

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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War Will Continue to Present Many Problems to Public Works Department During Year 1945

UNLESS the war comes to an abrupt conclusion, the Department of Public Works, in looking forward through 1945, must of necessity anticipate the same wartime problems which now confront it.

The Department of Public Works embraces the Division of Highways, Division of Architecture, and Division of Water Resources. These three agencies now are engaged in extensive postwar planning in conformity with the wishes of Governor Earl Warren. There will be a continuation of this work.

The war has created the major problems which have plagued the Department since Pearl Harbor. Drastic restrictions on new highway construction and also on the Governor's public building program have curtailed activities and the Department can not with any degree of confidence expect that these restrictions will be lifted during 1945.

The Division of Highways will have to confine itself to the maintenance of our highway system and to such new construction as may be desired by the Federal Government. The Division of Architecture will be limited to the preparation of plans for postwar building and construction or improvement of institutional structures which receive Federal Government approval for the use of critical materials.

The manpower shortage and the tremendous job of maintaining deteriorating roads and bridges are two of the problems which no doubt will continue to confront the Division of Highways during 1945. These, however, will not be permitted to interfere with postwar planning, which involves the preparation of plans and surveys and the acquisition of rights of way for an \$80,000,000 highway construction program that will be ready for launching when war ends.

It is estimated approximately \$19,000,000 will be available as of June 30, 1945, for postwar highway construction. In addition, it is estimated that about \$15,500,000 will accumulate between July 1, 1945 and June 30, 1947, for construction purposes.

Time Now to Reappraise Entire Highway System

"The last general reappraisal of our highway system was in 1927. Since then our population has increased 66 per cent, our automobile registrations have doubled. The size and numbers of trucking and other commercial vehicles have increased enormously. The heavy flow of war materials is accelerating obsolescence.

"At your last session we appropriated 12 million dollars for plans, specifications, and rights of way, and before this session ends, preparations will have been completed for an 80 million dollar program of improvements.

This is progress.

But it would seem that this is the time for the Legislature to reappraise the entire system and make certain we are planning soundly for the future."

Excerpt from Governor Warren's Message to the Legislature.



Entrance to Public Works Building, Sacramento

Budget allocations by the California Highway Commission for the 1945-1947 biennium are based on estimated revenues of \$68,000,000 for the biennial period. The commission already has designated 116 postwar projects which can be undertaken when peace comes.

Motor transport, which is vitally essential to the entire economy of California, depends for its existence on good highways and is of such economic importance to our State that to permit its destruction would bring disaster, while to improve it is imperative for the proper development and expansion of California's vast economic resources. Hence the necessity for the postwar planning program of the Division of Highways.

The Division of Architecture will, during 1945, continue the planning of new mental institutions, college buildings, correctional institutions, office buildings, State veterans' hospital expansions, and other State buildings, and will also continue the preparation of a wide program of reconditioning and repair to existing buildings.

The emergency repair and replacement of deteriorating buildings and equipment has been during the past year, and will continue to be during 1945, a major problem of both manpower and materials.

The money to pay for the postwar building program has accumulated in the treasury for this purpose as a result of the sound tax and fiscal policy of Governor Warren.

Some \$72,000,000 of the funds accumulated and earmarked are for State buildings and of this sum \$33,000,000 have been authorized by the Department of Finance and the State Board of Control. The completion of the planning of this postwar construction will be the major project of the Division of Architecture during 1945.

The Division of Water Resources will continue through 1945 as it has done for many years, its cooperative work with the Federal Government in connection with the Central Valley Project and the State Water Plan.

District VII Builds 22 Access Roads as Part of Its War Effort

By S. V. CORTELYOU, District Engineer

DECEMBER 7, 1941, found District VII with a fairly large program of construction work under contract and in a relatively short period after this date 54 engineers of varying grades left the district staff for the armed services of the United States.

At this time we were asked to undertake the construction of two flight strips, one in Ventura County and one in the metropolitan area. Due to Army requirements of approach clearances to these flight strips their location was a difficult problem. However, it was found possible to locate one not far from San Pedro in an extremely strategic position, yet on land which was not occupied by any improvements. It is assumed that the veil of censorship is not yet entirely lifted from this work; so no description of the size of the flight strips nor their exact location will be given.

HEAVY EXCAVATION

The flight strip in Los Angeles County involved the moving of 174,227 cubic yards of roadway excavation and the importation of 193,703 cubic yards of select material. The runway on this strip was given a base of cement-treated imported borrow with a plant mixed surface. This flight strip has been in constant use since its completion and has successfully carried far heavier wheel loads than were called for in the design.

The flight strip located in Ventura County was also located upon land on which there were no improvements although some walnut trees had to be removed to provide the required approach clearances. This flight strip involved 44,269 cubic yards of roadway excavation and the importation of 215,241 cubic yards of selected material. The base for the runway on this strip was composed of bituminous

treated selected material. The runway was surfaced with plant mix. This flight strip also has been in almost continuous use as a training field.

The aggregate cost of these two flight strips was \$683,000.

TWENTY-TWO ACCESS ROADS

The district has also been called upon to construct 22 access road projects, with a combined length of 36 miles, at a total cost of \$1,408,000.

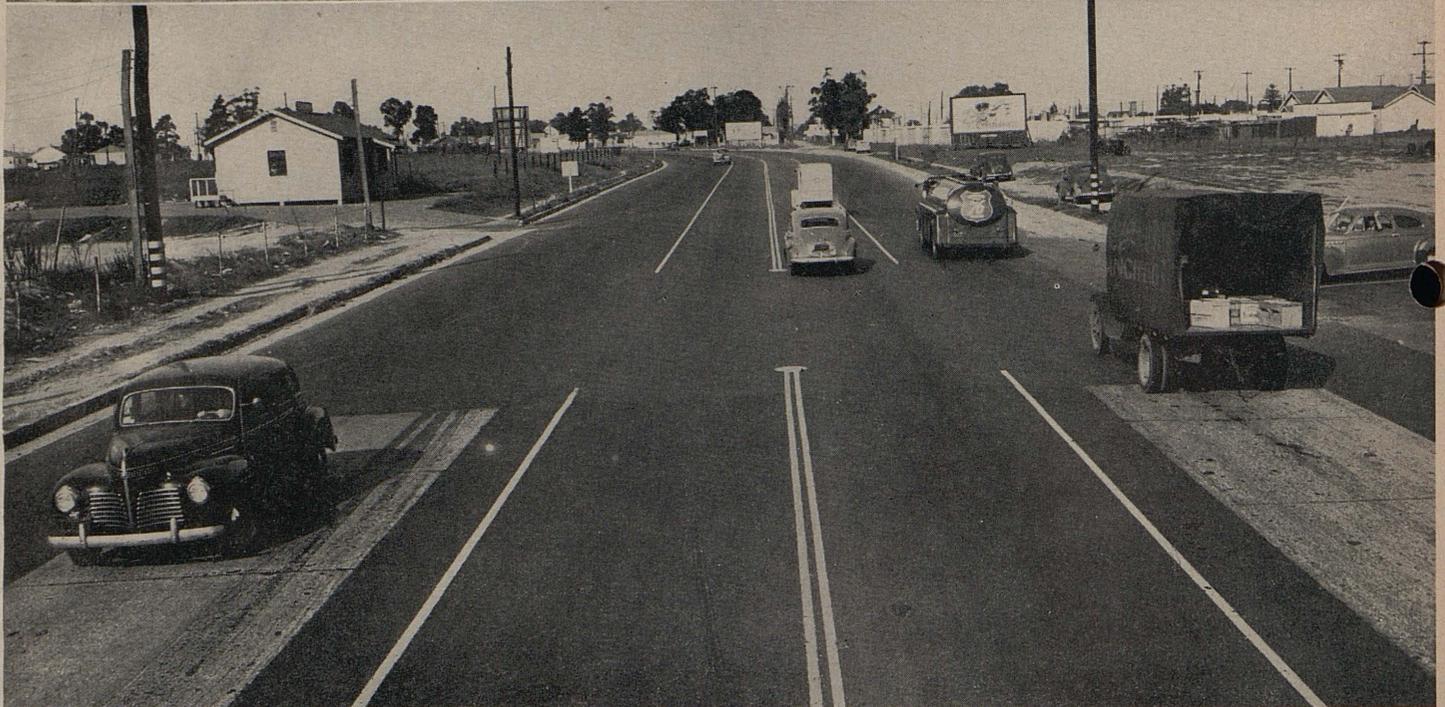
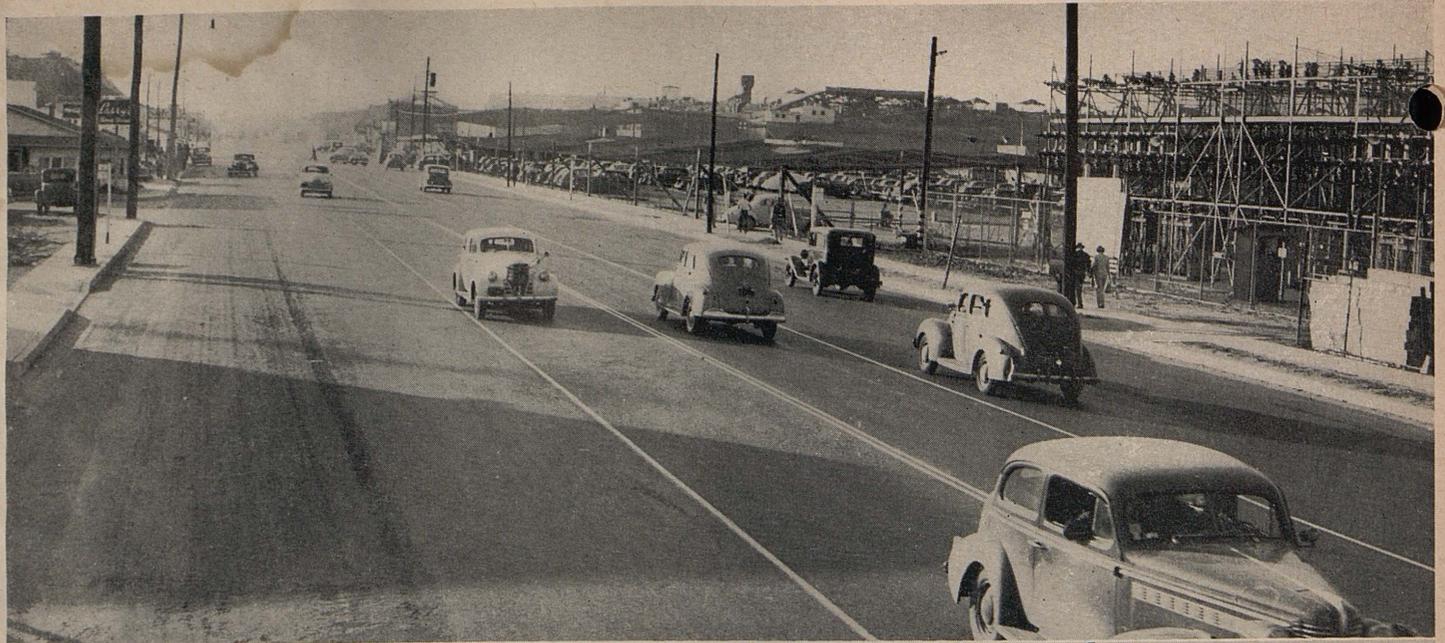
These are about evenly divided between war plants and military establishments. The Public Roads Administration engineers have kept in mind at all times their formula that access roads should be designed on a standard which would make them just sufficient to carry the wartime traffic. With this requirement to consider, the bulk of the access road construction in this district has been plant-mixed surfacing on a crusher run base, the plan

Looking easterly on Kenmere near Lincoln in Burbank, Los Angeles County, after improvement





Upper—This view was taken at Kenmere, looking northerly on Buena Vista in Burbank. Center—View looking southerly on Buena Vista south of Kenmere in Burbank. Lower—Imperial Highway looking east from Sepulveda Boulevard. Los Angeles Municipal Airport is on the left.



Upper—View of improved Imperial Highway looking east from Isis Avenue. Lower—Figueroa Street looking north from C Street in Wilmington, Los Angeles County

mixed surfacing being in general three inches thick and the crusher run base varying in thickness, depending on the bearing value of the native soil underneath.

This type of construction has proved very satisfactory for the war period as it requires a minimum of hand work and it has been found possible to obtain a fairly good job without many experienced workmen. So far it has proven adequate for the traffic for

which it was designed. Another advantage of this type of construction is that it takes much less elapsed time for its completion and, therefore, lessens the period of tie-up of the road in the very vital traffic areas in which these roads have been constructed.

NECESSARY DELAYS

In spite of the simple type of construction which has been applied to the bulk of these access roads, the period

which has had to elapse between the certifying of one of these roads for construction by the Public Roads Administration and the time the project could be let to contract has been considerable. One of the reasons is that in many cases new rights of way had to be obtained. In addition, the projects were almost all inside city limits and the improvement had to be correlated with the existing city improvements and be approved by city engi-

(Continued on page 32)

Wartime Road Construction in District I

By A. M. NASH, District Engineer

RESTRICTIONS on highway construction, resulting from the National Defense Program, and later by the declaration of war in 1941, made only those projects essential to the war effort eligible for approval for construction. At the same time it was imperative that the strategic highways and their bridges be maintained in a suitable condition to carry military and civilian traffic without hindrance.

As a consequence of these governmental restrictions, highway construction in District I since 1942 has been divided into the following three distinct classes of work:

1. Construction required by the Military for access to their establishments.
2. Construction required to repair strategic highways and protect them from deterioration.
3. Construction necessitated by detouring weak bridges or their replacement with new structures.

ARCATA-EUREKA HIGHWAY

In Class 1 was a project financed by the Federal Government, planned and constructed by the District during 1942 and 1943 at a cost of \$351,669.75 for providing a modern highway from Route 101 at Arcata to the Eureka Section Base on Humboldt Bay. The cost of surveys and plans for this project was provided by Humboldt County.

Primarily, construction of the new highway was to insure a traversable road at all times for the Military due to the failure of the lightly constructed county road which had deteriorated to such an extent from heavy truck hauling that in places the road had become almost impassable. This road had a further important function in that it provided access to the redwood lumber manufacturing town of Samoa, where are located the largest mills on Humboldt Bay.

After the war the highway will also afford easy access to recreational areas comprised of the ocean beaches of the Samoa peninsula as well as to the U. S. Coast Guard facilities located near the tip of the peninsula,



Grading a line change on north bank of Smith River, Del Norte, to by-pass a weak timber bridge

which have been maintained at this location for many years.

NEW ALIGNMENT REQUIRED

Construction involved the grading and surfacing of 3.64 miles of highway on entirely new and modern alignment and grades, to replace about 4.5 miles of failed county road, together with the widening and resurfacing of 5.87 miles of narrow county road, and the grading and surfacing of 1.55 miles of modern highway partly within the limits of the Government Naval Reservation to replace an obsolete and narrow one-way road. In addition to the road work, two new timber bridges were constructed and two widened and strengthened, the longest of these having a length of 491 feet and spanning Mad River Slough at the northerly end of Humboldt Bay.

The major items of work involved 94,848 cubic yards of gravel base, 14,644 tons of aggregate for plant

mixed surfacing, 850 tons of asphalt, and 216 MBM of redwood and fir timber piles for bridge construction. Because of the shortage of reinforcing steel for use in concrete, 4,748 lineal feet of old railroad rail was used for this purpose.

FIFTEEN MAJOR CONTRACTS

Major construction activities in District I since 1942 have been in Class 2, and in part have necessitated the award of 15 contracts for repairing 85.537 miles of highway at a cost of about \$748,250. These 15 contracts have been, in general, for the placing of base reinforcement in the minimum amount for duration traffic requirements, and a wearing surface of bituminous treated aggregate.

This sizable expenditure for highway surface repairs is the result of the unique position occupied by District I in respect to the war effort. Mendocino, Humboldt, and Del Norte counties, comprising the northerly coastal area of the State, and of District I, are the three major redwood timbered areas in the world, with their saw mills, large and small, producing, during 1944, an estimated 2½ million feet of lumber daily. These three counties are also a well-known recreational area traversed from north to south by the famed Redwood Highway along which are many State-owned parks readily accessible to tourists.

