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CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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California Counties Launch* Construction of 55 Bridges to Cost Approximately \$5,575,000

By C. L. HOLLISTER, Senior Bridge Engineer

IF YOU do not have occasion to get off the main state highway routes on to the county roads you are missing many of the beauty spots of the state. Many of these roads lead to points of great historic interest and to areas of wonderful recreational facilities; in addition they pass through some of the most fertile agricultural lands in California.

These county roads are feeders of the main traffic arteries over which pass the commercial products of forests, farms, ranches, mines and industries, which together form the vital life line of the vast rural population of the State of California.

The United States Congress of 1944 and the State Legislature of 1945 recognized these facts and allocated certain funds to assist the counties with a three-year program of county road and bridge improvements.

The counties of California have approximately 11,600 bridges of which 5,261 are inadequate and need early replacement because of structural weakness or impaired clearances. Therefore, many of the counties are wisely choosing to replace as many as possible of these structurally weak bridges from the funds made available.

Envisioned in the federal and state acts was the establishment of county highway engineering personnel in position to carry on a continuing highway and bridge program.

BIG SUMMER PROGRAM

The counties have therefore been busy the past year getting many bridge projects planned for immediate construction this summer, and it is believed that by the beginning of the summer construction season the counties will have under way 55 bridges with a total value of approximately \$5,575,000.

In order to facilitate the program, a new section in the state highway organization was created in June, 1945, under H. B. La Forge, Engineer

The architectural sketches which accompany this article were drawn by Van der Goes of the Bridge Department of the State Division of Highways.

of Federal Secondary Roads, to work with the counties toward the end outlined above. At the same time F. W. Panhorst, Bridge Engineer assigned the writer to assist on bridge projects. These engineers, along with those of the Public Roads Administration, are cooperating to their fullest extent with the counties on their bridge replacement programs in the following manner:

- (1) Working with the counties in selection of bridge sites and the most economical and serviceable type of structures.
- (2) Reviewing plans and estimates and preparing specification for advertisement.
- (3) Assisting counties with construction problems.
- (4) Advising and working with counties in maintenance and repair of these structures after completion.

COUNTIES PREPARE PLANS

Many of the counties are finding it possible to prepare bridge plans and estimates with their own forces; many are employing the services of consulting engineers, and in a few cases counties have requested assistance from the State in the preparation of their plans.

In all cases the Bridge Department is attempting to give the counties the most advanced technical service available for the design and construction of their bridges.

While the State has not requested that its standards for curbs, railings, walks, slabs, culverts, drains, and other details be used, most of the

counties realize the advisability of adopting a uniform state-wide system of bridge construction details. Such a system of standards tends to reduce construction costs, simplifies preparation of plans, and provides structures with the most serviceable details based on state-wide maintenance experience.

The first year's bridge program of the counties includes many interesting types of structures such as slabs, steel and concrete beam spans, trusses, arches, and movable spans of both the swing and vertical lift types.

Following is a list showing what each county is planning in the way of bridges to be built under the program for the first year. It also tells how the various counties are proposing to handle construction engineering on these bridge projects.

Pictures show some of the existing bridges to be replaced; and architectural sketches show some of the proposed new bridges.

BUTTE COUNTY

Bert N. Paxton, County Engineer, has under construction a bridge across South Fork of Feather River at Bidwell Bar. (See picture of existing bridge to be replaced.)

This structure is a modern reinforced-concrete girder bridge designed for heavy trucks, providing a 26-foot roadway with two small walkways. When completed it will facilitate movement of much needed lumber from this area. The State is to furnish Resident Engineer and the county is to furnish assistants.

Approximate cost, including engineering and contingencies..... \$110,000

CONTRA COSTA COUNTY

Joseph W. Barkley has plans for a bridge across Pacheco Slough, bids for which were received on March 26th.

* See articles in July-August, 1945, and November-December, 1946, "Highways and Public Works."

This structure is a hand operated swing bridge with concrete slab approaches. This structure is in an industrial area and will carry the products of steel mills and oil refineries. The county proposes to handle construction engineering with its own forces.

