"In particular, the operation of the bulldozers into the teeth of the enemy's positions was most inspiring and heartening, and created an immediate resurgence of the offensive spirit in weary troops."

Improvement in Armor Coating is Developed

(Continued from page 14)

ing over the spread screenings, which did much toward keeping the rock in place.

SUCCESSFUL RESULTS

All center laps were staggered from side to side for each course by using 9.5 and 11 foot spreads, which will prevent extensive bleeding at this point in the future.

All rolling was accomplished with two 8-ton tandem rollers. Screenings were spread on the road with a Buckeye spreader and after the crew became familiar with this spreader, very good results were obtained in the minimum of time.

Successful results were obtained with this method of armor coat construction with air temperatures as low as 50° F. This was the objective sought. Much to the surprise of everyone, the riding qualities were improved to a remarkable degree. Armor coat that averaged 48 inches of roughness per mile in 1943, as measured by the roughometer, were constructed as smooth as 15 inches per mile. This compared very favorably with the best riding pavements of any type.

The contractor, using a green crew, made an average daily production of 1754 lineal feet of completed armor coat 20 feet in width, and had a high production of 3400 lineal feet one day before the work was completed.

Under similar weather conditions it was his opinion that the methods used on this project were conducive to increased production and decreased costs over the conventional specified methods and in areas where the temperatures were high, they might show the same desirable results.

On the construction of this project, Contractor Marshall S. Hanrahan was represented by Superintendent Sam Ball, and the State by A. M. Nash, District Engineer; C. P. Sweet, District Construction Engineer, and in immediate charge of construction, H. M. Hansen, Resident Engineer, with Lester Spinney as street-man.

Mrs. Jones was spending a day in bed with a severe cough and her husband was working in the back yard, and hammering nails into some boards. Presently, his neighbor came over.

"How's the wife?" he asked.

"Not very well," replied Jones.

"Is that her coughin'?"

"No, you fathead, it's a henhouse."

Traffic Data Development

(Continued from page 20)

In the making of speed checks vehicles are separated into the following categories.

Passenger Cars
Busses
Light Trucks
Heavy Trucks
Trucks with Trailers

While the several classes of surveys so far enumerated provide the main features essential to the intelligent review of the traffic situation, there are numerous other elements which have direct and important bearing in specific cases and so call for separate investigation. Among studies of this kind are "time and delay," "approach speeds," and "traffic behavior" studies of many types.

In reciting this outline of the manner in which we go about the work of acquainting ourselves with needed information on the traffic we must serve, there has been no intention to present any of the methods as being uncommon or exceptional in themselves. In one important respect, however, we do perhaps occupy a position of more than ordinary advantage. That is the possession of broad and quite comprehensive background of factual traffic data sufficiently complete as to detail and marshalled in such manner that it is *usable.*

Traffic data can not be manufactured or produced at will in some artificial way in a laboratory. It must be accumulated *over the years* and *throughout the system.* And if in the field-gathering the records kept have been so simplified as to constitute little more than the total sum of vehicles observed, such records quickly reveal their inadequacy the moment any attempt is made to put them to real use. Without certain essential detail, totals may indeed be worse than useless in that they lend themselves to decisions based on mere speculation. A similar lack of substantial value can be ascribed to information which must be based on data acquired during a single count or isolated survey, which in themselves may be sufficiently complete as to detail but which, since they must stand alone, in reality represent only conditions as of the date the observations were made.

The California Division of Highways is unusually fortunate in this regard by reason of many years of continuous records of traffic covering the entire system and sufficiently detailed for nearly all essential needs. Directly tied in as they are with the State-wide comprehensive Transportation Survey of 1934, and carefully supplemented by many special studies, these records provide reliable support for judgment in the wide variety of highway problems which must be decided daily.

Pioneer State highway crew prepares to load its wagon for field work

CALIFORNIA MISSIONS

(Continued from page 21)

Through successive governmental regimes, San Juan Capistrano continued its decline and in June, 1841, the Indian community was dissolved and most of their lands divided among settlers. The mission became a pueblo by official decrees. Father Zalvidea departed for San Luis Rey about the end of 1842 and for four years there was no resident priest at San Juan Capistrano.