TIMBER INDUSTRY

Since 1941 the timber industry has been producing redwood lumber at a capacity limited only to that possible with available labor. Numerous small mills have been erected along the railroads and highways in an endeavor to supply the insatiable demand of war for lumber. The products of these small mills, as well as the old established firms, are cut from logs hauled largely by trucks over the highways from the forests to the mills. After the lumber product has been manufactured, it is either shipped by rail, or by large transport trucks to water transportation for transshipment to all part of the world occupied by the Allied armies. It is estimated that approximately 450

million feet of logs and lumber are hauled yearly over the roads in District I, and this converted to weight represents nearly 1½ billion tons of freight.

This hauling operation of a product recognized as of the highest priority in the war effort, in conjunction with the hauling of materials for use in the construction of defense establishments, caused sections of highways, primarily designed as recreational roads, to develop failures. As these progressed from further heavy hauling, inducing a frequency of load repetition ordinarily associated with industrial areas, it became imperative that repairs of sufficient adequacy be made to last for the duration.

ROAD FAILURES

Two of the 15 contracts awarded for repairs to 14.27 miles of highway at a cost of over \$92,000 were directly the result of heavy truck hauling of materials incidental to construction of airports essential to coastal defense. The Federal Government has recognized a responsibility for this class of failure and claims are pending to secure reimbursement of the State's expenditure for the work accomplished.

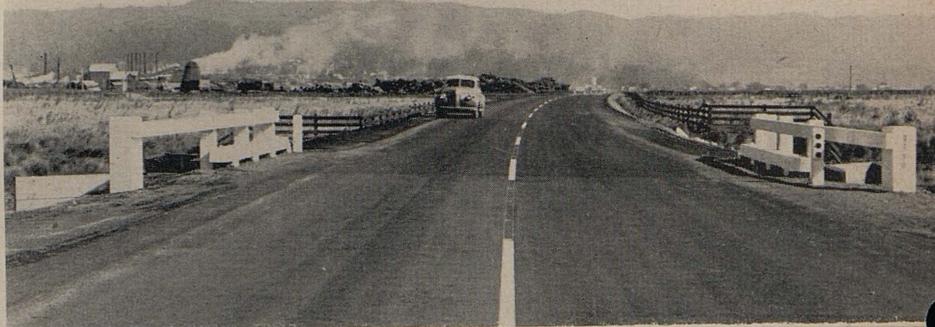
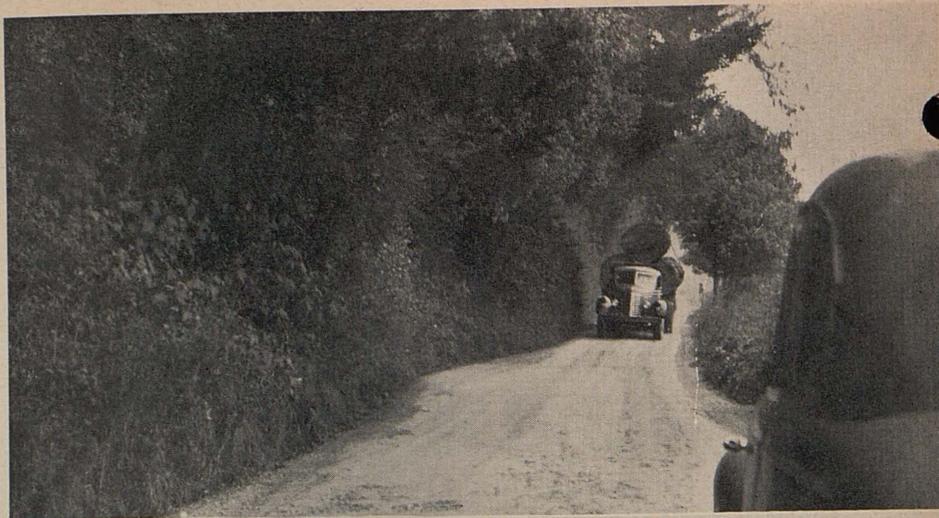
Base reinforcement used on these repair contracts has been, in general, of screened river gravel graded from 2½ inches to dust for the bottom courses, and from 1½ inches to dust for the upper 3 inches. The amount of binder material was purposely kept to the minimum, and bases placed with as little as 3 per cent of 200 mesh material were satisfactorily compacted with little difficulty being experienced in maintaining the base prior to placing of the prime coat.

PROBLEMS MET

One of the disadvantages of the dense graded plant or road mix surfacings in this coastal area of heavy rainfall, has been the tendency of the pavement to become unstable during the summer season following construction. From all indications this is caused by intrusion of moisture into the pavement from the road surface, or from the subgrade through capillary action. Whatever the source, the moisture in or under the pavement is forced to the surface by higher temperature, and this causes an unstable pavement, with the bituminous binder (particularly road oils and cut back asphalts) flushed to the surface.

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[Six]



Upper—Narrow road used as detour around weak bridge on U. S. Route 299 by heavily loaded logging trucks. Center—Type of road obtained by Humboldt County through reconstruction. Lower—This illustrates another type of road obtained by county after improvement.

George Bartlett Award Bestowed Upon C. H. Purcell

DIRECTOR of Public Works C. H. Purcell returned from the annual convention of the American Association of State Highway Officials held this year in Cincinnati, Ohio, with the coveted George S. Bartlett Award.

Mr. Purcell is the 13th recipient of this honor, which is "conferred annually upon some individual who has made an outstanding contribution to highway progress," by a three-member board of award made up of the presidents of the American Association of State Highway Officials, the American Road Builders Association and the Highway Research Board of the National Research Council.

The first award was made in 1931 to Thomas H. MacDonald, Chief of the U. S. Public Roads Administration. No award was bestowed in 1940.

The 1944 Board of Award consisted of Stanton Walker, President, Highway Research Board, Chairman; Samuel C. Hadden, President, American Association of State Highway Officials; Carl Brown, President, American Road Builders Association.

Dr. L. I. Hewes, Chief, Western Region, Public Roads Administration, introduced Mr. Purcell when the award was made. Dr. Hewes said:

"On this occasion of the conferring of the George S. Bartlett Award to Charles H. Purcell, it is my honored privilege to introduce him to the presiding officer.

"This award goes annually to a man who has made outstanding contribution to the advancement of American highways. So it is highly fitting to state briefly some of the achievements which measure his outstanding contributions. You should understand his qualities and his dimensions. He is well known to me, and I wish to emphasize first his persistent loyalty to his profession, his superiors and his subordinates. These qualities have helped him to accomplish unusual objectives.

"Mr. Purcell is a graduate of Nebraska, and also attended Stanford. After some unusual experiences as a young engineer in Wyoming, Nevada, Peru and Oregon, we find him in 1916 as Bridge Engineer for the Columbia River Highway Project.



"On January 1, 1918, I selected him as Bridge Engineer for the Public Roads Administration district at Portland, Oregon, and in 1919 recommended that he become District Engineer there. The district consisted of Oregon, Washington, Idaho, Montana and Alaska. He held this position for 10 years.

"In 1928 he was asked to become State Highway Engineer of California. In 1933, in addition to the State Highway Engineer's duties, he became Chief Engineer of the 75-mil-

lion dollar San Francisco-Oakland Bay Bridge. This seven-mile highway bridge and approaches presented some of the most difficult problems that ever confronted an engineer. It ranks among the most important and successful structures of the world. It now operates as a great express highway with a traffic of 50,000 vehicles daily. Its contribution to our war effort is incalculable.

"After 15 years as State Highway Engineer, during which time he super-

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CALIFORNIA MISSIONS

By KENNETH C. ADAMS, Editor

Mission San Gabriel Arcangel September 8, 1771

RESPONDING to a petition from Father Junipero Serra, Viceroy Carlos Francisco de Croix in the fall of 1770 sent from his Mexican headquarters permission to establish in California the fourth of the Franciscan missions. The new station was to be under the patronage of St. Gabriel, the Arcangel, and Fr. Serra and Captain Pedro Fages, the military commander, decided to locate it near the Rio de Nombre de Jesus de los Temblores (River of Earthquakes), a name given to the Rio de Santa Ana when the Portola expedition of 1769 camped upon the banks of that stream.

This mission, founded on September 8, 1771, and named San Gabriel Arcangel, was near a site that later became the City of Los Angeles, and was to be one of five situated about one day's travel apart north of San Diego.

Two padres, Fr. Pedro Benito Cambon and Fr. Angel Somera, were chosen to build the new mission, later known as "Pride of the Missions"; and on August 6, 1771, with a guard of 10 soldiers, these two marched out of San Diego. In view of the tragic events that came to pass at San Gabriel, due to mistreatment of the Indians by brutal Spanish soldiers, it is interesting to read Father Francisco Palou's account of the founding of the mission as given by Fr. Zephyrin Engelhardt, historian of California missions.

SAVAGES ARE IMPRESSED

"They traveled toward the north," says Father Palou, speaking of the priests and their military escort, "on the road taken by the expedition of 1769. After marching about 40 leagues, they arrived at the Rio de los Temblores. Just as they were deliberating about the choice of a site, a great multitude of savages, armed and headed by two chiefs, appeared and with frightful yells attempted to prevent the founding of the mission.

"Fearful that a battle might ensue and that some might be killed, one of the Fathers produced a canvas picture of Our Lady of Sorrows and put it in view of the savages. No sooner had he done this than all, overcome by the

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 third of the series.

sight of the beautiful image, threw down their bows and arrows. The two chiefs quickly ran up to lay at the feet of the Sovereign Queen as tokens of their greatest esteem the beads they

wore on the neck. By the same action they manifested their desire to be at peace with us. They called upon all the neighboring rancherias who in large numbers flocked together, men, women and children, and came to see the Most Holy Virgin. They also brought seeds, which they left at the feet of the Most Holy Lady, imagining that she would eat like the rest."

Father Palou records that "the sight of the image of our Lady transformed the savages around Mission San Gabriel so that they made frequent visits to the Fathers" and, following the first holy Mass celebrated under the shelter of boughs on September 8th, assisted the padres in building a chapel, buildings and stockade.

INDIANS AND SOLDIERS CLASH

With such an auspicious beginning toward mutual understanding it is a pity that the very soldiers sent to assist the priests should have been the ones to undo the good work done by the missionaries. Just when the Indians were going in large numbers to Mission San Gabriel, one of the soldiers outraged the wife of one of the chiefs and, in an ensuing clash between the natives and armed guards, the chief was killed. For a long time the Indians remained away from the Fathers and it was not until the offending soldier was transferred to Monterey that their confidence in the padres was restored.

This incident, Fr. Engelhardt claims, delayed the founding of Mission San Buenaventura for 12 years, Commandante Fages fearing to send any soldiers from San Gabriel north to assist in establishing another missionary station.

Visiting San Gabriel in September, 1772, Father Serra was delighted to find that a number of Indian children had been baptized, including the small son of the slain chief, but excesses being committed by the soldiers against the natives caused Junipero personally to complain to the Viceroy of Mexico, with the result that the military commander of California was specifically ordered to cease all interference with the padres and their neophytes.

CAPTAIN ANZA ARRIVES

Routine of San Gabriel was interrupted on March 22, 1774, by the ar-



Mission San Gabriel Arcangel turned over to the "Missionary Sons of the Immaculate Heart of Mary" in 1908 and which has been beautifully restored

Ancient grape arbor of Mission San Gabriel Arcangel. Photo by Byron Dome



rival of Captain Juan Bautista Anza and the weary and hungry members of his expedition who, after many hardships, had found their way from Sonora, Mexico, to the mission in carrying out instructions to locate a route from Sonora to Monterey. They crossed the Sierra through San Jacinto Pass. Discovery of this overland way led Viceroy Bucareli the following year to send out a new expedition from Sonora whose purpose was to found a presidio, mission and colony at San Francisco.

For two years Mission San Gabriel occupied itself more or less serenely with its spiritual and temporal work and then in 1776 the establishment was removed to its present location and construction of new buildings undertaken. In 1796 the small chapel was replaced with a larger church which, in turn, in 1800 was superseded by the existing building of stone, mortar and brick. In that year there were 1,078 neophytes at the mission, 1,953 had been baptised, 869 had been buried and 396 couples had been married.

In 1776, Father Serra stopped at the mission on his way from founding



Old Mission bells of San Gabriel. Photo by Byron Dome

the Mission San Juan Capistrano and records disclose that he baptized an Indian child there on December 11th of that year. Two years later, November 4, 1778, Junipero confirmed at the mission for the first time.

NEW TROUBLES

New troubles with the natives began in 1779 when Governor Felipe de Neve, an enemy of the missions, decreed that convert Indians at every mission should annually elect two alcaldes and two regidores or councilmen and vest them with control of the neophytes. Unfitted for self-government, the San Gabriel Indians become insolent to both the priests and soldiers. And then in July and August, 1781, two contingents of soldiers and settlers arrived from Sonora and from then on, throughout the founding of the pueblo of Los Angeles, there were frequent clashes between the padres and the Indians on the one hand and the soldiers and settlers on the other.

At the age of 68 years, Father Serra made a trip from Monterey to San Gabriel in February-March, 1782, to

discuss with Governor Neve the founding of Mission San Buenaventura and Mission Santa Barbara and on his way back north after a second visit in October, 1783, he officiated at 233 confirmations at San Gabriel, bringing the number of persons confirmed there by him to 866. By the year 1790, San Gabriel surpassed all missions in livestock and farm products and was second only to San Antonio in the number of neophytes.

An earthquake in 1804 did considerable damage to the new church and mission buildings, but construction proceeded steadily in spite of more or less continuous disputes between the padres and settlers over mission and Indian lands and increasing maladies to which the Indians fell heir as a result of association with the colonists. An incipient revolt among the natives was quelled in November, 1810.

EARTHQUAKE DOES DAMAGE

The earthquake of December 8, 1812, demolished the church tower and did other damage, but the priests made repairs and continued their building pro-

gram, completing a hospital in 1814. In 1813 the neophyte population was 1,600.

With the aid of the San Gabriel padres and their Indians, the pueblo of Los Angeles was enabled to build the Church of Our Lady of the Angels, which stands today in the center of the city of Los Angeles. It was completed about 1822.

From 1821, when Mexico declared her independence and California became a part of the new republic, San Gabriel suffered as did the other Franciscan missions from oppression by a long line of successive political regimes culminating in secularization and confiscation of the mission in 1834. San Gabriel was especially victimized by Governor Echeandia, who levied upon the mission for many thousands of dollars, provisions and farm products for the soldiery. Governor Micheltona's action in returning San Gabriel to the Franciscans brought only a brief respite to the padres for when Pio Pico became Governor their troubles multiplied. On June 8, 1846, Pico sold the mission to Hugo P. Reid and William Workman. A month later, the American flag was raised in Monterey, too late to save San Gabriel from the destruction wrought by greedy Mexican politicians. President Lincoln returned San Gabriel to the Catholic church in 1865.

Self-sacrificing padres carried on at San Gabriel caring for the few Indians left in the vicinity until 1908, when San Gabriel was turned over to the "Missionary Sons of the Immaculate Heart of Mary," an order that was founded in Spain in 1849. The old mission has been beautifully restored and its activities increased greatly during the last three decades.

Motorists desiring to visit San Gabriel from Los Angeles should proceed from the downtown section of the southern Metropolis out North Broadway to Huntington Drive, keeping on the left hand side of the road which leads into the community of Alhambra. At the eastern limits of Alhambra the visitor should turn right at Mission Road and proceed two blocks to the mission.

San Gabriel also is reached via the Pacific Electric Railway from Los Angeles city points. Directions may be obtained at the Pacific Electric Depot, Sixth and Main Streets. The distance from the heart of downtown Los Angeles to the mission is about 11 miles.

San Fernando Rey de Espana September 8, 1797

THAT zealous padre and devoted friend of Father Junipero Serra, Fr. Juan Crespi appears, in the light of history, to have been gifted with a divine intuition in the matter of unerring judgment in the selection of mission sites. He discovered several of them.

Marching from San Diego to Monterey with Gaspar de Portola's expedition in 1769, Fr. Crespi looked with the eye of a missionary upon the Valley Encino where, on August 5th of that year, Portola camped with his forces. The priest wrote to Father Serra that the site was an excellent one for a Franciscan station.