Approximate cost, including engineering and contingencies----- \$250,000

COLUSA COUNTY

County Surveyor de. St. Maurice is preparing to improve the capacity of the existing bridge across Sacramento River at Colusa by strengthening and providing a modern steel grid floor. This structure is in a rich agricultural land and will carry the products from farm to market. Bid opening date was April 2d. The State will furnish construction engineering.

Approximate cost, including engineering and contingencies----- \$150,000

Plans are also under way for a reinforced-concrete structure across Stone Coral Creek. It is planned to have this job under way this summer.

Approximate cost, including engineering and contingencies----- \$25,000

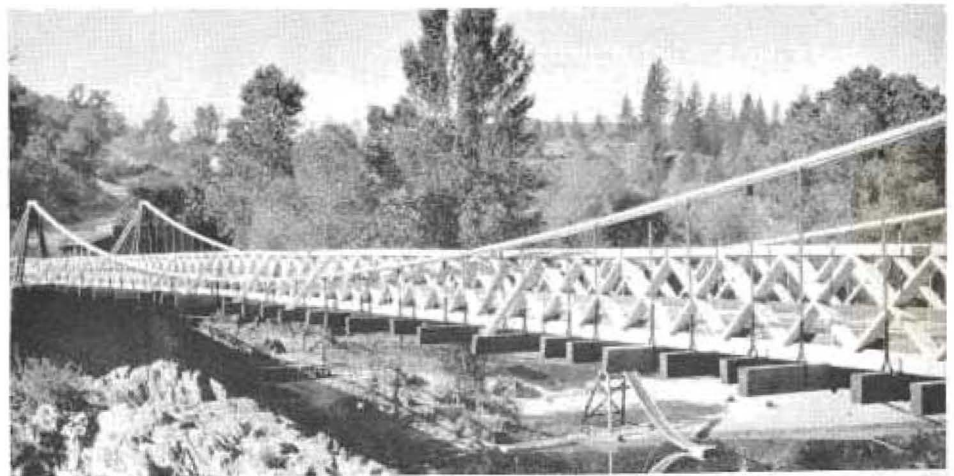
DEL NORTE COUNTY

Harry M. Malpas, County Surveyor, has plans under way for early advertisement of a bridge across South Fork of Smith River. (See architectural sketch.) This structure will be a modern steel arch, designed for a 15-ton truck and trailer, providing a 24-foot roadway. This structure when completed will facilitate movement of large quantities of timber from forest lands to the main state highway.

Approximate cost, including engineering and contingencies----- \$60,000

FRESNO AND MADERA COUNTIES

J. A. Nielsen of Fresno County and D. O. Houston of Madera County have plans for a bridge across the San Joaquin River at Firebaugh, between Fresno and Madera Counties. Bids are to be received on April 30th. This project will consist of two bridges, one across the main river and one across an overflow area. Each will consist of