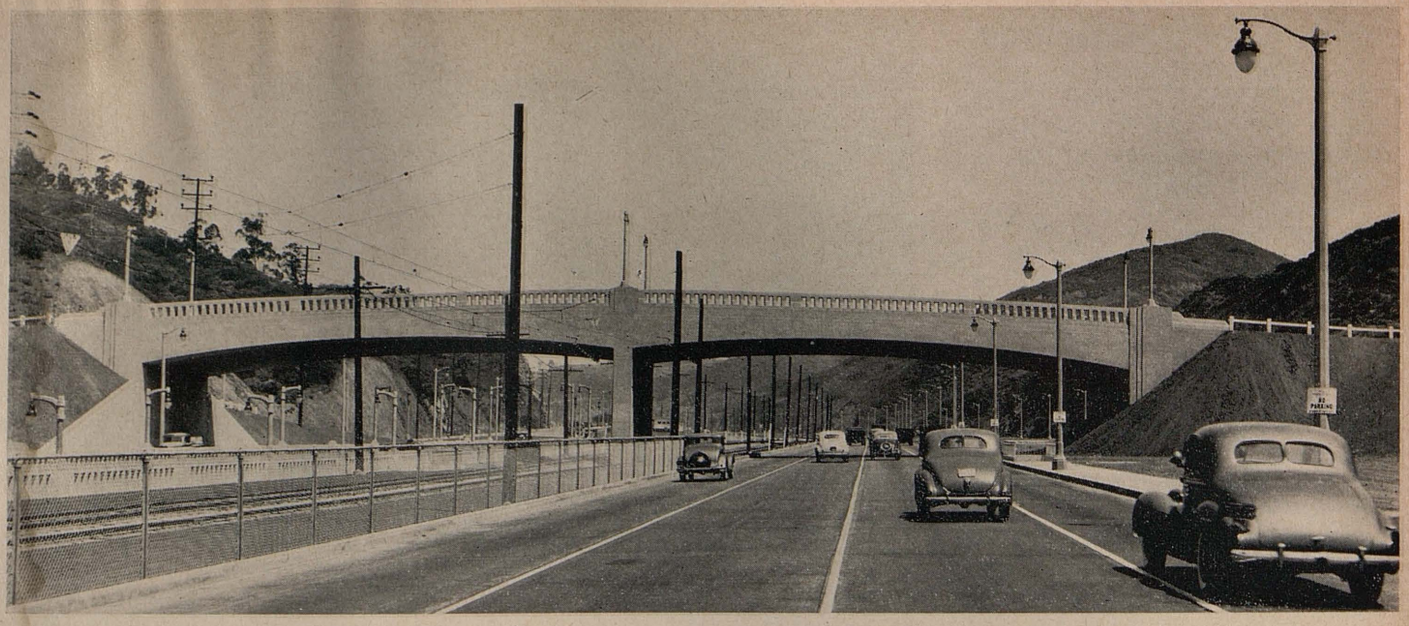
The mission came to an end on December 4, 1845, when it was sold at public auction by Governor Pio Pico to John Forster, his brother-in-law, and James McKinley. On July 7, 1846, the American Flag was raised at Monterey, 13 years too late to serve San Juan Capistrano and the other missions. San Juan Capistrano was returned to the Catholic church by President Lincoln on March 18, 1865.

Over a period of 60 years, Mission San Juan Capistrano, known as the "Jewel of the Missions," crumbled into ruins. Its restoration to its present day beauty was started in 1895 by Charles F. Lummis and the Landmarks Club, which he founded, and was completed by Father St. John O'Sullivan, beloved pastor of the mission.

Mission San Juan Capistrano is in Orange County almost midway between San Diego and Los Angeles. It is approximately 70 miles from San Diego on El Camino Real, the main State highway. Mission visitors traveling north from Mission San Luis Rey, second in the chain of Franciscan stations stretching from San Diego to Sonoma, leave the charming City of Oceanside and proceed 29 miles to San Juan Capistrano passing through Serra, named in honor of Father Junipero.