In August, 1795, Fr. Presidente Fermin Francisco de Lasuen dispatched an exploring party from Mission San Buenaventura with instructions to locate a suitable spot for a mission between that point and Mission San Gabriel, near Los Angeles. This and subsequent parties made exhaustive explorations and recommendations, but in the end it was found that Encino Valley, first come upon by Father Crespi, and named by him Santa Catalina de Bononia de los Eninos, was the best location. And there Father Lasuen decided to build Mission San Fernando Rey.

FATHER LASUEN FOUNDS MISSION

The Fr. Presidente of the California missions was 75 years of age in August, 1797, when, with Sergeant Ignacio Olivera and five soldiers, he set out from Mission Santa Barbara to establish San Fernando Rey, fifth in geographic order of the Franciscan missions on El Camino Real, but seventeenth in sequence of founding.

For clarity and conciseness, Father Lasuen's report to Governor Borica on the establishment of San Fernando Rey is a literary gem. It is in the Santa Barbara Mission Archives and as published by Father Engelhardt, mission historian, is worthy of repetition here. It follows:

"Viva Jesus!

"Senor Governador—My dear Senor: I have the happy satisfaction to communicate to Your Honor that today the solemn feast of the Nativity of Mary Most Holy, on this suitable spot called by the natives Achois Gomihabit, between the Missions of San Buenaventura and San Gabriel, with the assistance of the Rev. Fr.



The arches with their columns of San Fernando's arcade form one of the many beautiful attractions of the mission

Francisco Dumetz, destined for this Mission, of the troops assigned to guard the new establishment, and in the presence of many pagans of both sexes and all ages, who manifested a good deal of pleasure and satisfaction, I blessed the water, the site and a large cross, which we planted and venerated. I concluded the function by solemnly singing the Te Deum. Having finished this, in the same little arbor in which I celebrated the holy Sacrifice of the Mass, I blessed the Baptismal Font and then baptized those offered. Thanks be to God! Thus we took possession of the site by dedicating it in honor of the glorious San Fernando, King of Spain, and in this manner beginning the Mission under that sacred title in

conformity with the orders of His Excellency, Marquis de Branciforte, Viceroy of New Spain, and with those of Your Honor. God our Lord keep Your Honor in His holy Grace many years. Mission San Fernando established September 8, 1797. Fr. Fermin Francisco de Lasuen.—To Col. Com. Don Diego Borica."

INDEFATIGABLE SPIRIT

The unquenchable spirit of Fr. Lasuen is revealed by ancient records which show that in June, 1797, he left Mission San Carlos de Monterey, established the Mission San Jose north of the City of San Jose in what is now Santa Clara County on June 11th; marched to a place about 15 miles east of what now is Watson-



Mission San Fernando Rey de Espana as it looks today to the visitor entering its hallowed precincts

ville and founded the Mission San Juan Bautista on June 24th; turned south and on July 25th on El Camino Real established Mission San Miguel, and then trudged on into the south to found San Fernando on September 8th.

Fr. Lasuen was proud of the fact that he baptized an Indian child on the same day that he created Mission San Fernando and recorded the event in these words: "So on the spot, in the same little arbor in which I had celebrated the Holy Sacrifice of the Mass, I blessed the baptismal water and solemnly baptized Fernando Maria, about four years of age, called in paganism Coyohuoch, son of Mayso and of Chemayo, from the rancharia of Aichoicominga."

It would appear that the first mission church of San Fernando, a small adobe building, was blessed on November 28, 1797, for on that date there appears in the old mission records a notation that the forty-third baptism took place therein, all other baptisms having been solemnized in the "little arbor."

CONSTRUCTION RAPID

Construction of buildings at San Fernando, granaries and abodes for

the priests, Indians and soldiers proceeded rapidly and in 1799 a new church edifice was erected. In 1804, 70 additional adobe houses for the neophytes were built. The number of converts was almost 1,000. The

year 1806 saw the completion of newer and grander church, more granaries, a tannery and other structures. "The Mission of the Valley," as San Fernando Rey was known, was prospering.

This photograph taken more than a decade ago shows old walls of Mission San Fernando before reconstruction. Photo by Byron Dome





Worshippers and tourists alike find the old San Fernando Mission gardens, now a public park, as delightful as this photograph indicates them to be

Visitors to San Fernando Rey are greatly impressed by the unique long building 243 feet in length known as the "House of the Fathers." Old records show reports of progress in its construction beginning in December, 1810, and running to December 31, 1822, on which date Father Francisco Gonzales de Ibarra reported its completion after twelve years labor.

Poor Father Ibarra! The story of his devotion to San Fernando Rey and its Indians is a pathetic one. He saw the mission in its wonderful golden years and during the evil years of its deepest despair preceding its confiscation by Governor Pio Pico.

The revolt of Mexico against Spain starting in 1810 brought misery to San Fernando Rey as well as the other California missions. From 1811

until the end of the missionary period, San Fernando was compelled to support the idle soldiers and their families, furnishing food, clothing and pay. From 1822 to 1827, San Fernando contributed to the Santa Barbara presidio alone supplies amounting to \$21,203.

All money and supplies for the military had to be produced by the Indians of the mission and payment was enforced over the vigorous protests of Father Ibarra.

The Indian converts became virtual slaves of the soldiers and Mexican politicians. The latter, led by Governor Echeandia, coveted the mission lands, which they and their successors finally obtained by theft and fraud.

The earthquake of 1812 caused considerable damage to the mission and buildings, but repairs and reconstruc-

tion were undertaken immediately. In 1819 there were 1,080 neophytes enrolled and in spite of military and political oppression, San Fernando Rey was in a prosperous state.

Preparatory to seizing the missions, Echeandia demanded from Fr. Ibarra in 1827 an inventory of all lands and property and that inventory showed, among other things, that the mission possessed 6,000 head of cattle and 8,000 sheep. In that year, Echeandia announced a plan to make San Fernando Rey a pueblo, emancipate the Indians and designate the missionary in charge as pastor of the natives. He failed in this.

MISSIONS CONFISCATED

Four years later Manuel Victoria was sent to California as Governor and was endeavoring to help the Francis-

(Continued on page 20)

Bridge Maintenance Practice On California Highway System

By MERLE H. GODWIN, Associate Bridge 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 with timber deck systems. 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, of which this is the second. It deals with Repairs and Replacements to Bulkheads and Abutments.

AS stated in the previous article, the total number of timber bridges on the California State Highway System is about 1,500 and these structures represent a replacement value of approximately \$10,000,000 out of a total bridge value of \$125,000,000. About 1,000 of these bridges have timber bulkheads, the rest being mostly of concrete; therefore, some 2,000 timber bulkheads must be maintained.

Assuming an average replacement cost of \$1,000 for each bulkhead, their value would be about \$2,000,000. It is thus evident that the maintenance and replacement of timber bulkheads is a sizeable item. This article covers some of the troubles encountered in this work and the methods employed by the Bridge Maintenance Section in maintaining such portions of a timber structure.

Concrete abutments give very little trouble, that which does occur being chiefly confined to settlement, mostly due to scour. Such trouble is not necessarily peculiar to type of material but may occur in timber construction as well as in other types. Correction of settlement will be covered in a subsequent article to appear shortly.

OLD COUNTY BRIDGES

A considerable portion of the timber construction found on California Highways was inherited from the counties at the time the roads were taken into the State system. The balance was built by the State, some of which is of untreated timber, a type made necessary at a time when funds were limited or a temporary type of construction

was justified. Maintenance of these structures has been heavy, especially for those portions in direct contact with the soil, such as bulkheads. Treated timber has been used where a more permanent type of construction was desired. Such timber has given little trouble and satisfactory results have usually been obtained.

Under different climatic conditions similar types of construction show wide variations in service life or maintenance costs and a type of construction proving economical for one section of the State might not prove so for another. In the damp coastal regions, untreated timber has a short service life, whereas in the drier valley and foothill regions this kind of construction has given fair service.

As noted in the previous article the superstructure is a rather vulnerable part of the bridge, being subjected directly to heavy live load concentration. Bulkheads are also very vulnerable, being exposed not only to the high stresses above noted, but in addition, to the erosive action of the stream and its burden as well as to the troubles developing from contact with the earth. Other and more serious troubles in such portions of a structure are shrinkage, checking, and decay; the latter being especially destructive to timber bulkheads.

IMPACT EFFECTS

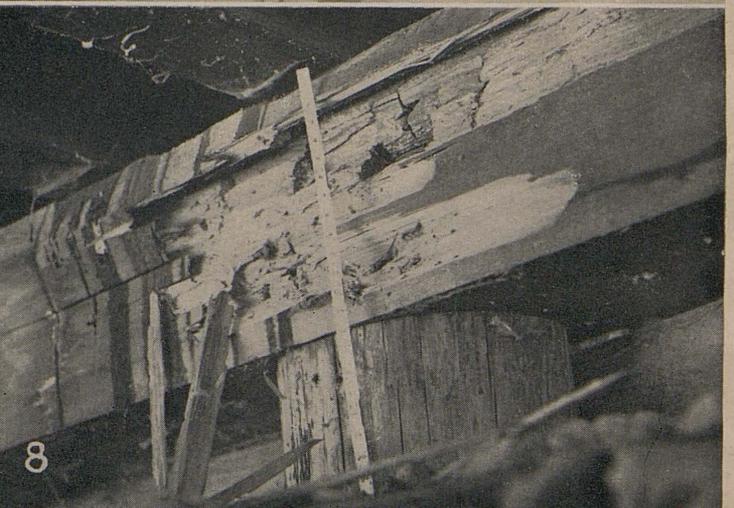
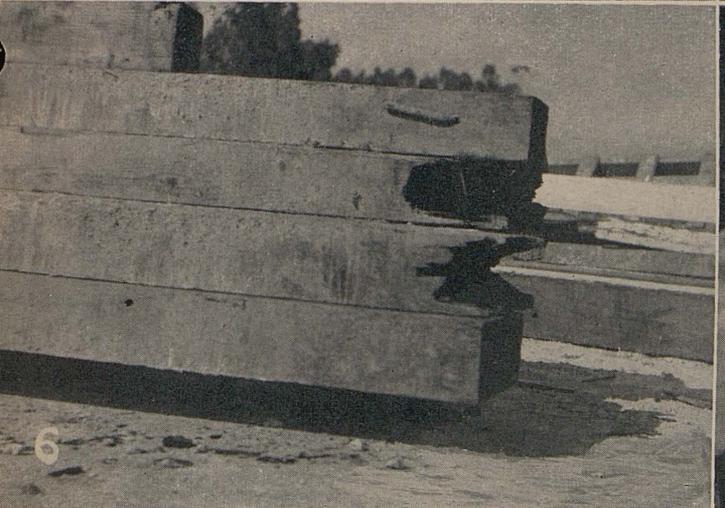
Impact effects are generally made evident by crushing of the caps either between stringers and piles or directly over the pile tops. (Photo No. 1.) If not due to a weakness in design, it is

a result of decay in cap or pile tops. Sealing out the moisture by painting contact surfaces with wood preservative or covering pile tops with an impervious membrane such as treated fabric or sheet metal is effective and prolongs the service life. Sometimes moisture gets into such places because of inadequate design of floor system directly over the caps. Every effort should be made to secure as watertight construction as possible at this location and an impervious sheet (shown in Fig. B) is effective in either stopping or reducing such inroads to reasonable amounts.

Scour damage caused by the erosive action of the stream can be minimized by proper penetration of piling, lowering of the grillage and backwalls to a safe level or by several other protective measures commonly used. Damage due to erosive action working directly on the piling at ground line levels can be corrected or prevented by several methods. Details covering such work will appear in a subsequent article dealing with pile protection and repairs. Decay at this point can only be satisfactorily prevented by the use of treated piles or posts or by replacement using one of the methods shown below.

SHRINKAGE UNAVOIDABLE

Shrinkage in some degree is unavoidable in exposed structures such as timber bridges. Use of solid bridging between stringers and directly over the abutment caps, if placed with grain vertical and cut to length equal to depth of stringer, will cause trouble, since shrinkage in this bridging is



less than in the horizontally grained stringers.

The differential shrinkage will force the flooring upwards, break up the surfacing, and with the admission of moisture, hasten decay. This may be avoided either by cutting vertical grain pieces in lengths shorter than stringer depth, placing the grain horizontally or by using herring-bone bridging. Better still is the use of dowels from stringer to cap as a substitute for bridging. (Fig. D.) Checking of timber in treated or untreated

piles or dimension members admits water and encourages decay. Spraying of checks with a wood preservative may sufficiently improve conditions to justify the cost; however, it is not an entirely satisfactory solution and the condition is one which is difficult to handle.

FUNGI GROWTH

Development of rot requires the presence of decay fungi with suitable conditions of moisture, temperature, and air. The lack of any one of these

three conditions will inhibit decay. Complete control of any one of these in an exposed structure such as a timber bridge is practically impossible. It is possible, however, to limit them sufficiently to secure a fair degree of service. Wood continuously wet or continuously dry (below 20%) will not decay. However, if alternately wet and dry or with moisture content at the right amount (generally somewhat above and near 20%) temperature and air being favorable, decay will be rapid.

Timber in contact with earth is generally exposed to conditions conducive to fungi growth. To prevent or limit this growth, such timber should be protected as much as possible from changes in moisture content. This protection can be furnished in some degree by using proper construction methods. Once decay has started, repairs or replacements as indicated herein are eventually required.

Contact surfaces are locations which are favorable to the collection of moisture and encourage growth of fungi. They are thus vulnerable locations and weak points in timber bridge construction if proper steps are not taken to protect them in all ways possible.

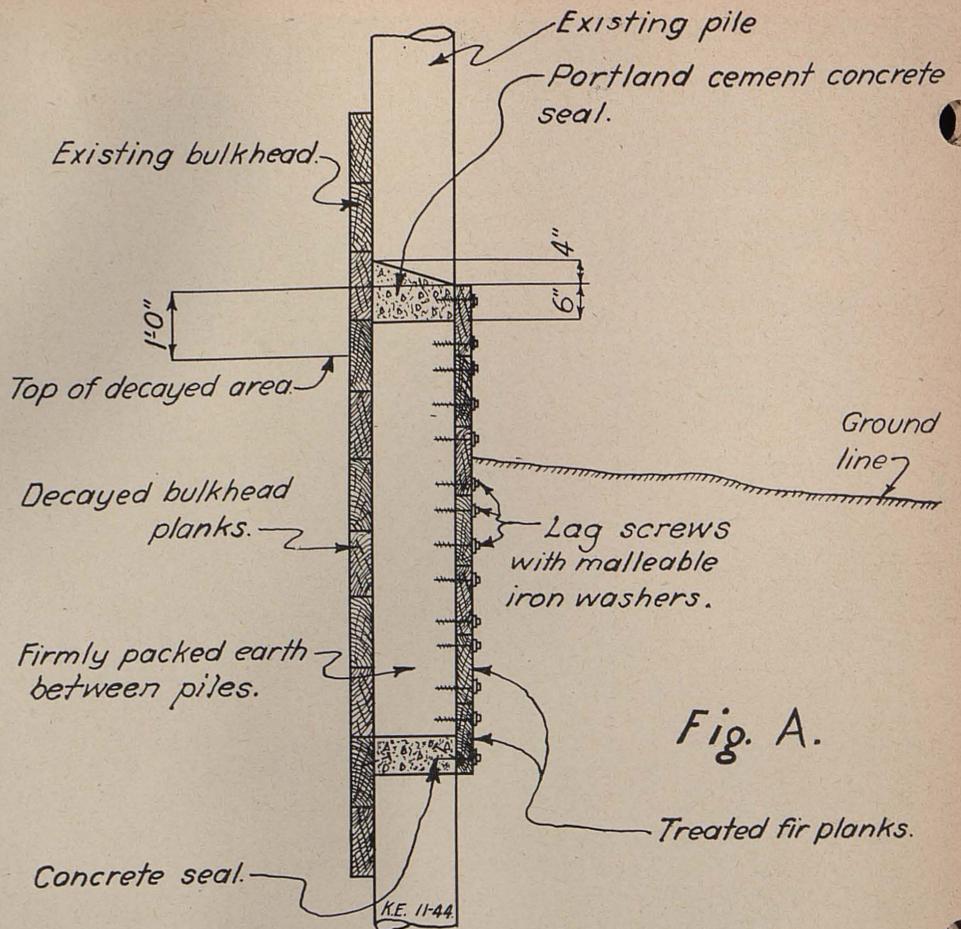
In timber bulkheads such surfaces are found between the following members: (1) bulkhead planks and approach fill, (2) stringers and flooring, (3) stringer ends and bulkhead planks, (4) stringers and top of caps, (5) top of piles or posts and caps, (6) caps and bulkhead planks, (7) piles or posts and bulkhead planks. Correction of trouble due to decay at these locations is often difficult and expensive. Photos 1, 2, 3, and 4 show several such surfaces where decay has developed, and figures A, B, C, and D show several methods employed in correcting these troubles.