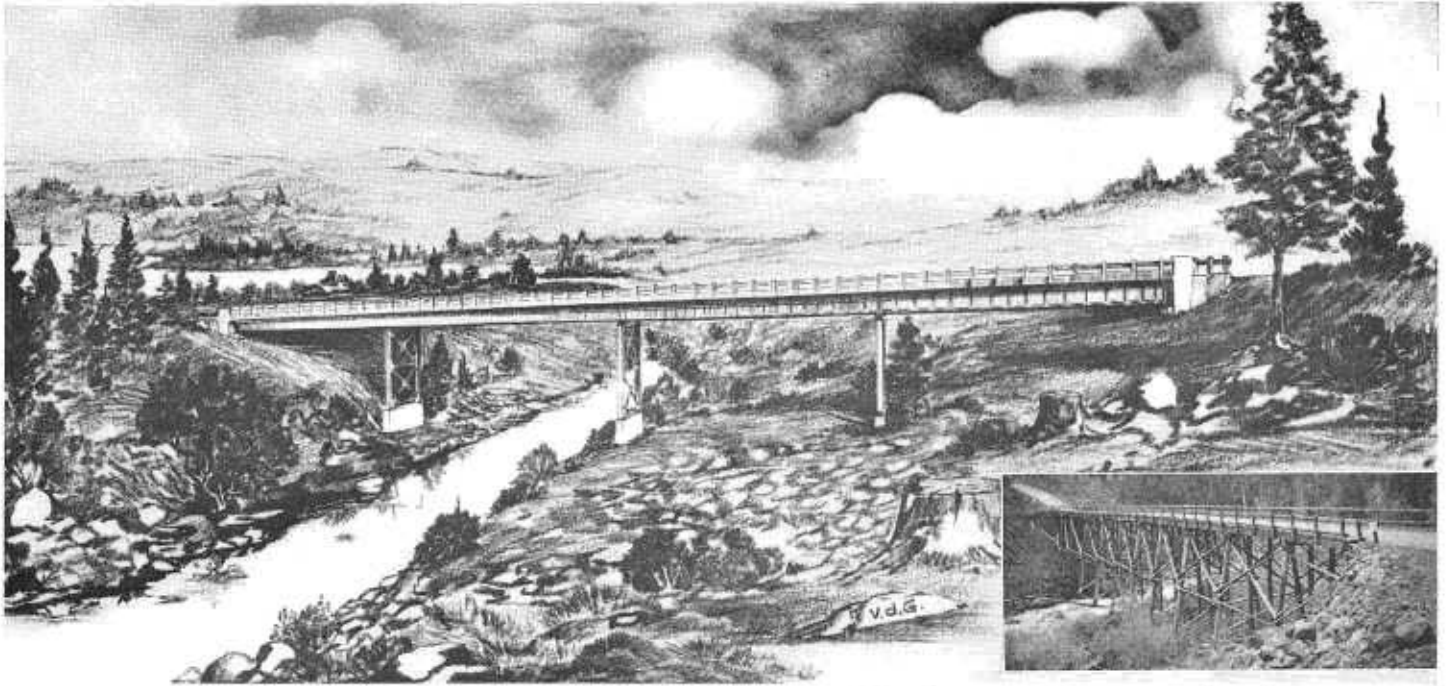


Upper—Existing bridge across South Fork of Feather River at Bidwell Bar, Butte County. Has been in use since 1856. The wire cables and wrought iron hanger rods were brought by ship around Cape Horn. When replaced it will remain as a foot bridge in the Bidwell Bar State Park. Center—This bridge is typical of many structures which are no longer able to meet the demands of highway traffic and must be replaced as soon as possible. Lower—Russian River Bridge at Hacienda, Sonoma County. A one-way bridge, originally designed for a single track railroad, which for many years has been used as a highway bridge. Reconstruction will provide for spreading the trusses and building new concrete approaches so as to make clearances for two lanes of traffic

a series of steel stringer spans with a 26-foot roadway. The structure is in a rich agricultural area and will facilitate the movement of products from farm to market. It is tentatively planned to have the State handle construc-

tion engineering for the two counties, with assistance from the Counties on inspection and stake out.

Approximate cost, including engineering and contingencies----- \$360,000



This structure is a series of steel girder spans consisting of one main span 90 feet long, two 80 feet long, and one 70-foot approach span. It is located near Lake Almanor in Plumas County, is now under construction, and will be completed early this spring. Insert—Existing structure which will be replaced

GLENN COUNTY

August J. Hoever, County Surveyor, has plans under way for a bridge across Willow Creek. This structure will be a modern reinforced concrete slab bridge designed for heavy trucks, facilitating the movement of timber, cattle and sheep from the area east of Willows. The county proposes to handle construction engineering.