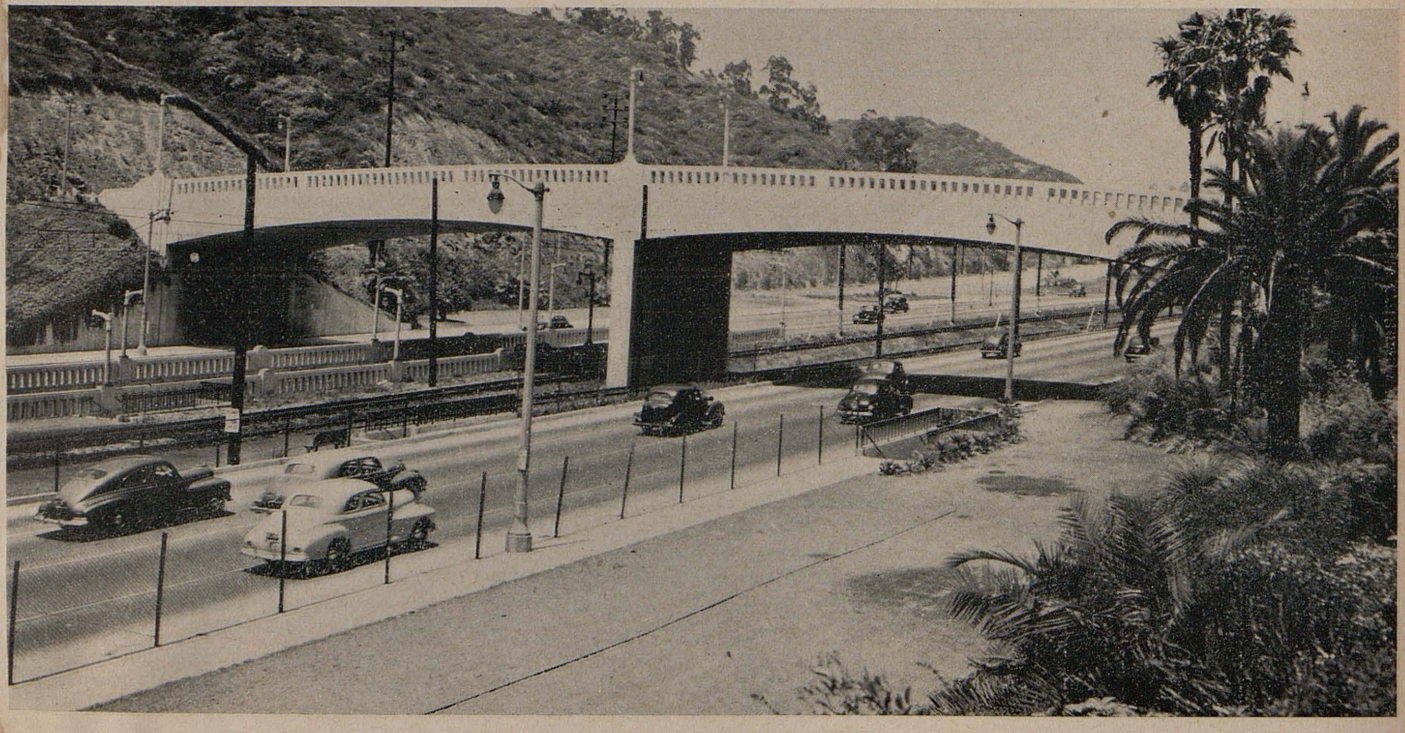
This mission is 23 miles south of Santa Ana, county seat of Orange. Leaving this city, the mission motorist en route to San Juan Capistrano passes through Tustin and Irvine, centers of an amazingly beautiful and wealthy citrus district. At the mission, flowers bloom the year 'round in the garden surrounding the cloisters and the bells of the campanario daily peal forth the Angelus and call the faithful to Holy Mass.

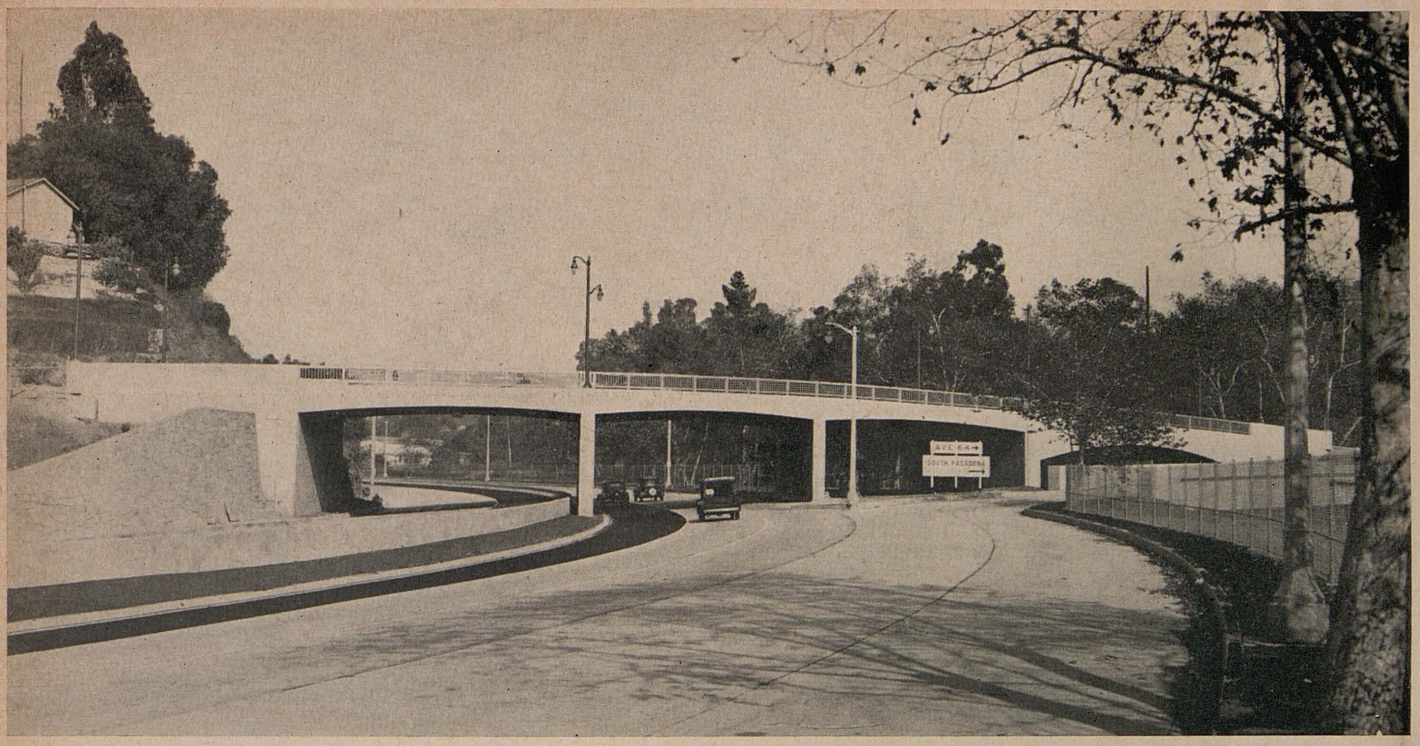
Next—Mission San Gabriel Arcangel and Mission San Fernando Rey de Espana.