PROPER DESIGN REQUIRED

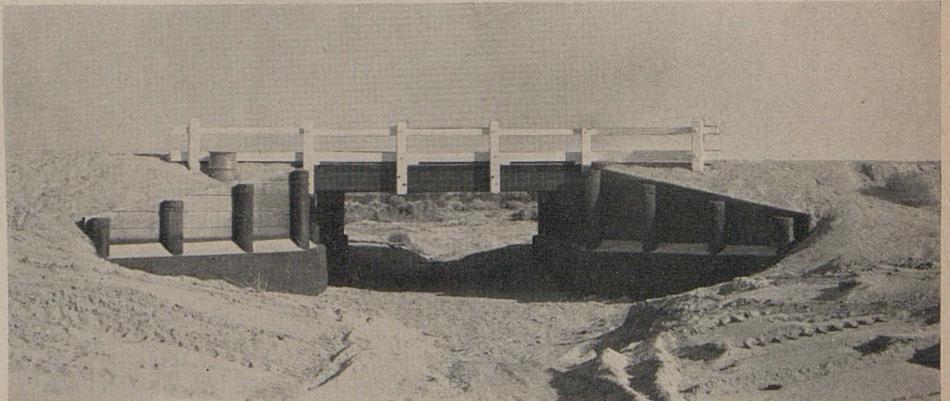
Much of this trouble can be eliminated or reduced in the original construction by proper design. Painting of all contact surfaces with two coats of wood preservative seals out the moisture to a large extent and yields increased life at small cost. Complete painting of all sides of a timber member without definite knowledge of moisture content may do more harm than good. If moisture content is favorable to fungi growth, sealing will accelerate this growth and decay will progress more rapidly than would have been the case had no paint been used at all.

Bulkhead planks, if untreated, can be effectively and cheaply protected by placing building paper between them and the approach fills. Generally, two layers of paper should be used and each layer should be well brushed with an application of tar or asphalt. Treated timber in this location gives satisfactory service.

Weakness due to decay in bulkhead planks of an existing structure can be corrected by the method shown in Fig. A. (Photo No. 5.) After excavating to the desired depth treated planks are lagged onto the outer faces



⑤



of existing piles or posts and the space between old and new planks is then filled with sand. This is an effective and economical way of substituting for such decayed planks, especially where a limited life remains in the piling. Cost of such work has run around \$1.00 per square foot of surface area of new planks. Several variations revolving around this general idea have also been used.

DECAY CAUSES LOOSENESS

Decay occurring between stringers and flooring directly over caps will

cause looseness at this point; surfacing fails and with the admission of moisture, decay is rapid. To avoid such conditions, an effective membrane discussed above and shown in Fig B, can be placed. If decay has progressed to a marked degree, more drastic measures must be taken. Conditions permitting, a supplemental timber bent could be constructed in front of the old one, the decomposed sections of stringers cut out and remaining good timber insulated from the earth before back-filling. In such instances, it will always be found worthwhile to remove

the old timber, since such decay in the ends of stringers, if advanced, will result in failure through crushing, (Photo No. 6).

If only a few stringers are involved, replacement with new ones may prove economical. Of course, conditions allowing excess moisture to prevail at these points should be eliminated. More extensive decay may require replacement of all stringers and decking.

REPLACEMENT EXPENSIVE

Stringer replacement is an expensive and troublesome operation and attention to a few simple details will yield worthwhile returns in the form of reduced maintenance. Dirt and other debris is too often allowed to accumulate in and around the stringer and cap supports. It acts as a sponge to retain the moisture and is the direct result of a great deal of expensive repairs that otherwise would not be necessary. Maintenance forces too frequently neglect this condition, where an ounce of prevention in the form of a little elbow grease is certainly worth many pounds of cure.

When it is realized that a small amount of rot in the end of a stringer (Photo No. 6) will completely immo-

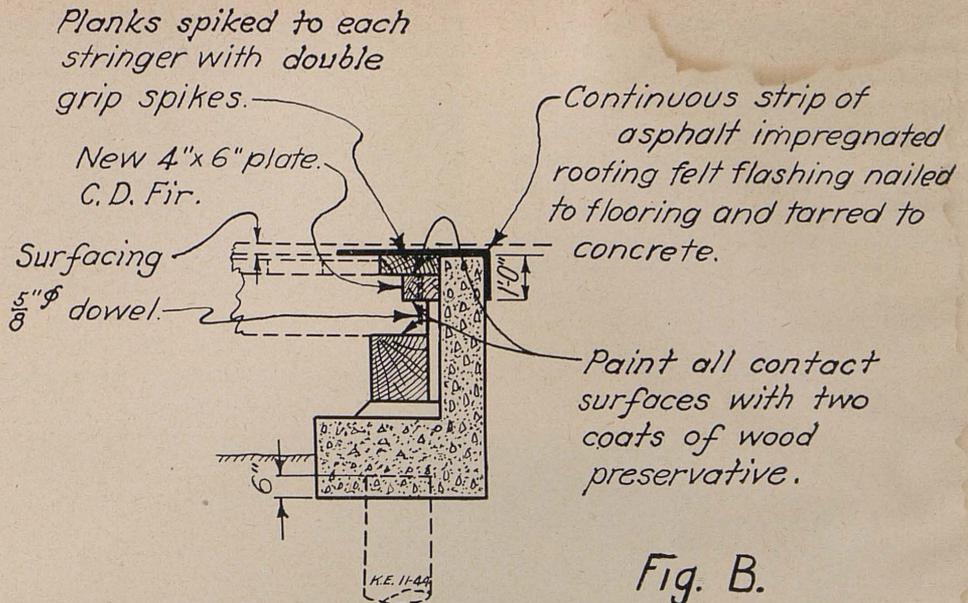


Fig. B.

STRINGER ENDS PROTECTED

Stringer ends should be well protected from moisture and construction should be such as to permit the free circulation of air in and around their ends. Corrugated sheet metal backing is an effective and economical way of providing good detail at this point. (Fig. D and Photo No. 7.) When used, it should be bent over onto the flooring to protect these parts from outside moisture. That portion of the corrugated sheet which is bent over onto the floorings should be flattened out so that no springing action will develop under wheel loads. Such springing can only result in breakup of surfacing with all the consequent damage resulting from such action. Clearance between stringer ends and the back-wall should be provided as shown in several of the figures.

Decay between stringers and top of cap also shows up in the crushing of the stringers and when serious, may require the complete replacing of damaged members or construction of a supplemental bent in front of the bulkhead.

MOISTURE DAMAGING

Ends of timber sticks, such as stringers and caps, are especially susceptible to decay. Moisture must be kept away from these parts and the ends of such sticks should be well treated with wood preservative.

Decay between cap and pile tops is evidenced through crushing of the caps (Photo No. 8). Replacement of cap as well as stubbing of pile tops may be necessary.

When decay is extensive and replacement of the entire bulkhead is neces-

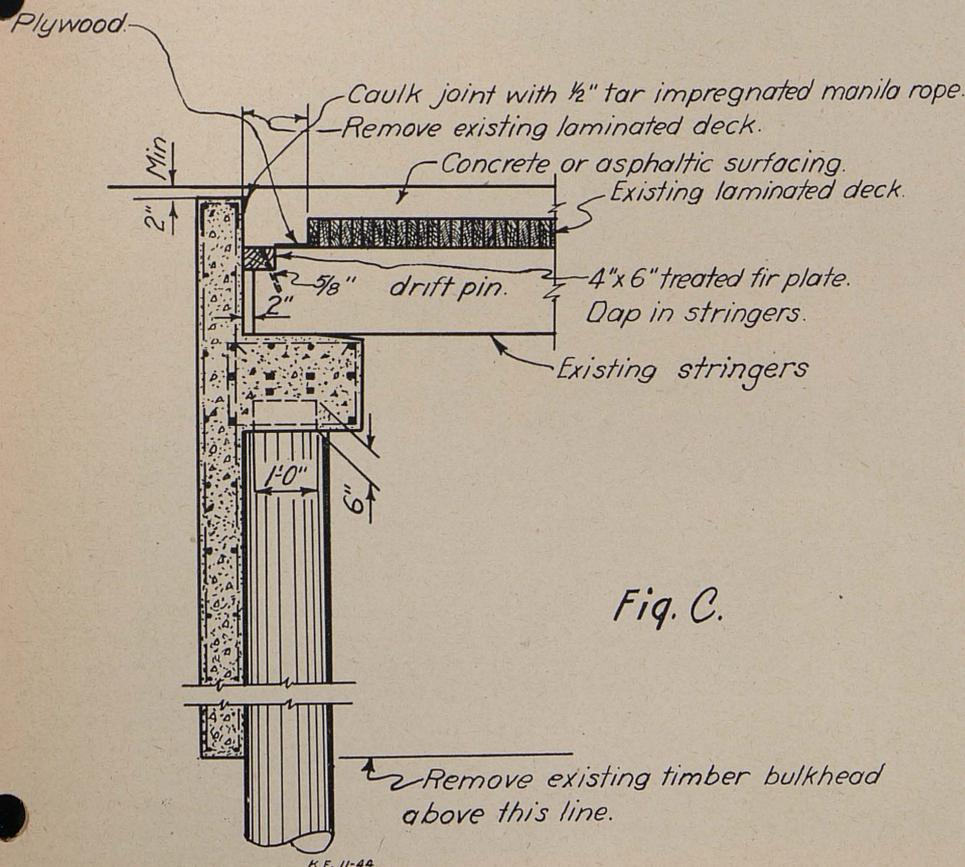


Fig. C.

sary, several types of new abutments may be considered. Impending improvements might indicate re-alignment in the near future and temporary reconstruction at the present site may be necessary. Partial repairs by one of the several methods noted above can be made or replacement with untreated timber of like construction might be the most economical procedure. If alignment is final and a more permanent type of construction is indicated, a new concrete abutment may be constructed. One of several more

permanent types of construction may be used as shown in **Figs. B, C, D.**

"L" TYPE CONSTRUCTION

Fig. B shows an effective "L" type of construction used in many structures. It may be built directly on old pile stubs if the condition of these is sufficiently good to give the required support (**Photo No. 9**). This is often the case and is an economical way of saving concrete in the new footing.

In the figure, note the small pedestal support for the cap which reduces con-

crete and timber contact surfaces and allows room for the accumulation and easy removal of small amounts of debris that are bound to collect around such locations. The space between ends of stringers and back-wall allows air circulation and the continuous asphaltic membrane gives the necessary protection against moisture infiltration, thus protecting the many timber contact surfaces at this location.

CROSS-OVERS

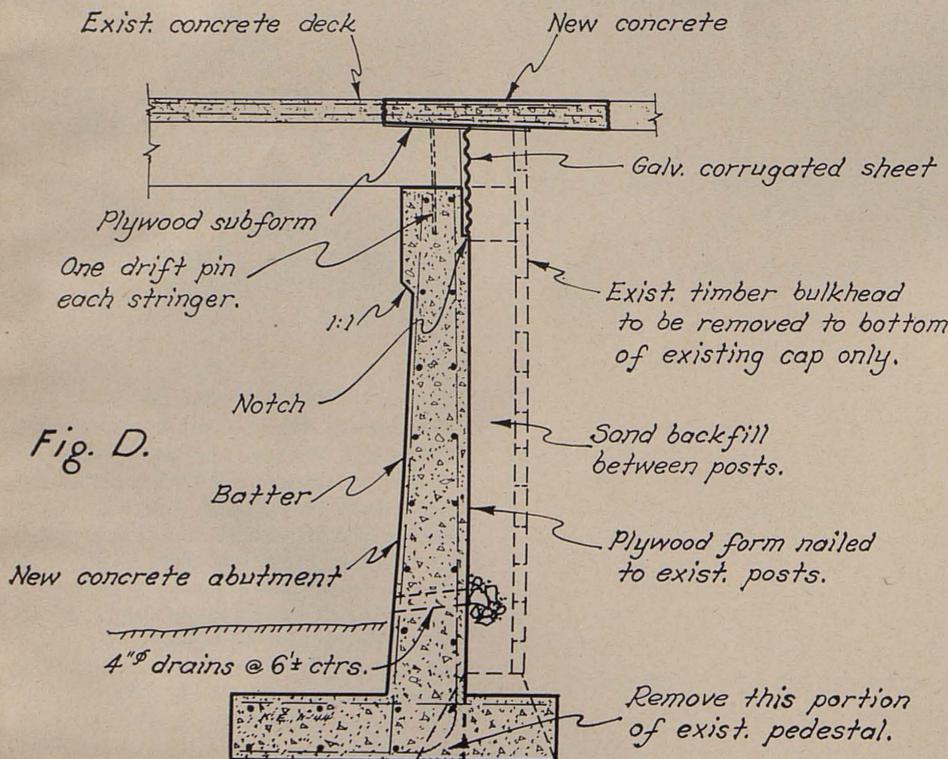
Several abutments of the type shown in **Fig. B** have been installed under traffic using the "cross-overs" shown in **Photos 10 and 11**. These have been made of salvaged 6-inch planks, built into units of three planks each for ease in handling. They will span an opening of approximately 6 feet and this generally allows sufficient room for working below grade levels. Such "cross-overs" are easily and quickly installed and can be transported and stored with a minimum of trouble.

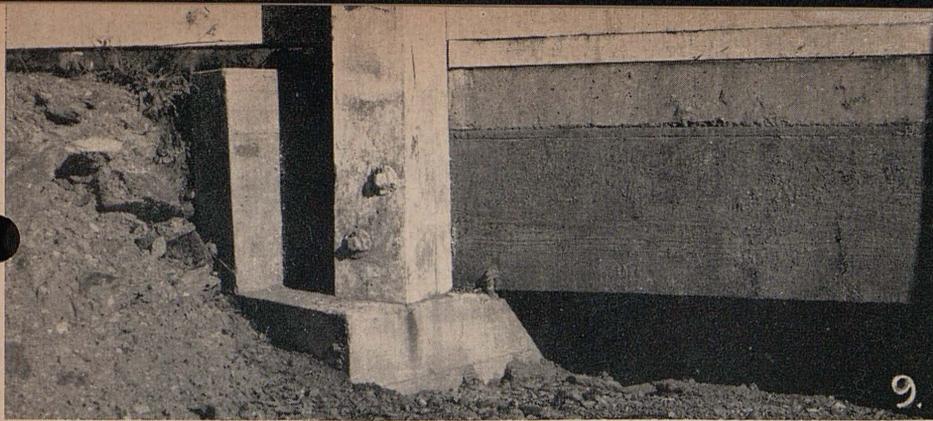
Fig. C shows a type used extensively with treated timber piling. Treated timber piling and untreated timber stringers and flooring were in good shape with many remaining years of service life. Bulkhead planks and caps were badly deteriorated and effective backing with permanent construction was desired. Note clearance at stringer ends and caulking at joint to prevent admission of water. These are important considerations as indicated by the decay that develops at such spots, when such provisions are lacking.

BULKHEAD REPLACEMENT

Fig. D shows a type of construction used to make complete replacement of a bulkhead. The work can be done under traffic and construction completed up to the bottom of the stringers before any portion of the traveled way is disturbed. Previous explorations with a timber boring outfit had definitely located the extent of the decay, thus establishing the exact position wanted for the new concrete wall and the length of stringers which had to be cut off.

Interference by existing concrete pedestals or timber posts is overcome without much trouble. After pouring footings, forms can be placed against the outer faces of the posts and the space back-filled with sand. Wings can also be completed at this time. Excavation on traveled way is made for one-half width of roadway, taking out a small section of the pavement and





approach roadway slab as well as the fill.