Approximate cost, including engineering and contingencies---- \$20,000

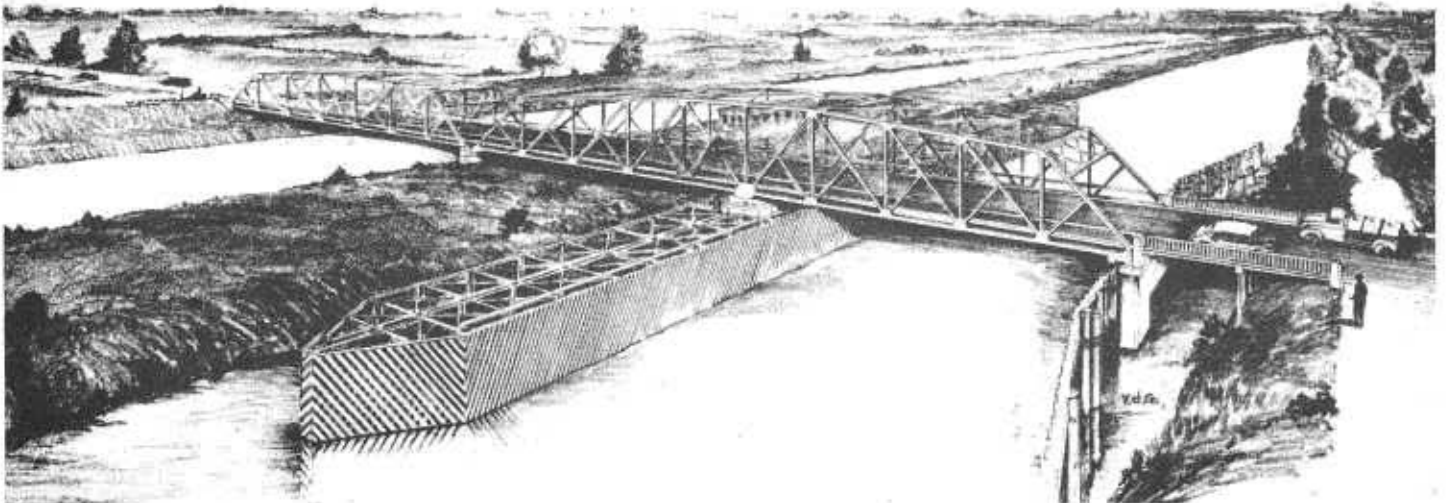
HUMBOLDT COUNTY

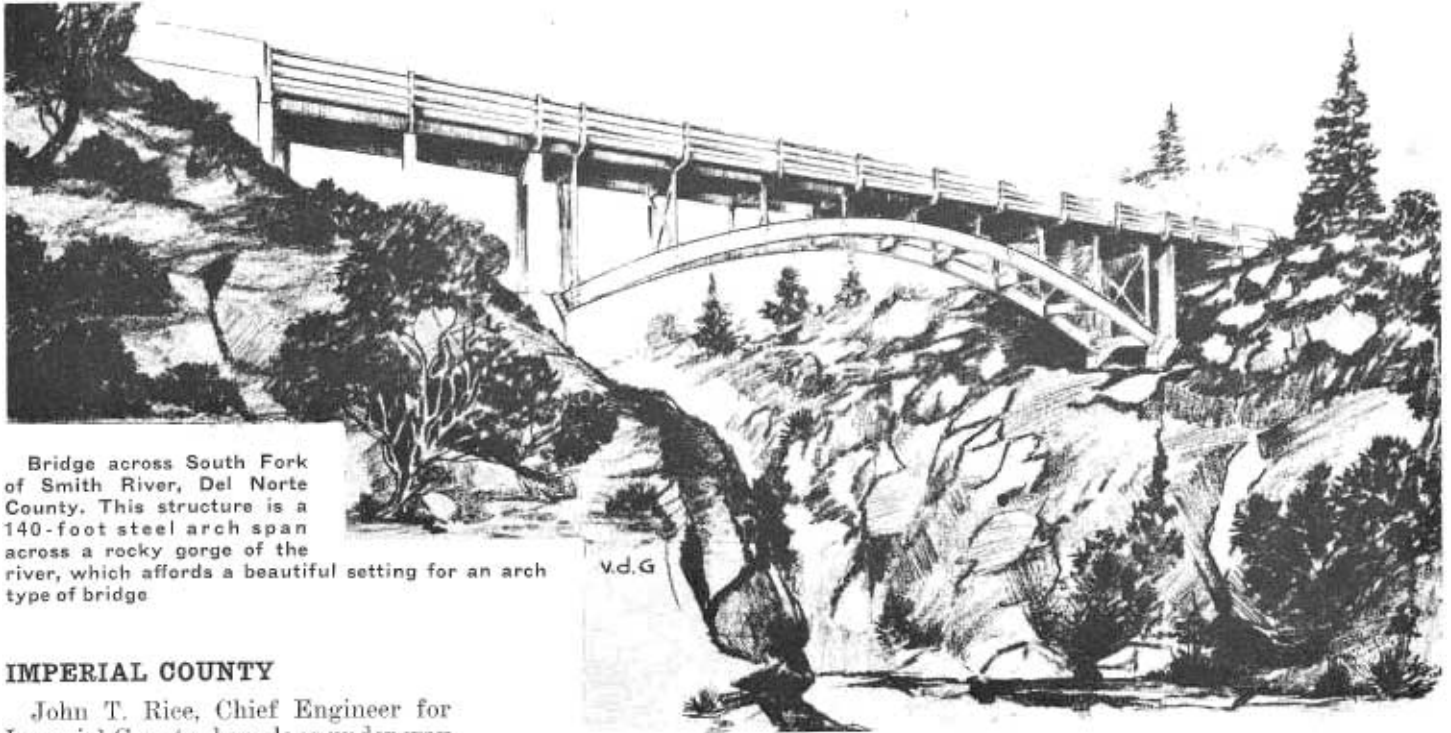
Frank E. Kelly has plans under way for the improvement and re-flooring of the bridge across the South Fork of Eel River at the entrance to Whitmore Grove State Park. The existing structure is restricted to one-