LANDSCAPING of California State highways to control bank erosion and to obliterate unsightly earth scars caused by construction is receiving more and more attention from the Division of Highways.

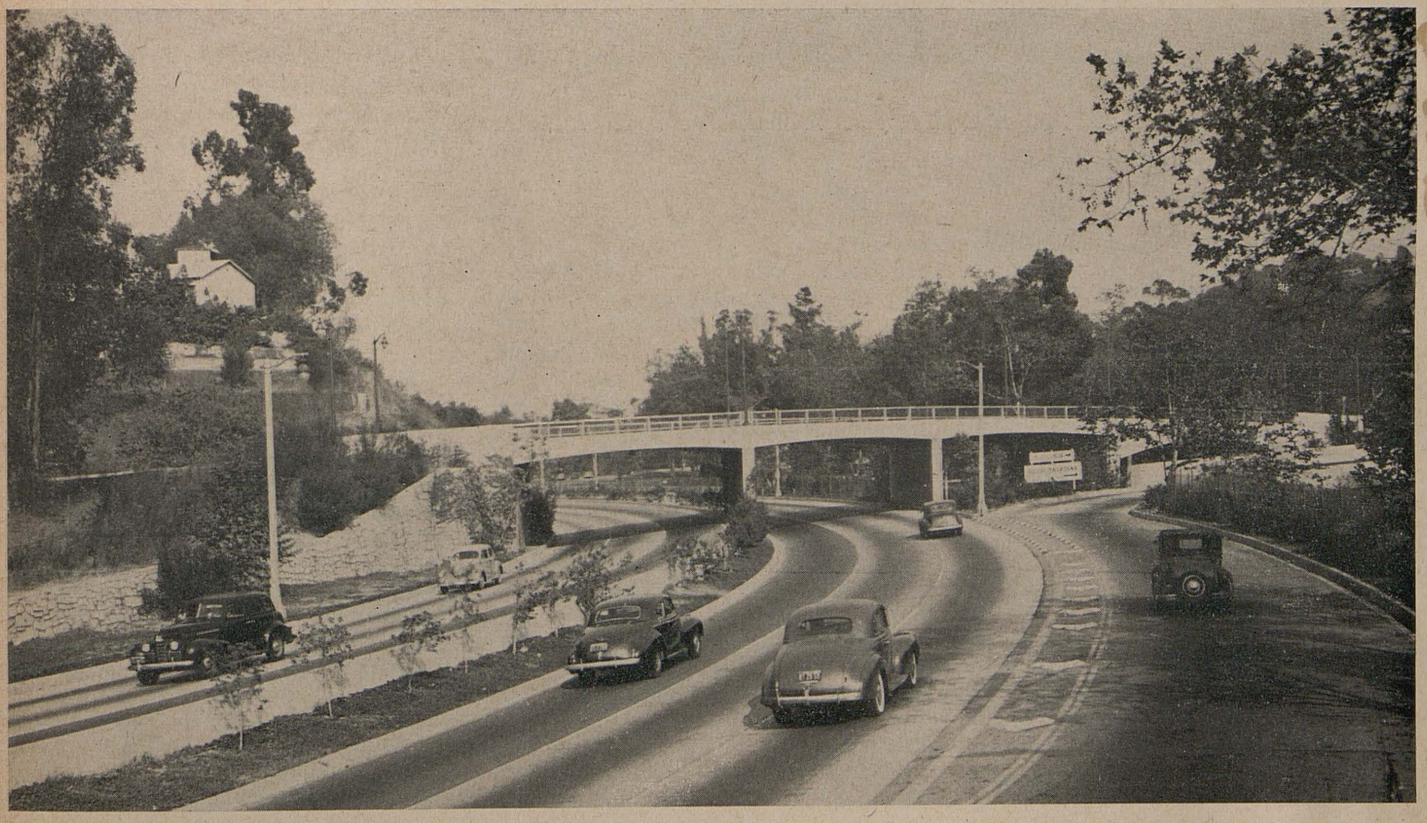
These two photographs show examples of landscaping on Cahuenga Pass Highway. The views are looking northerly, showing the Pilgrimage Bridge, at the south end of Cahuenga Pass Highway, main entrance to the Los Angeles metropolitan area from northern coastal points. The upper picture was taken before and the lower picture after landscaping, which was supervised by the Division of Highways in cooperation with the City of Los Angeles. All plant material was obtained from Los Angeles city parks and municipal nurseries. The lawn in the foreground of the lower photograph was planted with kikuyu grass. The main advantage of this grass is its ability to crowd out Bermuda grass and remain green during the winter months. Unlike Bermuda, it bears no seed and therefore may be confined to any given area. The palm trees were salvaged from another highway project, which was under construction through Elysian Park in Los Angeles.