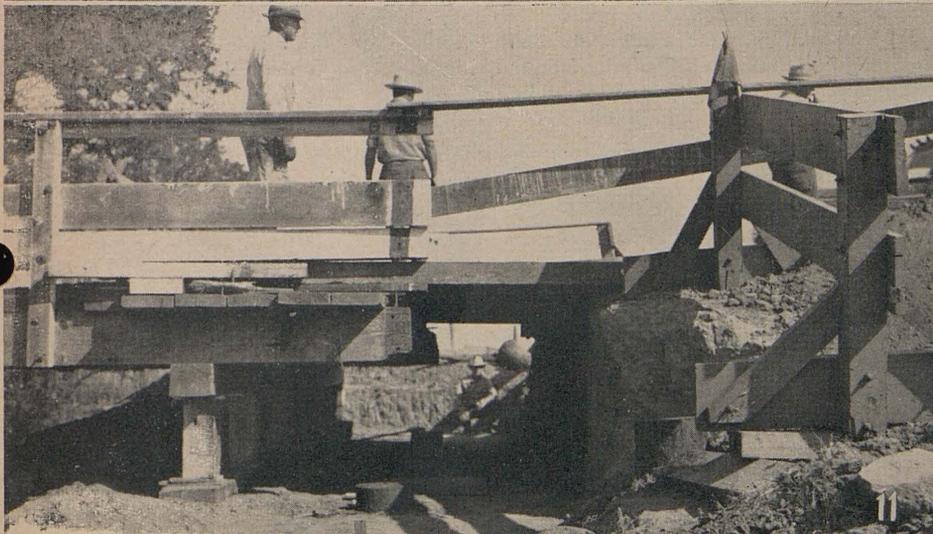
Removal of this fill is made deep enough to permit extraction of the old cap, the balance of the planks and posts being left in place. Corrugated sheet metal backing, as shown, is placed to protect the ends of stringers and to give proper circulation of air. Roadway and approach slab is then replaced.



SATISFACTORY TYPE

Photo No. 12 shows a counterforted type of abutment built directly in front of the existing old bulkhead, somewhat along the lines of the construction detailed in the paragraph immediately above. It is a satisfactory type under the proper conditions.

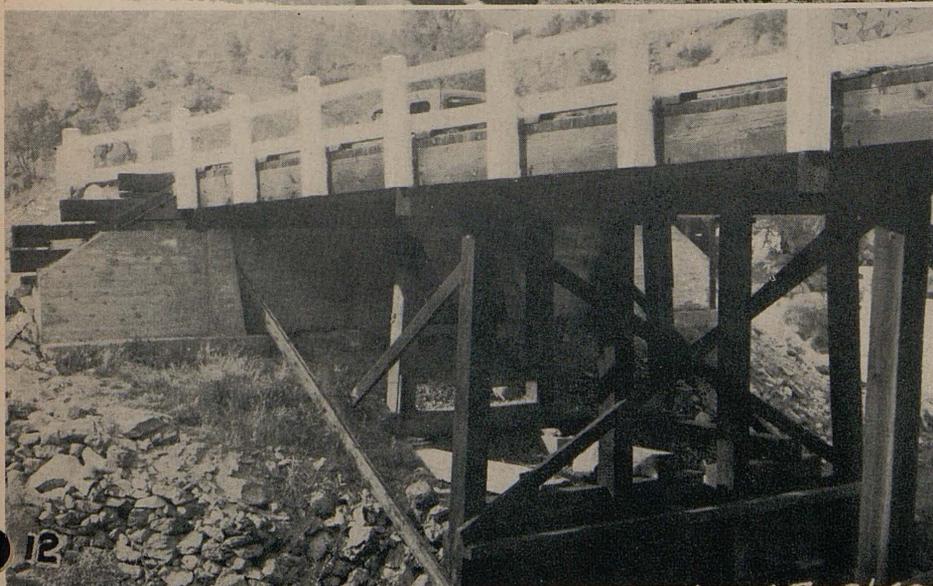
Photo No. 13 shows a type of construction made possible by using existing "dead-man" rods. The outer ends of these rods were tied to the old 6 x 6 inch wales and the extension necessary to grip the wales came in very handy, since the "dead-man" rods could be utilized as tie-backs for the new concrete wall.



The joint between the bridge end and approach fill is a weak and vulnerable point in timber deck and bulkhead construction. The need for impervious construction at this location and necessity of resisting the high impact forces occurring here, requires good, sturdy detail if the desired results in the form of water-tightness and rigidity are to be obtained. Some substitute for an end diaphragm must be provided for the flooring between stringers. Two of the figures show a plate about 4 x 6 inches. This plate dapped into the stringer ends and designed to give support to the flooring at this point should be well tied down to the stringers, either by dowels or long diagonal bolts through the plates and stringers.

The few types of construction above listed give some idea of the variations that may be considered in work of this nature. Of course, to enumerate all of the methods that have been used for the peculiar conditions that are continually presenting themselves in the maintenance of such structures is not possible in such limited space as is here available.

From this discussion, it is evident that most of the trouble arising in timber bulkhead construction is caused by decay due to excess moisture. Since this develops mostly at the contact surfaces between timber and those between timber and ground, protection of such surfaces against the inroads of





moisture is very important and may be provided in a fair degree by the employment of some of the methods noted above.

Equally important is the matter of keeping debris away from a few vital points in the structure. The matter of cleaning this debris away from such

locations is badly neglected and does not receive nearly the attention it deserves. Incorporation of the measures above noted in the design, construction, repair and maintenance of such structures will be well repaid in reduced maintenance costs and increased service life.

George Bartlett Award Bestowed Upon C. H. Purcell

(Continued from page 7)

vised the expenditure of over 600 million dollars, Mr. Purcell, in January of last year, became Director of the California Department of Public Works.

"In 1941 the President of the United States appointed him a member of the Inter-Regional Highway Committee of seven. This committee's report is now a well known document.

"In his long and useful career this man has been untiring in exploring opportunities to fill out the entire area of his job to the fullest. He has improved highway technique and he has developed and inspired leaders.

"Mr. President, I take pleasure in introducing to you a member of your executive committee and a former president of your Association, Mr. Charles H. Purcell."

CALIFORNIA MISSIONS

(Continued from page 13)

can missions when he was overthrown by Pio Pico and his followers, including Echeandia, and on August 9, 1834, Jose Figueroa, who had become governor, issued his decree confiscating all California missions. In October of that year, Lieutenant Antonio de Valle was directed by the governor to take charge of San Fernando Rey as a paid administrator. His inventory valued the mission and its holdings at \$41,714.

Ill from grief and heartbroken, Father Ibarra, probably out of his mind as a result of his sorrows, fled from San Fernando to Sonora, Mexico, in June, 1835, unable to remain and see the complete destruction of all his years of toil. With him went Father Estenaga of Mission San Gabriel, who had undergone similar treatment at the hands of the politicians. Their desertion was akin to apostasy from their Order, but Fr. Narciso Duran, the Commissary Prefect, understood their motives and forgave them. Father Ibarra returned to San Fernando in October, 1836, and Fr. Estenaga went back to San Gabriel. Father Ibarra died, broken in spirit, at San Diego.

San Fernando struggled along under various political regimes until December 5, 1845, when Governor Pico

"leased" the mission and lands to his brother, Andres Pico, and to Juan Manso at a yearly rental of \$1,120. The following year he sold the mission to Eulogio Celis for \$14,000.

MISSION RETURNED BY LINCOLN

As was the case with the other missions, American occupation put an end to Pico and his ilk and on May 31, 1862, President Abraham Lincoln returned San Fernando Rey to the Catholic church.

Restoration of this old mission, which was begun in 1897, by the Landmark Club has made of it one of California's beauty spots. Here is beautiful Brand Park, the land for which was presented to the city of Los Angeles by the Mission Land Company in 1920. The original star-shaped fountain built more than a century ago by the Indians under direction of the padres was given in 1922 to the park by L. C. Brand, who had it removed from the old mission fields. Here also is "Memory Garden" in which are olive trees dedicated to the famous men who took part in the conquest of California and pepper trees raised from seed gathered from the aged trees planted at Mission San Luis Rey. The

Oblate Fathers took charge of San Fernando Rey in August, 1923, erected a church for Mexicans in 1925 and established there a school.

Mission visitors motoring from south to north over the "Trail of the Padres" pass through the City of Los Angeles. From Seventh and Broadway, in the heart of downtown Los Angeles, the route is out Broadway to San Fernando Road, State Highway Route 4, U. S. 99, known as the Inland Route to San Francisco, to the City of San Fernando, a distance of 17 miles. From the main highway, Mission Bell signs direct the visitor to San Fernando Rey de Espana, about one mile from the center of the business section of the city.

Visitors from the north may motor through the San Joaquin Valley over State Route 4 which leads direct to San Fernando. Or, coming south over El Camino Real, State Route 2, U. S. 101, known as the Coast Highway, the motorist will turn east at Montalvo, just south of Ventura, and travel State Route 118 through Saticoy and Moor Park direct to San Fernando.

Next—Mission San Buenaventura and Mission Santa Barbara.

What Expense is Justified for Aesthetic Treatment of Parkways?

By H. DANA BOWERS, Landscape Engineer

The following paper was delivered to the Roadside Development Committee of the American Association of State Highway Officials at the annual meeting of the Association in Cincinnati on November 27, 1944.

WITH a large program of projects in the postwar period for landscaping and roadside improvement on Freeways and Parkways comes the thought to us Landscape Engineers that Roadside Development has finally come into its own.

At last it appears we will have the pleasure of planning for a comparative permanent roadside development project and perhaps live long enough to enjoy its ultimate development without suffering the repeated sad experience of seeing the destruction of our favorite brain-child to make way for more lanes to accommodate more and faster traffic.

However, as with all pleasant dreams, we eventually wake up to the cold reality of the dawn to find the facts of life once more confronting us. Again it is a matter of economics.

Some time ago I wrote to the Chairman of the Roadside Development Committee of the American Association of State Highway Officials in connection with determining the justification for large landscape expenditures on Freeways and Parkways. The letter is quoted:

WHAT SHOULD COST BE?

"Dear Mr. Wright: Reference is made to my informal discussion with you at Chicago relative to the possibility of promoting a research project by your committee on Roadside Development for the purpose of determining the justifiable economic limits of Roadside Development for various highway classes.

"Postwar plans contemplate the construction of several types of roadways. Among them are Freeways or Parkways which, in my opinion, merit immediate concern. Experience in

landscaping of Freeways has revealed the high cost involved in the installation and maintenance of roadsides treated commensurate with the location. Since the proposed mileage of similar conditions is considerable and, in view of the \$3,000 per mile per year it costs for roadside or landscape maintenance alone, on one of our Freeways, I am greatly concerned as to the repercussive potentialities of continuing such high type treatment.

"In determining the practical limits to which we can go it might be in order to first line out the various highway classifications as regards to landscape requirements. As an example, a Freeway connecting two urban areas could comprise three classifications: urban, suburban and rural. Each could have separate landscape requirements.

DEFINITE ECONOMIC VALUE

"We know that soil stabilization or erosion control has a definite economic value and expenditures for this purpose can easily be justified. The justification for expenditures to create and maintain aesthetic values, however, is a debatable question and one that can readily become a subject of dispute. With the advent of postwar Freeway construction with its wide right-of-way and large areas at separations there will naturally follow demands from civil organizations for embellishment. These demands, often impractical, would be much simpler to resist or reason with if the States as a whole could adopt some kind of an agreed standard or policy. Whether such a policy could be made to fit both eastern and western conditions is a subject for study. I trust I have made myself clear and would appreciate your reaction to proposing such a project to your committee."

It would seem that one approach to the problem would be to define landscape requirements. We can not say that these requirements are merely matters of opinion. In order to justify a continuous program and to prevent criticism outside the organization as well as from within we should be able

to show a profit, as it were, on the investment.

TWO LANDSCAPE REQUIREMENTS

Aside from the fact that things should look well, even roadsides; assuming we have all the Garden Clubs, advocates of beauty, and "down with the billboards" groups to champion our cause, the public in general and engineers in particular do not always appreciate seeing money expended merely to improve appearances. When such expenditures are questioned, it would be well to be able to show the potential dollars and cents saved as a result of our labors. It is up to us, therefore, to produce.

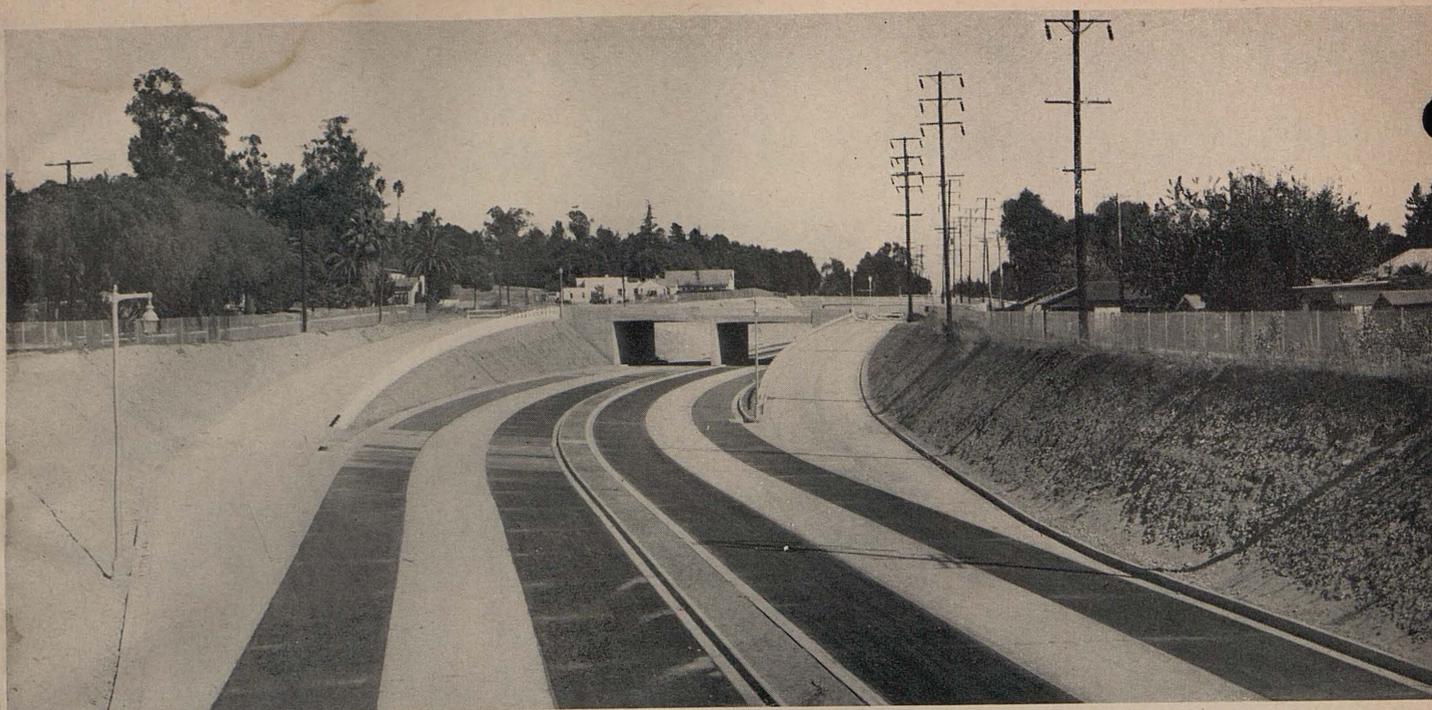
Now in general there are only two landscape requirements; first, soil stabilization which without question can be justified economically; and second, the aesthetic requirement which is so often the bone of contention.

The strongest argument in favor of aesthetic treatment is the effect which the bisecting of a community or a high type of residential or business district by highway construction can have on the value of the property in that neighborhood.