way traffic. The improvement will allow for two lanes of traffic and greatly facilitate the movement of large amounts of forest products from the area west of the Park to the state highway.

Construction engineering has not yet been worked out with the county. Approximate cost, including engineering and contingencies---- \$45,000

Bridge across Grant Line Canal. Is located on the Tracy Island Road in San Joaquin County. It is to be a modern electrically operated swing span to allow for the passage of boats





Bridge across South Fork of Smith River, Del Norte County. This structure is a 140-foot steel arch span across a rocky gorge of the river, which affords a beautiful setting for an arch type of bridge

IMPERIAL COUNTY

John T. Rice, Chief Engineer for Imperial County, has plans under way for a bridge across Tamarack Canal. This structure will be built as a part of a road contract, which when completed will speed the movement of early spring fruits and vegetables to market.

It is tentatively planned for the State to handle construction engineering with county assistance.

Approximate cost, including engineering and contingencies --- \$35,000

INYO COUNTY

A. A. Brierly, County Surveyor, has two timber bridges to be constructed with a road project. These structures are located in an agricultural area about four miles east of Bishop.

Approximate cost of bridges, including engineering and contingencies ----- \$65,000

KERN COUNTY

J. R. Thornton, County Surveyor, proposes to readvertise for construction of a bridge across Kern River. Bids were received in February and rejected because of high prices. This structure is located in an agricultural area to the west of Bakersfield. The county proposes to handle construction engineering with its own forces.

Approximate cost, including engineering and contingencies -- \$85,000

KINGS COUNTY AND FRESNO COUNTY

J. R. Hayes, Kings County Engineer, and J. A. Nielsen, Fresno County Engineer, have proposed the Kings River Bridge at Hardwick, between Kings and Fresno Counties, bids for which were received April 9th. This structure is a modern reinforced concrete girder design with a 26-foot roadway. It is located about seven miles northeast of Hanford in a rich agricultural area.

Kings County is to provide construction engineers from its forces.

Approximate cost, including engineering and contingencies --- \$180,000

LOS ANGELES COUNTY

O. F. Cooley, County Road Commissioner, has plans complete for the largest bridge program of any county. The following three jobs are being made ready for early advertisement.