THESE photographs show another example of landscaping. The views are looking easterly at the Marmion Way bridge over the Arroyo Seco Parkway between Los Angeles and Pasadena.

Due to a very limited right-of-way, the fence and objectionable views from the highway shown in the upper photograph were screened off by the use of native shrubs and various types of vines. The lower picture, taken after planting, illustrates the use of shrubbery to shield headlight glare on a curve.



San Francisco-Oakland Bay Bridge Completes Eight Years of Operation

By HOWARD C. WOOD, Senior Bridge Engineer

THE first eight years of operation of the San Francisco-Oakland Bay Bridge were completed on November 12, 1944, with a record which is outstanding in many respects and is especially noteworthy when viewed in the light of the contribution of this great transportation artery to the prosecution of the war.

Since the date of its opening the bridge has carried 120,156,686 vehicles and collected its share of tolls from 110,655,000 interurban train passengers.

As of November 12, 1944, total revenues approximated $44,800,000.

VEHICULAR TRAFFIC

Beginning with a modest figure of about 25,000 vehicles per day, the use of the bridge increased steadily during the next three years, with a particularly accelerated rise in traffic during 1940.

By the latter part of 1940, the initial effects of America's defense preparations were beginning to be felt. The rapid pace of these preparations continued to increase, especially in industrial centers like the San Francisco Bay Region, and highway traffic generally reflected this expansion.

Bay Bridge traffic reached a peak during the autumn of 1942 when for several months the daily average number of vehicular crossings exceeded 60,000. With the extension of gasoline rationing to the Pacific Coast in December, 1942, bridge traffic suffered a sharp drop. In December, 1942, and January, 1943, the daily averages were 43,637 and 45,871 vehicles, respectively. However, traffic volume on the bridge has gradually risen since that time, reaching an average of about 53,000 vehicles per day during recent months.

In the war years the increase in heavy trucking and in bus passenger traffic has been very pronounced, reflecting the expansion of war production activities as well as the curtailment in the use of private passenger automobiles.

In spite of the continued large volume of traffic, the Bay Bridge accident record has remained low.

INTERURBAN TRAIN TRAFFIC

On January 15, 1939, interurban train service across the bridge was inaugurated. During the first two years of operation, these trains carried an average of between 50,000 and 56,000 passengers per day. As a result of the abandonment of service over certain lines, a low point was reached during the latter part of 1941 with an average of about 32,000 passengers per day. However, with the increase in the tempo of the war industries and the effects of the gasoline and tire shortage, the travel on the interurban trains increased at a high rate during 1942, reaching an average of more than 58,000 passengers per day at the end of the year. For the year 1943, the average was almost 59,000. During 1944 there has been another pronounced rise, reaching an average of almost 70,000 passengers per day in September.

FINANCING

The bridge was originally financed by the sale of revenue bonds in the total amount of $73,000,000 to the Reconstruction Finance Corporation. In addition, an allotment of $6,600,000 was granted from the State Highway Fund to be used for the construction of the bridge approaches, subject to the requirement that after the redemption of all revenue bonds, this amount would be refunded to the Highway Fund out of toll collections. In 1939 a refinancing was effected and a new issue of 4 per cent bonds in principal amount of $71,000,000 was sold to a syndicate of investment houses. The specified redemption date of the last of these bonds was 1976.

The large volume of bridge traffic and the consequent increase in income, coupled with changed conditions in the securities market, made it advisable in the early part of this year to consider another refinancing of the debt. After careful consideration of all factors, this was accomplished by action of the California Toll Bridge Authority through the sale on May 22, 1944, of $56,000,000 principal amount of revenue bonds at an average interest rate to maturity of 1.96613 per cent, effecting a saving of $5,097,000 in interest costs (California Highways and Public Works, May-June, 1944).