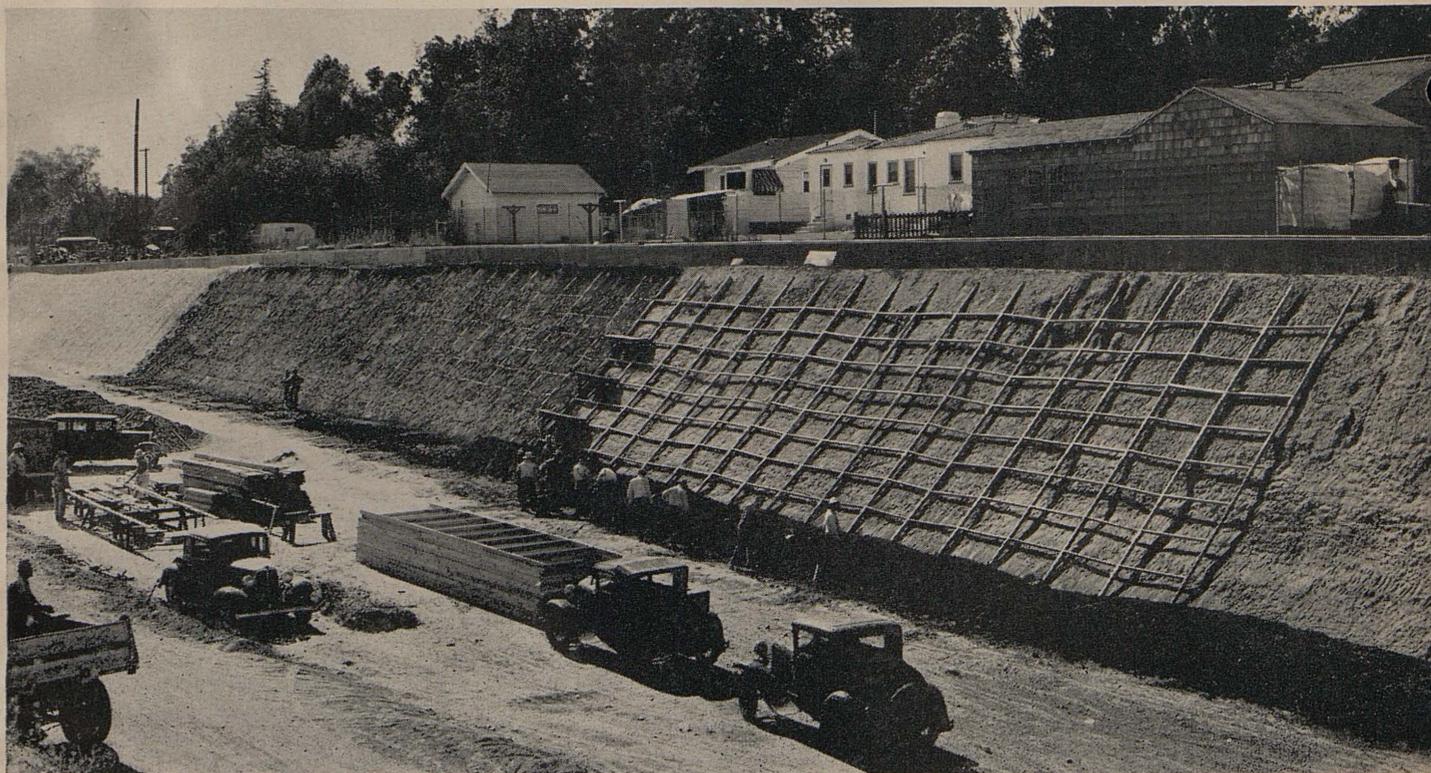
FUTURE LAND VALUES

The future value of these affected properties bear a direct relation to the general appearance of the highway. If treated to simulate a park-like appearance and neatly maintained, it reasonably follows that the proximity of such a landscaped arterial will uphold existing values and in many cases augment them. Income and taxation from these properties will then suffer no loss. On the other hand, if we become superpractical and confine our treatment to soil stabilization alone, without regard to appearance, which could easily be done, the result could still be an eyesore and a detriment to the developed adjoining property.

To more clearly emphasize the economic value of proper landscaping, let us assume the alignment of the highway is diagonally through a residential section of modest homes of the \$4000 to \$5000 class, where real pride



1—Looking easterly toward the Orange Grove Avenue overpass in South Pasadena. This is one of the bridges over the Arroyo Seco Parkway between Los Angeles and Pasadena opened to traffic in July, 1940. To save right of way cost, slopes were constructed on 1:1. Soil encountered was sandy gravel and clay loam.



2—Slopes in process of stabilization. In order to establish growth to prevent erosion on these steep slopes, wooden frames were laid on the slope to form boxes 3 feet by 2 feet by 4 inches. These were backfilled with a mixture of top soil and manure. Straw was then applied approximately 6 inches thick and held in place by 4 inch mesh galvanized reinforcing wire tied firmly to the wooden frames and to the top and base of slope. Vines were planted through the wire and straw at 18-inch intervals. Irrigation is provided by a type of irrigation system laid along the top of slopes.



3—The same area as it appears today. Growth has been successful in preventing loss by erosion as well as providing colorful and pleasing slope cover. Varieties of plants used include lantana, honeysuckle, English ivy, periwinkle, ivy geraniums, moon vine and mourning rose. All bridge piers and abutments are planted with Boston ivy to effect a tracery of green over the concrete surface.

of ownership exists. Assume also, that the highway is constructed on a fill through this area.

Without landscape treatment, it is probable that the value of abutting properties will be depreciated from 15 per cent to as high as 50 per cent. Payment of damages to compensate for the depreciation in value would not rehabilitate the property values. This could only be accomplished by appropriate treatment to restore aesthetic values.

TAX ROLL AFFECTED

Assessed value of these depreciated properties proportionately reduces the tax roll, with the result that the income to the public treasury is reduced. I can conceive of many cases where this reduction in public income can, in a reasonable period of time, amount to more than the total cost of appropriate treatment of the highway.

It naturally follows that if the highway passes through a section where residences are in the \$20,000 to \$50,000 class, the justification for landscaping

for this one purpose alone, is multiplied several times over.

From this standpoint alone then, we can reasonably evaluate aesthetic treatment in dollars and cents.

Other arguments in favor of aesthetic treatment are the abatement of traffic noises and the restoration of privacy of the home through vegetative screening. Sound and sight can be effectively reduced and screened off with plants.

DISADVANTAGES

These two particular disadvantages frequently represent real nuisances to adjoining property. The fact that we may construct a high fill directly beside his dwelling, but on adjoining land, represents no different condition than to construct a building of several stories with a blank wall in the same location. Unless his property suffers material damage no compensation is legally due him, if the construction does not encroach upon his land; affect an existing street in front of his property, or his access rights.

So far we have discussed the situation as it affects property of the better class residential and business districts. How about the reverse, where the route lies through blighted areas or slum sections? We can hardly maintain the argument of decreased property values in this case. In all probability, however, an improved highway will enhance these values and serve to rehabilitate the area. And, in my opinion, landscaping of the highway will be directly reflected in appreciation of land values. Temporarily it will eliminate unsightly views from the highway. It is more difficult to fix a monetary value to this type of service. The type and cost of treatment given would seem to depend more on an adoption of policy to contribute to improve civic conditions or pride in engineering achievement of a pleasing road well designed and constructed.

DIFFERENCE IN COST

There is a considerable difference in the cost of treating some 6 acres per mile on 100 feet of right of way

as against some 20 acres per mile on urban parkways. The purchase of right of way through cities can not always be confined to the minimum width required for the roadway. Entire lots along with improvements thereon must be acquired and more often than not that portion of such parcels not needed for the highway, have little or no value for residential or commercial use. The problem of their treatment and maintenance then follows.

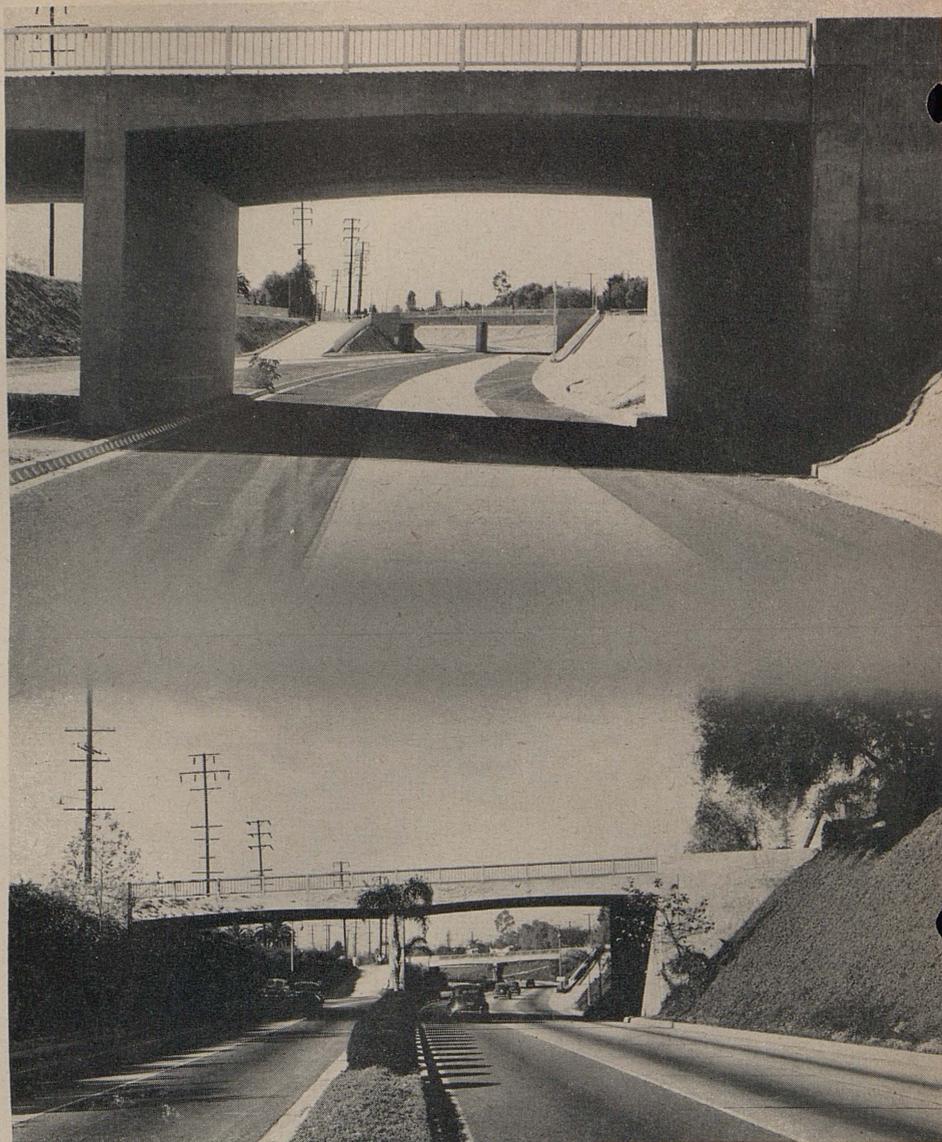
In California we can always depend on two things, dry summers and dry weeds and grasses. These present a serious fire hazard that obviously must be controlled in some manner. They also present an unsightly appearance particularly through urban and suburban areas where the contrast is not a pleasing one. That brings us back to the question: How much of an expenditure can be economically justified for the aesthetic treatment and maintenance of Parkways?

This question may not register as particularly important with some of you Easterners, so fortunate as to be blessed with natural overhead irrigation, but in the Western States it is a number one problem.

ARROYO-SECO PARKWAY

For example, our Arroyo-Secco Parkway between Los Angeles and Pasadena, 7 miles in length, costs \$22,000 per year or an excess of \$3,000 per mile per year for maintenance. This entire area is planted to various ground covers, trees and shrubs, and is all under sprinkling system. We have no ground cover sufficiently drought resistant for inland use, to maintain a green cover throughout the summer season and compete with the natural weeds and grasses. The use of native indigenous material can be made to provide suitable screen plantings without irrigation, but the problem of fire hazard beneath and between these plantings still remain. We can not seem to adopt half way measures in our planting and still produce an attractive effect, appropriate through urban or suburban areas.

It can be said that a Parkway costing on an average of one million dollars per mile for right of way, and one and one-half million per mile for construction, and traversing residential and business districts, should be treated and maintained commensurate with the adjoining community and its benefit and enjoyment to the traveling public.



Prospect Avenue overhead, Arroyo Seco Parkway, before and after landscaping

POSTWAR PROJECTS

Such treatment now prepared for postwar projects will be expensive. Planting preparation constitutes the big percentage of the cost since in many cases, all top soil must be imported, and it takes considerable top soil to cover 20 acres per mile, even with a skimpy 6 inches. Growing conditions are not good, by any stretch of the imagination, where buildings and drives have existed for several decades. If planting is to be done, it is more economical in the long run to give every consideration to the preparation of the soil. However, curtailment on installation, invariably results in prolonged excessive maintenance. To continually seek more maintenance money to rectify the mistakes of cheap installation, is an irritant to any organization. It

is an excellent manner in which to retard the progress of Roadside Development, since to the many highway engineers, landscaping is still to be tolerated rather than encouraged.

Any way we look at it, landscaped or not, the additional right of way needed for Freeway and Parkway construction is going to boost maintenance costs materially. It would seem that a few comparative figures of maintenance cost on variously treated roadsides might aid in arriving at some answer to the question. We know in California that the difference will be considerable, if we expect anything at all attractive. With the exception of irrigation from about October to March, our maintenance varies little throughout the year, and neglect is immediately noticeable.

Former Highway Men Hold Reunion in Far Pacific

FOURTH USN CONSTRUCTION BRIGADE

c/o Fleet Post Office
San Francisco, California

JWD;aa

8 September 1944

To: All Officers in Charge
PLEASE POST

1. All former employees of the State of California, Division of Highways are invited to attend a roundup at the 4th USNC Brigade office at Lorengau on Sunday 17 September 1944 at 1400.

2. Come and get in the pictures and join in a "I knew you when" bull session.

3. Men, Chiefs and Officers come and see the pals you didn't know were here.

Lt. J. W. Davis, CEC, USNR
Former member, Bridge Dept.
State of California
Division of Highways.

All Const. Regiments
All Const. Battalions
All CBMU
PAD #1
Drydock
ABCD Annex

THE foregoing bulletin posted in Army and Navy camps in the South Pacific last September resulted in 11 former employees of the California Division of Highways getting together for a reunion.

With a letter to F. W. Panhorst, Bridge Engineer of the Division, Lieutenant J. W. Davis, formerly on Panhorst's staff, who sponsored the party, sent the accompanying photograph. Davis wrote:

"I'm enclosing a photograph taken in the Admiralty Islands of a group of 11 out of 14 former members of the Division of Highways. There were four of us from the Bridge Department all working on the same base.

"Mike Foley worked in the materials section as X.O. of ABCD. Ray Ivy was on bridge and dock construction. Bill Hedgepeth worked with me as electrical engineer and I ran the design and field engineering department for the Brigade. It certainly seemed



In this setting in the South Pacific, Division of Highways men on military leave staged a reunion. The Roman numerals following the names of some of the celebrants indicate the California Highway district in which they served before the war. Standing, left to right, Lt. (j.g.) W. C. Ewing, II & IV, 4th Brigade; Lt. E. R. Foley, Bridge Department, 46th C.B.; Lt. J. W. Shaver, I-II-VII-VIII, 4th Brigade; Lt. R. J. Ivy, Bridge Department, 44th C.B.; CMM P. A. Goforth, VII & XI, 78th C.B.; Lt. J. W. Davis, I-IV & Bridge Department, 4th Brigade; CMM T. J. Hagerman, Maintenance Shop 2, 78th C.B.; CWO K. E. Pilkenton, XI-VIII-VI-III-I-X-V, 78th C.B.; EM1/c A. Fross, Bay Bridge, 44th C.B.; Kneeling, left to right, MM1/c R. H. Barrett, California Highway Patrol, Bakersfield, 78th C.B.; CCM W. R. Borden, II, 5th Regiment

quite a coincidence that everyone should meet up here halfway around the world.

"During the time I've been in both the Hebrides and Admiralties the past two years I've met many former State highway employees and it has been most interesting swapping stories.

"At the present time, I'm with NATS in the construction department, which has taken me on quite an extensive tour of the South and South-west Pacific area.

"Merry Christmas and Happy New Year."

"Jack Davis"

Commissioners Reappointed

Governor Earl Warren has reappointed for four-year terms State Highway Commissioners James Guthrie, San Bernardino publisher, and Chester H. Warlow, Fresno banker, whose terms expired January 15th.

Under a legislative act reorganizing the Highway Commission, Governor Warren on September 14, 1943, named a new Commission with Director of Public Works C. H. Purcell as chairman. The appointees drew straws to

determine their staggered tenures of office. Walter Sandelin, Ukiah, who drew the short term, was reappointed by the Governor last year for four years and now Mr. Guthrie and Mr. Warlow have been sworn in again. Commissioner Harrison R. Baker, Pasadena, holds office until January 15, 1946, and Commissioners Homer P. Brown, Placerville, and C. Arnholt Smith, San Diego, until January 15, 1947.