Los Angeles River Bridge at Florence Avenue

This job is a series of 83-foot concrete girder spans with a four-lane roadway and two sidewalks. It will facilitate the movement of heavy traffic in an industrial area of Los Angeles County.

Approximate cost, including engineering and contingencies --- \$475,000

San Gabriel River Bridge

This job consists of four 150-foot steel deck truss spans with a 26-foot roadway and two sidewalks. It is located in the San Gabriel Mountains and serves a popular recreational area.

Approximate cost, including engineering and contingencies --- \$540,000

Santa Clara River Bridge and Southern Pacific Railroad Overhead

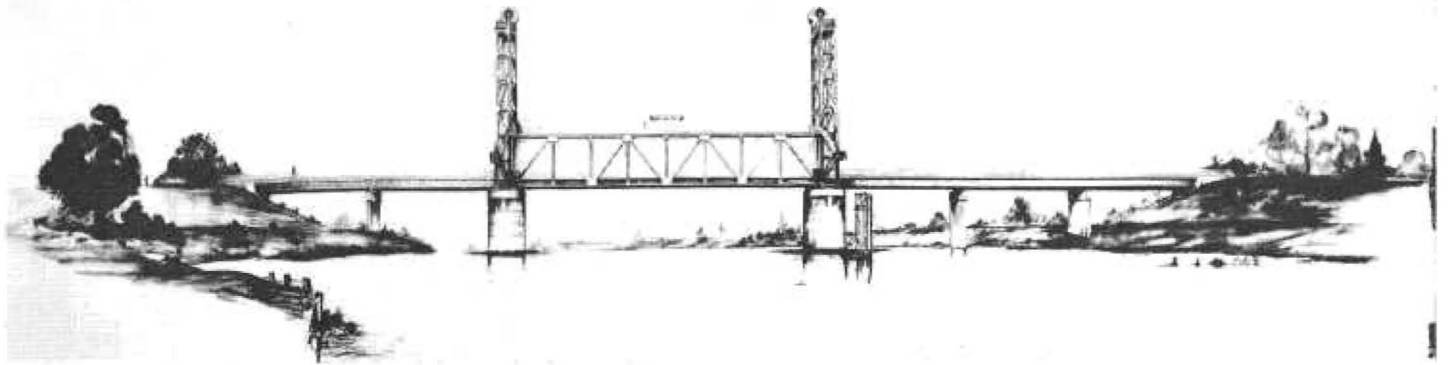
This structure consists of two 145-foot and two 106-foot girder spans with a 26-foot roadway. This structure is located in the Santa Clara River Canyon and will carry heavy trucking between Palmdale and Los Angeles.

Approximate cost, including engineering and contingencies --- \$300,000

Bridge Engineer S. R. Kennedy of Los Angeles County has prepared the design for these structures and will handle construction engineering with the county's engineering staff.

MADERA COUNTY

D. O. Houston, County Surveyor, has plans ready for a bridge across Fine Gold Creek for which the bid opening date was April 2d. This structure is a steel stringer design with 24-foot roadway and will facilitate the



Napa River Bridge. This structure is to be located on a new county road cutoff south of Napa. It is a 90-foot vertical lift type to facilitate movements of boats on the river

hauling of timber from forest lands from the mountain slopes east of Madera.

The State will provide construction engineering with assistance from the county.

Approximate cost, including engineering and contingencies --- \$95,000

MARIPOSA COUNTY

County Surveyor F. A. Casaccia, proposes to have under construction early this summer six small bridge structures across De Long Creek, Bear Creek, Corbett Creek, Middle Fork Chowchilla Creek, North Fork Chowchilla Creek and Pegleg Creek.

It is tentatively planned that the State will furnish construction engineering with assistance from the county.

Approximate cost, including engineering and contingencies ---- \$95,000

MENDOCINO COUNTY

Russell Cummins, County Surveyor, proposes to have under construction early this summer two bridges, one across Chamberlain Creek which will serve a vast area of forest lands, and one across Morrison Creek which will serve a rich agricultural area.