Under the new bond issue, the last redemption date is September 1, 1962. However, should revenues continue at the 1942-1943-1944 level (approximately $6,000,000 annually) all outstanding bonds will have been retired by 1955.

In addition to making it possible to advance the date on which the bridge bonds will be redeemed, the large traffic volume has also resulted in a series of reductions of automobile tolls from the initial rate of 65 cents per car to the present 25 cents per car, with corresponding reductions in most other vehicle classifications.

BRIDGE MAINTENANCE AND OPERATION

The problems of maintenance and operation have been greatly aggravated by the acute manpower shortage.

In the toll collection department the serious situation has been relieved in part by the employment of women as collectors. However, there is still a large turnover and on many occasions a shortage of qualified personnel exists.

The painting and other maintenance forces have been unavoidably reduced; however, it has been possible to maintain the minimum crew necessary to prevent the occurrence of permanent damage to the structure through excessive paint deterioration or other causes.

The emergency service crew, which handles the operation of the fire engine and the tow trucks, is likewise short-handed. However, by careful assignment and by "streamlining" some of its operations, this crew has been able to maintain a high efficiency in its work of keeping the bridge decks clear of stalled vehicles.

(Continued on page 28)

Origin of Sections, Townships and Ranges Goes Back to Colonial Days

(Continued from page 5)

sulted in confusion and litigation. But it was only natural that such a system as the one last described, should exist in the South, where there were large plantations, slave labor, and a mild climate favoring the extension and scattering of settlements over the coast lands, while in the inland country, the system enabled the pioneers to locate good lands along the streams, rivers and lakes. Some Virginia statesmen, notably Thomas Jefferson, had urged that the New England System be adopted in the disposal of the Virginia State lands, but without success.

Thus, we see that, prior to the Revolution, no uniform system of land arrangement had been worked out. The union of the 13 colonies was very weak, and precluded any grant of power over lands to a central legislature. Then, too, before the Revolution, the idea of National lands outside the State, had not yet developed.

REVOLUTION

Then came the Revolution, with its consequent victory for the colonies. The first result of the victory was for the patriots to claim as much territory as possible for the new Government. Six of the colonies had sea-to-sea claims, based on ancient charters. These were Massachusetts, Connecticut, Virginia, North Carolina, South Carolina, and Georgia. But the other States had no charter claims to the lands west of the Alleghenies, and were restricted to definite boundaries.

Inevitably, a controversy arose. Did the lands beyond the Alleghenies belong to the States under their charters, or to the United States, as a result of the successful Revolution? The States with definite boundaries, headed by Maryland, argued that while the western lands should as against England be considered as a part of the States, the Continental Congress should limit the boundaries of the great States, and erect new colonies. The upshot of this state of affairs was, that the smaller States refused to ratify the Articles of Confederation until these disputed lands were ceded to the Nation for the common good.

New York and Virginia agreed to cede their lands in 1780 and 1781, whereupon Maryland ratified the Articles of Confederation. Between 1782 and 1807, the seven claimant States ceded their lands, creating a public domain for the benefit of the central Government. These lands covered all the territory between the Alleghenies and the Mississippi, with the exception of Kentucky, which was reserved by Virginia, and the Connecticut Reserve in Ohio. All lands thus ceded, not covered by the above reservations, or reserved as bounties by Congress to the Continental Army, were to be considered as a "common fund for the use and benefit of such of the United States as have become, or shall become members of the Confederation—and shall be faithfully and bona fide disposed of for that purpose, and for no other use or purpose whatsoever."

CONGRESS ASSUMES POWER

The Articles of Confederation conferred no power on Congress to accept or govern any common lands, but Congress assumed that power. Here we have a vast public domain under the control and disposition of the Continental Congress, making possible a plan for a National system of plotting public lands. The natural outcome of this situation was a lively discussion, as to the policy of controlling and disposing of this land. At those times these lands were considered primarily to be used as a producer of revenue, and the actual value of the land was greatly exaggerated. The public and Congress looked upon these western lands as valuable assets that should be carefully managed.

EARLY PLANS

Early in 1781, one Pelatiah Webster, proposed a system for the sale of these public lands which was highly suggestive. He proposed that the land should be surveyed into townships of six, eight, or ten miles square. Webster also provided that the land should be sold at public auction in whole townships to the highest bidder; the minimum price was to be one Spanish dollar per acre; purchasers should be obliged to settle and improve the land within two or three years, or forfeit the same; and lastly, the townships should be laid in courses or tiers, and only when one tier was settled should the next one be placed on sale. He also provided that salt licks, coal and mineral lands should be reserved for the public use.

Webster's plan had several merits. It tended to push out settlements in close columns, easily defended from the enemy; laws and customs could be easily extended; and the absentee proprietor could not profit by the hardship and labor of the pioneer.