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

IN 1784, the Virginia cession finally was completed, and a committee was appointed to prepare a plan for the disposal of the lands. The idea was to use the public lands as a fund to pay the public debt. The committee of 1784 was composed of Thomas Jefferson of Virginia, chairman; Hugh Williamson of North Carolina, David Howell of Rhode Island, Elbridge Gerry of Massachusetts (of "gerrymandering" fame), and Jacob Reed of South Carolina. This committee did not attempt to formulate a new plan for the disposal of the lands but turned rather to the methods already in use by the colonies, which methods were two in number, and have already been described.

On May 7, 1784, Jefferson's committee reported to Congress, and although three of the five members came from the Southern States, they recommended the New England System of "discriminate" prior surveys. The features of this report were that surveys should precede sales; tracts of ten geographical miles square, subdivided into one hundred lots, were to be laid off and called "hundreds"; there was no provision for education or religion. The Southern System of disposition, by warrants, certificates and caveats, was to be used.

This report was in Jefferson's handwriting, and he was, no doubt, its principal author; the provision for ten mile townships was in line with his recent advocacy of hundred mile States, and decimal money divisions; although we will see that later this idea was in his absence, waived in favor of the Northern half dozen or six mile ideas. On May 28th, Congress voted not to consider the report at that time; only North Carolina voting for immediate action.

WASHINGTON VISITS WEST

But settlers kept passing over the mountains into the Ohio territory; the soldiers were demanding their promised bounty, and the need of increased revenue was felt. Accordingly, in the summer of 1784, Washington visited the west, and although he did not reach Ohio, was convinced of the necessity of a compact settlement of the New Country, and he stated this fact in let-

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 second of two installments.

ters to Jacob Reed, then a member of Congress. Washington told of the roving of the people, and of the marking out, surveying and settling of lands, and the consequent discontent among the Indians.

Washington also wrote to Richard

Henry Lee, then President of Congress, on March 15, 1785, advocating the sale of a small amount of land at a medium price; and favored the idea of "progressive seating," as he called it. This "seating" could be best obtained under the township plan of the New Englanders, although it does not follow that Washington had that plan in mind. These letters of Washington must have had some influence on the action of Congress in this matter; how much, we do not know.

THE SECOND COMMITTEE

On March 5, 1785, the report of 1784 was again considered by Congress. It was read a second time, and after a debate, was referred to a committee of one member from each State, the most prominent of these being William Grayson and James Monroe of Virginia, and Rufus King of Massachusetts. (Jefferson had been sent to France to aid Franklin and Adams in making treaties with European countries.)

This committee reported on April 14th. They kept the rectangular townships, but reduced the size to seven miles square; and substituted statute miles for geographical miles; they insisted on "township planting," sales to be at public auction for not less than one dollar per acre. There were reserves set apart for schools and religious uses, and for the future disposition of Congress.

The day after the report was presented to Congress, Grayson sent a copy to Washington, and gave the reasons advanced by the advocates of the measure, which were as follows: Surveys were urged, because they would avoid boundary disputes, and surveying into squares was least expensive. Sale by auction was defended, because it gave the same chance to those away from the lands. Sale by townships, with the aid for education and religion, was urged, because it encouraged purchasing and settling together, which end would be defeated by the Southern method of "indiscriminate location."

Under the proposed system, the poorer classes would unite to buy a township, while the speculator would be excluded, because the price would be too large; and if he did buy, the cry

for greater revenue by the government would be answered. Transfer by deed was required, and the formalities of warranties, entries and returns, were abolished. From Grayson's letter, it is very clear that the members from the Northeast had their own way in every important particular.

DISCUSSION IN CONGRESS

Grayson asked for Washington's opinion on the proposed plan, and Washington, on April 25th, forwarded a criticism. He favored the township plan, but objected to the proposed sale of lands by the respective States. He believed that this would lead to state jobbing; and that Federal ownership and a central land office would be more convenient and encourage more competition in buying. Incidentally, this was one of the first features of the Ordinance to be amended.

When the report was presented, the discussion was carried into Congress. It was apparent that Congress was willing to accept the advantages of the rectangular surveys before sale, but the delegates from the South opposed the "township planting" feature; and they sought to amend the clause that provided that land could only be sold by entire townships, and advocated that settlers should be allowed to purchase smaller amounts whenever they desired. The conflict then, was between the theory of the Northeast compact settlement and discriminate locations, and a modified Southern System of rectangular surveys, but with individual purchases by smaller sections.

THE LAND ORDINANCE

The Land Ordinance was under consideration for over a month in New York City where Congress was meeting. It so happened that on April 18, 1785, the New York legislature passed a land law providing for townships of six miles square; and should a body of persons unite to purchase a township, they were to receive lands for schools; but smaller tracts up to 500 acres might be sold. It became apparent in Congress that neither party could have its own way as to the size of the minimum tract to be sold. A proposed compromise provided that half of the townships should be sold as a whole; and the other half should be sold to a New York purchaser selecting 640 acres, without the surrounding land being sold; but his tract had to be bounded by sectional lines. Another amendment reduced the size of the township to six miles square (an obvious com-

promise by the Southerners in favor of New England). Still another struck out the provision of a section in each township for religion as tending to create a State church.

Finally, on May 20, 1785, the Land Ordinance was passed. It provided as follows: Territory ceded by the States was to be sold as soon as the Indian titles were purchased. The formation of states was no longer a prerequisite. Land was to be surveyed in townships six miles square, subdivided into lots or sections one mile square. First lines North and South, East and West, were to commence on the Ohio River at the Pennsylvania border; and only the township lines were to be actually surveyed. Townships were to be sold alternately as a whole and by lots. Sales were to take place in the states. A range was a tier of townships, running from North to South, enumerated from East to West. When seven ranges were surveyed, the townships were to be drawn by lot, one-seventh for the Continental Army, and the balance for the states, to be sold by the commissioners of the land office therein at public auction. A minimum price of one dollar per acre was established to be paid in specie, or land office certificates; but the expenses of surveying, calculated at thirty-six dollars a township, were to be paid by the purchaser at the time of sale. Purchasers secured deeds for definite tracts of land. Congress reserved sections 8, 11, 26 and 29, in each township, and one-third of all gold, silver, lead and copper mines. Section 16 was reserved to maintain the public schools. The form of deeds and the manner of issuing them was also provided for.

Thus, this Ordinance of 1785, which is the foundation of our national land system of Sections, Townships and Ranges, was a compromise of conflicting interests and opinions, based on the methods used by the older states. The presurvey features of the Northern township system were adopted, along with the individual or section purchase ideas of the South.

APPLICATION OF THE SYSTEM

The first application of the new Congressional Township plan of 1785, was along "Ellicott's Line" or the Eastern edge of the Northwest or Indian Territory, now the State of Ohio. These are the "Old Seven Ranges." The starting point of the first principal meridian, governing succeeding ranges, is the junction of the Ohio and Miami Rivers. As the country grew, other principal

meridians were established, and designated by numbers, up to the Sixth, in Kansas and Nebraska. The Third begins at the confluence of the Ohio and Mississippi Rivers, and the Fifth at the Mississippi and Arkansas Rivers. After the Sixth, the meridians were designated by name. Some were named for rivers, as the Willamette, and the Gila and Salt River meridians. Others took the names of mountains, as Mount San Bernardino, and Mount Diablo. The area governed by each meridian differs greatly. The Fifth runs to Township 163 North and Range 106 West.

The Ordinance of 1786 provided for a Surveyor General. Rufus Putnam was the first to hold the office. Jared Mansfield was the second. Under the Act of 1812 Edward Tiffin became first Commissioner of the General Land Office. He introduced our present system of offsetting for the convergency of North and South lines due to the curvature of the earth.

SIZE OF TOWNSHIPS

The size the townships were to be was at first doubtful. The original suggestion was as we have seen, ten miles square, later changed to seven miles. The New York State Military lands were laid out in townships ten miles square, and the Ohio Military and Connecticut Reserves, five miles. Col. George Morgan planned townships five miles square for his colonization scheme in Spanish Missouri. It is rather obvious that a ten mile township would have been more convenient for future descriptions, than the six mile township which was actually adopted.

Under the Act of 1785 the townships were not officially sectionized. Under that of 1796 half were sectionized. Under those of 1805 and later dates all of the townships were divided.

The starting point for numbering the sections was in doubt at first. In the Old Seven Ranges, Section 1 is at the Southeast corner, and the numbering runs Northwardly and begins again with Section 7 at the South. This arrangement was advocated by Thomas Hutchins, United States Geographer. But Congress later decreed that we should start at the Northeast corner, and that the numbering should continue back and forth throughout the township (which is really not the best possible arrangement). This may have been because the first surveys began at the South line of the Connecticut Reserve, and were staked out by surveyors walking westwardly and returning

(Continued on next page)

Holding State Highways In Central California



This photograph shows type of new surfacing on U. S. 99E north of Durham in Butte County

IN keeping with the war effort, the 1944 highway work in District III of the California Highways has been confined to essential repair, heavy maintenance and small access road projects to military establishments.

The 11 counties of this district roughly cover the area between Galt and Chico and between Clear Lake and the Nevada State Line. Most of the heavy access roads and flight strip construction was completed in the first two years of the war.

A typical example of the work under way during the year 1944 is exemplified in a project just being completed in the vicinity of Nelson

and Durham in Butte County on Highway 99E.

The original highway consisted of some of the first concrete road constructed in the State and has served remarkably well even though constructed on soil which present day practice would not tolerate as sub-grade material.

This new protective work consisted of placing a two-inch blanket of plant-mixed surfacing over areas of the original concrete that was still in fair shape, while on the remaining section it was necessary to add a blanket of imported material and a course of crusher run base to raise the grade line

for drainage purposes and to reinforce the shattered pavement. A double seal coat was applied to the crusher run base and will serve until a plant-mix surface can be added in the future.

Gravel from a local stream was utilized in producing all materials except screenings, the result being that a high quality product was obtained at a comparatively low cost, at the same time using a minimum of critical shipping facilities.

This typical work was performed by Contractor Piazza and Huntley, with Mr. E. L. Miller as Resident Engineer.

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

(Continued from preceding page)

toward the East along the next tier of sections to the South.

CONCLUSION

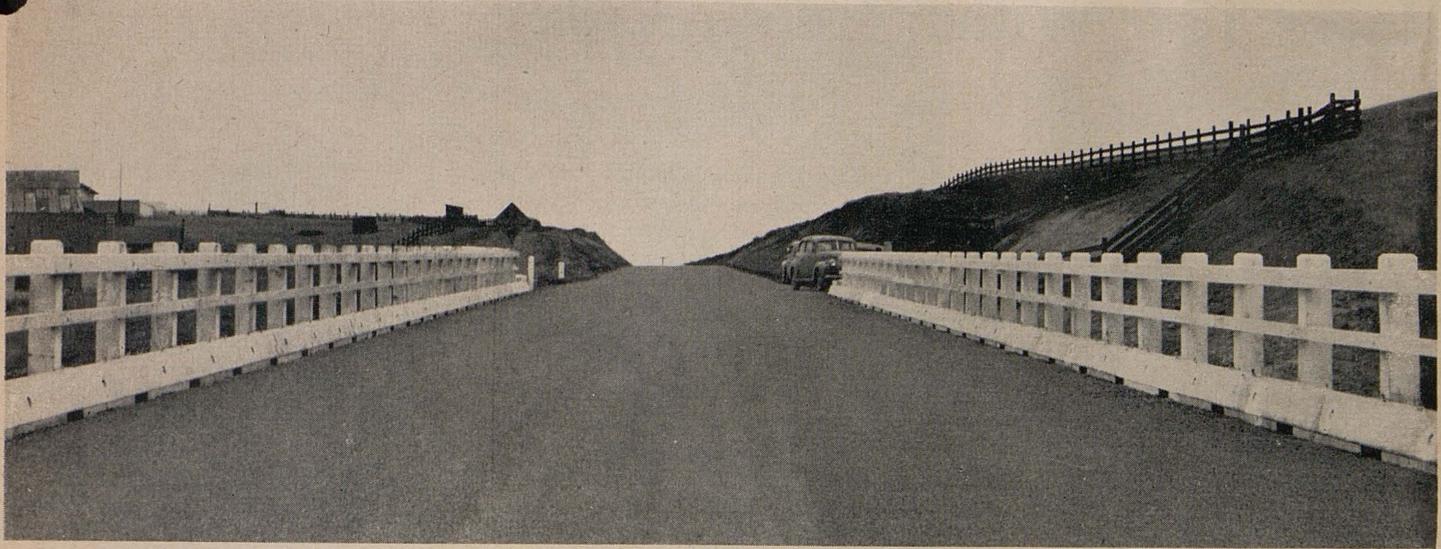
In this way was laid the foundation for our great American system of land plotting, the only improvement in property description since the earliest

records of ancient times. If the Congress of the Confederation had done nothing else, it would have distinguished itself by thus setting up our unique system of Sections, Townships and Ranges; a system so far superior to any other previously used, that its minor defects can be readily over-

looked. And while we are heaping praises upon Jefferson, Washington, and the rest of the fathers of our country, for their other governmental achievements, let us remember that not the least of their successful experiments was the Rectangular System of Pre-Surveys of the Public Domain.

Wartime Road Construction in District I

(Continued from page 6)



Showing type of deck surface on and approach to new Albion River Bridge

To overcome this type of failure an open graded aggregate mixed with E grade asphalt of 100 to 30 penetration has been used for the first time in this district to surface about 13 miles of highway. The open graded mix, not having the percentage of fine particles found in the dense graded, should be relatively free from capillarity, and if this anticipated result is demonstrated by the subsequent performance of the pavement, it should prove of distinct value to this district in securing a

pavement not susceptible to failures from moisture.

Three grading and surfacing contracts awarded since 1942 are in Class 3 and were considered essential to the war effort to prevent disruption of the hauling of high priority materials or to military and civilian traffic.

These projects, estimated to cost \$91,342, provide four-tenths mile of approaches to the new Albion River Bridge on the Mendocino County coast, five-tenths mile of modern highway on the north bank of the Smith River in

Del Norte County as incidental to replacing an unsafe timber bridge 89 feet long with a 60 inch concrete culvert, and finally a project using Federal Access funds for timber roads, involving the reconstruction of nine-tenths mile of highway on new alignment and grade, together with the widening and resurfacing of 1.4 miles all along the north bank of Mad River in Humboldt County. This road has to be used as a detour for heavily loaded lumber trucks to avoid a weak and obsolete bridge on U. S. Route 299.

DISTRICT I HIGHWAY CONSTRUCTION 1942-1944

Location	Contractor	Type of Work	Length Miles	Cost	Date Completed
Arcata-Eureka Section Base	John Carlin Const. Co.	Bridges			
	Mercer, Fraser Co.	Grade-Surface	11.060	\$351,669.75	10/ 8/43
I-Men-Lak-15-49-89	Harold Smith	Resurface	8.272	67,201.16	11/ 9/42
I-Hum-1-G	Mercer, Fraser Co.	Resurface	2.700	41,372.68	9/25/42
I-Men-1-B	E. A. Ford	Resurface	6.680	42,530.85	7/ 1/43
I-Men-1-G,H,I	Close Building Supply	Resurface	4.410	19,709.42	9/ 7/43
I-Men,Hum-1-K,A,D	Close Building Supply	Resurface	8.088	25,625.50	8/31/43
I-Hum-1-J	Mercer, Fraser Co.	Resurface	5.041	39,812.74	10/21/43
I-Hum-1-J	Marshall S. Hanrahan	Resurface	9.042	158,070.11	10/ 4/44
I-DN-71-A	Marshall S. Hanrahan	Resurface	9.230	52,435.94	8/12/44
I-Men-1-H	Close Building Supply	Resurface	1.964	36,865.33	6/15/44
I-Men,Hum-1-I,A	Clements & Co.	Resurface	9.700	107,251.90	
I-Hum-1-E,F	Mercer-Fraser Co.	Resurface	3.700	52,343.34	
I-Men-48-56-C,D	Ted Watkins	Resurface	3.360	36,111.21	7/ 7/44
I-Men-56-D	A. J. Clausen	Grade-Surface	0.400	28,819.84	7/21/44
I-Men-48-B,A,D	Elmer J. Warner and Ted Watkins	Resurface	4.400	30,682.65	10/13/44
I-Hum-56-D,E	A. Teichert & Co.	Resurface	3.850	40,721.14	9/11/44
I-Hum-20-A	Mercer, Fraser Co.	Resurface	5.100	47,517.75	Under Construction
I-DN-81-A	John Burman & Son	Grade-Surface	0.50	31,787.44	Under Construction
I-Hum-85-A	E. B. Bishop	Grade-Surface	0.900	30,734.50	Under Construction

State Assumes Maintenance of Route 127 Within Death Valley

By W. L. SAVAGE, Assistant Highway Engineer

THE California Department of Public Works, Division of Highways, entering into an agreement with the National Park Service has assumed full maintenance of that portion of State Route 127 within the boundaries of Death Valley National Monument.