Between 1781 and 1784, when the first Congressional land committee reported, the western lands were several times before the attention of Congress. When Connecticut offered to cede her lands in 1780, she insisted that the township system be extended over the land ceded by that State. This system of disposition was accepted by the committee which reported on the cessions of New York, Virginia, and Connecticut. No action was taken on this report by Congress.

THE "ARMY PLAN"

Early in 1783, 283 Army officers proposed to establish a new State northwest of the Ohio. They petitioned Congress for satisfaction in that region, of the bounty offers of Congress. Their plan advocated the township system; and conditions of settlement and cultivation were to be attached to each grant of land by Congress, with penalties for noncompliance. This was known as the "Army Plan."

On June 5, 1783, Bland of Virginia, made a proposal, seconded by Hamilton, that the territory to be set aside for accounts due the soldiers, should be laid off in districts not exceeding two degrees of latitude, and three degrees of longitude each; and into townships not exceeding ---- miles square. Out of every 100,000 acres granted to the soldiers, 10,000 acres were to be reserved as common property of the United States. This was known as the "Financier's Plan." It can be readily seen that both of these plans insisted on the township system; but the "Army Plan" provided that unappropriated land was to belong to the State, would be used for local needs, and there would be no ownership of land by the Nation; while in the later plan the National domain was created.

WASHINGTON APPROVES PLAN

The Army Plan was delivered on June 16, 1783, to General Washington,

(Continued on next page)

Early Origin of Townships, Ranges and Sections

(Continued from preceding page)

and on the following day was forwarded by him to Congress. A letter from Rufus Putnam (Chief of Engineers of the Continental Army) to Washington, accompanied the petition by the Army officers. This letter stated that the officers wished the grants to be made by townships six square, or six by twelve, or six by eighteen, to be subdivided by the proprietors to six miles square, "that being the standard on which they wish all calculations to be made."

Washington approved this plan heartily, and wrote to Congress that this plan of colonization "would connect our Government with the frontiers; extend our settlements progressively, and plant a brave people as our advance post." Washington also urged the matter in person while Congress sat at Princeton. Congress, however, pleaded the incomplete cession of lands, and finally, on October 29th, stated that at that time it could not make any appropriation of land.

The second installment will appear in the next issue of California Highways and Public Works.

Bay Bridge Completes Eight Years of Operation

(Continued from page 26)

At the present time, 71 employees of the bridge operation and maintenance staff are serving in the armed forces of the United States.

RELATION TO WAR EFFORT

It is probably unnecessary to mention the importance of the Bay Bridge in connection with the war effort. Although it can never be accurately appraised, its contribution to the war is recognized and appreciated by Army and Navy officials as well as by the average citizen. Possibly its importance can be visualized by imagining the handicaps which would have been suffered by the local war industries, and therefore in the Nation's war effort, if the bridge had not been available in this time of crisis.

After the war is over and victory won, the Bay Bridge will continue to serve its peace-time function of providing an economic and cultural life line between the metropolitan areas on both sides of San Francisco Bay and contributing to the general welfare of California's citizens.

Highway Bids and Contract Awards

October 1944

CALAVERAS COUNTY—Between Sandy Gulch Mill Pond and J. P. Lodge Road, about 7 miles to be surfaced with imported base material. District X, Blue Mountain Road. George French, Jr., Stockton, $49,000; R. A. Westbrook, Sacramento, $55,100; M. J. Ruddy & Son, Modesto, $56,950; J. P. Breen, Sacramento, $65,450. Contract awarded to H. Sykes, Patterson, $47,650.

HUMBOLDT COUNTY—At Benbow, a distance of about 0.1 mile, a slide area to be stabilized. District I, Route 1, Section A. Frank E. Young, Berkeley, $76,342; Scheumann & Johnson, Seattle, $80,186; C. M. Syar, Vallejo, $82,232; R. A. Farish, San Francisco, $89,043; J. Henry Harris, Berkeley, $89,986; Guerin Bros., San Francisco, $97,226; N. M. Ball Sons, Berkeley, $118,888. Contract awarded to E. B. Bishop, Orland, $69,673.

HUMBOLDT COUNTY—Between 1.5 miles east of Route 1 and Route 20, about 0.9 mile, to be graded and surfaced with imported base material. District I, Route 85, Section A. Guerin Bros., South San Francisco, $29,925; N. M. Ball Sons, Berkeley, $30,585; Scheumann & Johnson, Seattle, Washington, $33,855. Contract awarded to E. B. Bishop, Orland, $26,090.

KERN COUNTY—Between North Reservation Gate and Muroc School, about 1.0 mile to be graded, surfaced with imported surfacing material and bituminous surface treatment applied. District IX. Oswald Bros., Los Angeles, $49,408; Phoenix Construction Co., Bakersfield, $52,495; R. A. Farish, San Francisco, $55,212. Contract awarded to R. W. Hampton Co. Inc., Los Angeles, $44,359.

LASSEN COUNTY—Repairing a surfaced area with roadmixed bituminous material. District II, Honey Lake. Contract awarded to Harms Bros., Sacramento, $15,773.

MARIN COUNTY—Across Richardson Bay at Manzanita and Corte Madera Creek at Greenbrae, the bridge decks on the movable spans to be removed and replaced with steel flooring. District IV, Route 1, Section C. James H. McFarland, San Francisco, $19,970; Freethy-Kimball Company, San Francisco, $21,950; Kiss Crane Co., San Pablo, $33,394; Peter Sorensen, Redwood City, $31,083. Contract awarded to Fred D. Kyle, Los Angeles, $19,533.

ORANGE COUNTY—At Carbon Canyon Creek, a net length of about 0.2 mile, an existing timber bridge with concrete deck to be raised to new grade, approaches to be graded, plant-mixed surfacing to be placed, and bituminous surface treatment to be applied. District VII, Route 175, Section B. Contract awarded to Norman I. Fadel, North Hollywood, $23,552.

RIVERSIDE COUNTY—Plant-mixed surfacing between junction Route 26 and Palm Springs. District VIII, Route 187, Section D. Contract awarded to George A. Herz & Associates, San Bernardino, $6,270.

SAN BERNARDINO COUNTY—On Tippecanoe Avenue between Third Street and Base Line road, about 1.2 miles to be graded and surfaced with plant-mixed surfacing. District VIII. E. L. Yeager, Riverside, $35,992; Olympic Contracting Co., Los Angeles, $51,191; Griffith Co., Los Angeles, $57,340. Contract awarded to Geo. Herz & Co., San Bernardino, $34,651.

SAN BERNARDINO COUNTY—North of Blue Cut, between Devore and Alray, about ½ mile of creek channel to be constructed. District VIII, Route 31, Section B. L. S. Hutchinson Co., Los Angeles, $16,180; C. G. Willis & Sons, Los Angeles, $16,840; Ralph A. Bell, Sierra Madre, $17,630; Owl Truck & Construction Co., Compton, $17,760; Norman I. Fadel, North Hollywood, $35,400; J. E. Roberts, San Bernardino, $41,732; Egglestone & Root, San Bernardino, $53,600. Contract awarded to Mittry Bros. Construction Co., Los Angeles, $15,760.

SAN BERNARDINO COUNTY—Between Riverside County line and State Route 58, about 53.5 miles to be repaired by placing road-mixed surfacing over portions of the existing surface and applying seal coat to existing and new surfacing. District VIII, Route 146, Sections A, B, C, D. C. R. Herring Co., Los Angeles, $44,120; R. R. Hensler, Glendale, $45,477. Contract awarded to Carson Frazzini, Tonopah, Nevada, $42,331.

VENTURA COUNTY—Between Moorpark and Chatsworth, about 0.1 mile embankments to be restored, portland cement concrete pavements to be constructed, plant-mixed surfacing to be placed, and heavy stone riprap to be placed. District VII, Route 9, Sections B, C. Nathan A. Moore, Alhambra, $26,025. Contract awarded to Norman I. Fadel, North Hollywood, $15,057.

November 1944

LOS ANGELES AND VENTURA COUNTIES—At Las Flores and Big Sycamore maintenance stations, maintenance station buildings to be painted. District VII, Route 60, Sections A,A. Contract awarded to David Wein, Los Angeles, $2,080.

TULARE COUNTY—At Southern Pacific Railroad Crossing (Sharpe's Crossing) about 8 miles north of Visalia, a floodlight system to be furnished and installed. District VI, Route 132, Section B. Scott-Buttner Electric Co., Oakland, $1,496. Contract awarded to California Lead Cable Splicing Co., Los Angeles, $700.

SAN JOAQUIN COUNTY—Between Stockton and Rough and Ready Island, about 2.4 miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Louis Biasotti & Son, Stockton, $78,020; M. J. B. Construction Co., Stockton, $81,432; Elmer J. Warner, Stockton, $83,569; Claude C. Wood, Lodi, $102,745; R. A. Farish, San Francisco, $106,012. Contract awarded to Geo. French, Jr., Stockton, $75,253.

SAN FRANCISCO CITY AND COUNTY—On Hunters Point Boulevard, Innes Avenue and Donahue Street, about 0.7 mile to be graded and paved with asphalt concrete pavement on crusher run base and on existing pavement. District IV. Chas. L. Harney, San Francisco, $49,822; Eaton & Smith, San Francisco, $56,247; A. G. Raisch Co., San Francisco, $58,400; Peter Sorenson, Redwood City, $69,229. Contract awarded to Fay Improvement Company, San Francisco, $44,369.

Doc: "Have you told Mr. Brown that he's the father of twins?"

Nurse: "Not yet. He's shaving."

State of California

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