This agreement was necessitated due to the fact that the National Park Service found itself without labor and equipment sufficient to perform the required maintenance.

The National Park Service has, through an agreement entered into with the State, maintained and improved this route since April 3, 1937, but found it necessary to be relieved of this obligation.

The highway through the Monument was added to the State system on August 21, 1933. From that date to April 3, 1937, it was maintained by the State.

During 1937, the National Park Service, desiring to improve the roads within the valley, and having at its disposal Civilian Conservation Corps labor, petitioned the State for an agreement to be allowed to construct and maintain the existing State highway. This agreement was entered into and the Park Service performed its part of the agreement by improving the then existing narrow road into a wider safe highway. Side ditches, drainage dips, road approaches and road connections were constructed. Labor and equipment was furnished to road-mix the traveled way. Directional, guide and warning signs were installed. Ample maintenance was performed to provide a safe highway at all times.

STORM WIPES OUT ROAD

This program continued uninterrupted until August 10, 1942, when the worst storm in the history of the valley descended upon Death Valley and the region adjacent. Flood waters roaring down Furnace Creek Wash obliterated everything in their path. The highway for 11 miles above Furnace Creek Inn to the Furnace Creek Ranch was destroyed.

Ten miles of road was completely obliterated with no indication remaining of where it formerly existed. Millions of tons of material were deposited at the mouth of Furnace Creek Wash within the valley. Furnace Creek Inn, on the hillside near the wash, suffered considerable damage. The State assumed the cost of reestablishing the road to a satisfactory usable condition.

State Route 127, between the eastern foot of the High Sierra Range below Mt. Whitney and Baker in eastern San Bernardino County, if traveled during the favorable part of the year, provides the motorist with a most interesting and variable type of scenery not to be found elsewhere.

SCENIC ROUTE

Leaving Lone Pine on U. S. 395, under the shade of Mt. Whitney, the road passes through the old town of Keeler where nearby was the famous Cerro Gordo silver mine operated first in the 70's, and on to high plateau country having an elevation of 5,000 ft. overlooking Panamint Valley.

The view into and across Panamint Valley from this vantage point is one not quickly forgotten. The Panamint Mountain Range, constituting the western boundary of Death Valley, is seen ahead and Telescope Peak, elevation 11,045 ft. is most important. The road now drops down into Panamint Sink to an elevation of 2,000 ft., crosses the valley floor and begins the ascent up the side of the Panamint Range until Towne's Pass, elevation 5,200 ft., is reached. The road then descends gradually into Death Valley.

The portion between Panamint Valley and the entrance to Emigrant Canyon was originally constructed by Bob Eichbaum, under franchise granted him by Inyo County which allowed the collection of a toll of \$2.50 per car and driver and fifty cents for each passenger. The State acquired title to this road on December 19, 1934 for a payment of \$25,000.

INTO DEATH VALLEY

Descending into Death Valley one passes the Stove Pipe Wells Hotel located on the western edge of the valley, the "Devil's Corn Field," which is arrowweed clumps with clay footings resembling shocked corn, the Park Headquarters and C.C.C. Camp, the ruins of the old Harmony Borax Works (the first borax workings in the valley), Furnace Creek Ranch and finally reaches Furnace Creek Inn at the mouth of Furnace Creek Wash.

Located at the extreme north end of the valley 56 miles from the Inn is "Scotty's Castle." South of the Inn is located the "Devil's Golf Course" which is an immense salt deposit erupted by the extreme summer heat, and "Bad Water," elevation 279.6 ft. below sea level, the lowest point in the western hemisphere.

The camp of Ryan is located 11 miles east of Death Valley Inn and 4 miles southerly from the road to Death Valley Junction. Here was located the first borax development on a large scale. The Tonopah and Tidewater Railroad was completed into Ryan in 1907 and borax mining and shipment continued to 1927 when activities were transferred to Kramer in the Mojave Desert where higher quality deposits were discovered.

BORAX MINING

Death Valley is approximately 150 miles in length and from 6 to 20 miles wide. It is completely surrounded by mountains. Seventy-five miles of its length are below sea level. On February 11, 1933, an area of 2,500 square miles was made a National Monument by Presidential Proclamation; 478 square miles were added on March 26, 1937, including the area in which "Scotty's Castle" is located.

It is reported the valley received its name from the words of one of the survivors of the unfortunate Bennett-Arcane Party, who after reaching the crest of the Panamints, looked back into the sink and uttered a heartfelt farewell, "Goodbye, Death Valley."

In Memoriam

George H. P. Lichthardt

The Division of Highways lost another valuable and much loved employee when Senior Chemical Testing Engineer George H. P. Lichthardt passed away suddenly on the night of Sunday, December 10, 1944, at the age of 67 years.

"Doc" as he was familiarly called, had been the Chief Chemist for the Division for over 23 years and had spent one additional year in State service with the State Purchasing Agent's Department.

Born in Sacramento, March 17, 1877, he received his early education in Sacramento and was graduated from the University of California College of Pharmacy Class of 1896. He later received his LLD from the University of Wisconsin and was a member of the California State Bar Association.

He has been listed in the American Men of Science, the Who's Who of American scientific men.

He was a member of the Scottish Rite Bodies, the Sacramento Pyramid of Sciots, the Sacramento Parlor of the Native Sons of the Golden West, the American Chemical Society and the American Association for the Advancement of Science, and was past president of the United States Army Reserve Officers Association. He held the rank of major in the Chemical Warfare Service Reserve.

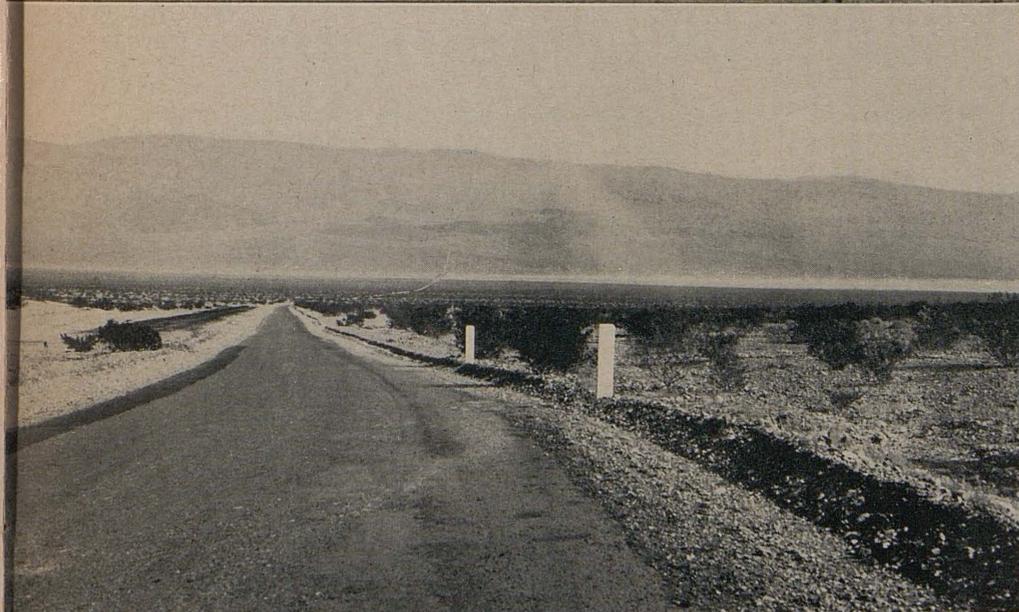
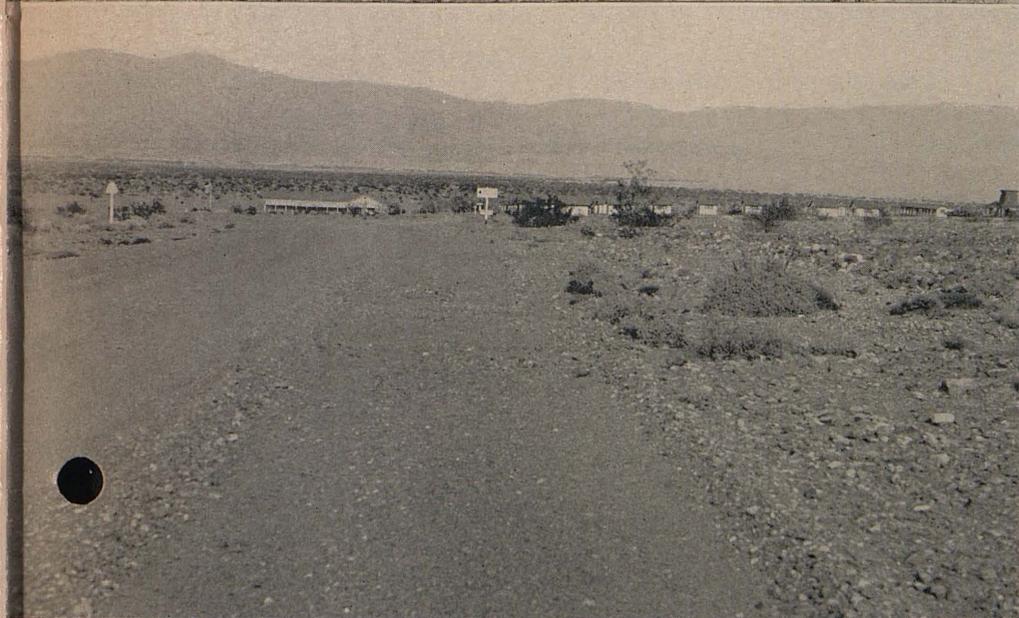
When World War II broke out, Mr. Lichthardt received notice to report for duty in the Chemical Warfare Service but much to his disappointment the order was canceled when it was learned that he was 64 years old and had passed the deadline on the age limit.

He then volunteered to take part in the Civilian Defense Program and towards the end of the intense activities connected with this program had charge of the Gas Protection Training in the Sacramento area.

His intense patriotism was again exhibited when he took the lead in the erection of a flagpole over the main Laboratory Building and personally raised and lowered the flag each day.

Although he rendered valuable service to the State in solving many chemical problems his principal contribution was the working out of the traffic line paint formula and the specifications under which all purchases of traffic line paint were made by the California Division of Highways from 1932 to 1942, when the principal ingredients (China wood oil and Manila gum) became unattainable because of war conditions.

During this decade the California traffic line paint formula received National recognition and was widely followed in its essential characteristics by the majority of the State Highway Departments and many paint manufacturers.



The upper photograph shows a section of State Route 127 in Death Valley before the State took over its maintenance and improvement. Center—Looking northerly on new highway through Stovepipe Wells. Amargosa Range and floor of Death Valley ahead. Lower—Looking east across Panamint Valley with Panamint Sink and Panamint Mountains in distance

District VII Builds 22 Access Roads as Part of Its War Effort

(Continued from page 4)

neers and city councils as well as be subjected to the usual searching review by the Public Roads Administration.

Only three of the access roads were in any part on the State Highway System and of those three, only one had any considerable portion of its length on the State system.

On the whole the contractors have had very little delay through shortage of materials but the manpower shortage has been constantly in evidence.

At times all of the output of the available asphalt plants has been taken over by the Army or Navy, causing delays in placing the surfacing.

NEW PROJECTS

Bids have just been opened on one more access road. Plans are nearly completed on a second. The Federal Government has set aside eight million dollars for yet another access road project, studies for which are in progress; but it is not likely that actual

construction on this project will be started while the manpower shortage is as acute as it is at present in this area.

These access roads, together with postwar planning, have completely occupied the depleted district forces and it has been found difficult to meet the established deadlines on postwar projects with the engineering personnel available.

The following table gives a list of the projects, together with contract, cost and major item of work:

Location	Amount	Contractor	Access to	Type of Improvement
Los Angeles—Stewart St., Exposition Blvd. and Dorchester Ave.....	\$61,627.50	Griffith Company	Airplane plant	Plant-mix surfacing on imported base
Orange—Katello Ave. and Dennis bet. Los Alamitos Blvd. and Farquhar..	\$82,784.08	Griffith Company	Naval aviation training base	Plant-mix surfacing on imported base
Los Angeles—Redondo Blvd.....	\$101,786.37	Vido Kovacevich	Airplane plant	Widen and resurfacing existing road with plant mix
Los Angeles—Chavez Ravine.....	\$47,390.43	Griffith Company	Naval Reserve Armory	Plant mixed surfacing on imported base
Los Angeles—Imperial Highway....	\$167,202.47	J. E. Haddock Inc.	Airplane plant	Widen and surface with plant mix on cement stabilized base
Orange—Baker St.	\$127,157.11	Griffith Company	Army aviation training center	Plant-mix surfacing on imported base
Ventura—Port Hueneme	\$213,987.78	Basich Bros.	Naval Base	Plant mixed surfacing on existing pavement on portions; plant mixed surfacing on imported base on other sections
Los Angeles—Pearl St.	\$20,957.75	Sparks & Mundo	Airplane plant	Resurfacing existing pavement with plant mix
Los Angeles—Mormon Island—La Paloma Ave., Falcon St. and Fries Ave.	\$31,019.65	Griffith Company	Port facilities	Portland cement concrete pavement
Los Angeles—E. Broadway, Crenshaw and Doty.....	\$38,883.63	Oswald Bros.	Airplane plants	Grade and surface with plant mix on imported base
Los Angeles—Woodley Ave. and Roscoe Blvd.	\$15,077.40	Schroeder & Co.	Naval Air Base	Plant mixed surfacing on imported base
Los Angeles—Ontario St.....	\$12,641.00	Schroeder & Co.	Airplane plant	Plant mixed surfacing on imported base
Orange—Avenida Dolores	\$6,930.70	Sully-Miller	Marine Base	Plant mixed surfacing on existing street
Los Angeles—Clybourn Ave. and Van Owen	\$35,345.13	Warren Southwest Inc.	Airplane plant	Plant mixed surfacing on imported base
Orange—Trabuco Rd. and Central Ave.	\$101,566.58	W. E. Hall	Marine Air Base	Widen and surface existing pavement with plant mix
Los Angeles—Douglas St., bet. Imperial and 1400 feet Sly.....	\$35,364.60	Olympic Contracting Co.	Airplane plant	Portland cement concrete pavement
Los Angeles—Figueroa St., bet. Anaheim St. and B Sts.; and C St. bet. Hawaiian Ave. and Figueroa St....	\$44,534.65	Griffith Company	Shipyards	Widen and pave portions with Portland cement concrete, and resurface existing pavement with plant mix
Orange—Valencia and Red Hill Ave., bet. Neptune and Rte. 2.....	\$59,271.05	State day labor	Navy lighter-than-air base	Grade and surface
Los Angeles—Atlantic and Bandini..	\$22,555.33	Vido Kovacevich	Army Air Base	Channelize and install traffic signals
Los Angeles—Glenoaks Blvd., Kenmore and Ontario St.....	\$87,343.80	Day labor, City of Burbank	Airplane plant	Widen; pave with A. C. pavement
Los Angeles—Van Owen bet. Hollywood Way and Clybourn.....	\$20,000.00	Day labor, City of Burbank	Airplane plant	Grade and surface—A. C. pavement
Los Angeles—Woodley Ave. and Saticoy St.	\$74,820.68	Griffith Company	Naval Aviation Base	Widen, and pave portions with asphaltic concrete and portions with Portland cement concrete

State of California

EARL WARREN, Governor

Department of Public Works

Headquarters: Public Works Building, Twelfth and N Streets, Sacramento

CHARLES H. PURCELL, Director of Public Works

A. H. HENDERSON, Assistant Director

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