The county proposes to provide for construction engineering from its own staff.

Approximate cost of the two bridges, including engineering and contingencies ----- \$55,000

MONTEREY COUNTY

Howard F. Cozzens has plans ready for early advertisement of a railroad grade separation structure. The struc-

ture will provide for two lanes of traffic over the main line tracks of the Southern Pacific Company south of Salinas. The new structure and highway will facilitate the movement of a large volume of traffic between a new industrial area and a new housing area which are now separated by the railroad. (See architectural sketch.)

It is tentatively planned for the county to handle construction engineering on this project.

Approximate cost, including engineering and contingencies --- \$250,000

NAPA COUNTY

Ed. P. Ball, County Engineer, has plans for a bridge across Soda Springs Creek. This structure is to be built in conjunction with a road project for the improvement of the Silverado Trail Road which serves the east side of the rich Napa Valley agricultural area.

County engineering staff will handle construction engineering.

Approximate cost of bridge, including engineering and contingencies ----- \$15,000

Napa County also has planned for the future a road and bridge project between the two main highways south of Napa. This project will provide a cut-off and relieve the city streets of a great deal of heavy traffic including a large volume of trucking. The bridge will span the navigable Napa River and will be a vertical lift type as shown in architectural sketch.

Approximate cost of bridge, including engineering and contingencies ----- \$300,000

PLUMAS COUNTY

A. J. Watson, County Surveyor, now has under construction a bridge across Hamilton Branch. (See architectural sketch.) This new bridge and road will facilitate the movement of lumber and serve a large recreational area in the vicinity of Lake Almanor.

The State is handling construction engineering with assistance from the county.

Approximate cost, including engineering and contingencies --- \$75,000

SACRAMENTO COUNTY

Edwin A. Fairbairn, County Engineer, has three bridge projects under way.

The Laguna Creek Bridge (see picture of completed structure) is located just north of Elk Grove. It facilitates the movement of farm products in this area. Plans were prepared by the county. The State is handling construction engineering with assistance of the county engineering staff.

Approximate cost, including engineering and contingencies --- \$35,000

The bridge across Bear Slough is now under construction and when completed will serve a large agricultural area. (See picture of existing bridge with work under way for new construction.) New bridge is a series of reinforced concrete slabs with a 26-foot roadway.

Plans were prepared by the county. The State is handling construction engineering with assistance from the county.

Approximate cost, including engineering and contingencies --- \$80,000



Laguna Creek Bridge. This structure is just north of Elk Grove in Sacramento County and is the first bridge to be completed under the present program. It is a modern reinforced concrete slab structure with a 30-foot roadway and was designed by the county

The bridge across Arcade Creek on Madison Avenue is now under construction. It will serve a farm and suburban home area. Construction engineering is being handled by the State with assistance from the county.

Approximate cost, including engineering and contingencies..... \$20,000

SAN BERNARDINO COUNTY

Howard Way, County Engineer, has prepared plans for two bridges, one across Santa Ana River and the other across Timoteo Creek. Bids were received March 6, 1947. These bridges are of the steel stringer type, with a 30-foot roadway and 2-foot walkways. These bridges and road when completed will provide an important traffic artery which is now cut off during flow of water in Santa Ana River.

The county will handle construction engineering on this project.

Approximate cost of bridges, including engineering and contingencies \$260,000

The county also proposes another bridge of similar type across City Creek. Plans are now being processed by county and the job should be under construction this summer.

Approximate cost, including engineering and contingencies.... \$60,000

SAN JOAQUIN COUNTY

Julius B. Manthey, County Engineer, plans two bridges under the first year's program, one across the Mokelumne River on Peltier Road, bids for which were received on April 9th. This structure will provide new facilities for the movement of farm products across the river between Thornton and the main State highway north of Lodi. This structure consists of one 150-foot through steel truss span with

730 feet of reinforced concrete slab approach spans. A 24-foot roadway is provided.

The county will provide for construction engineering on this project.

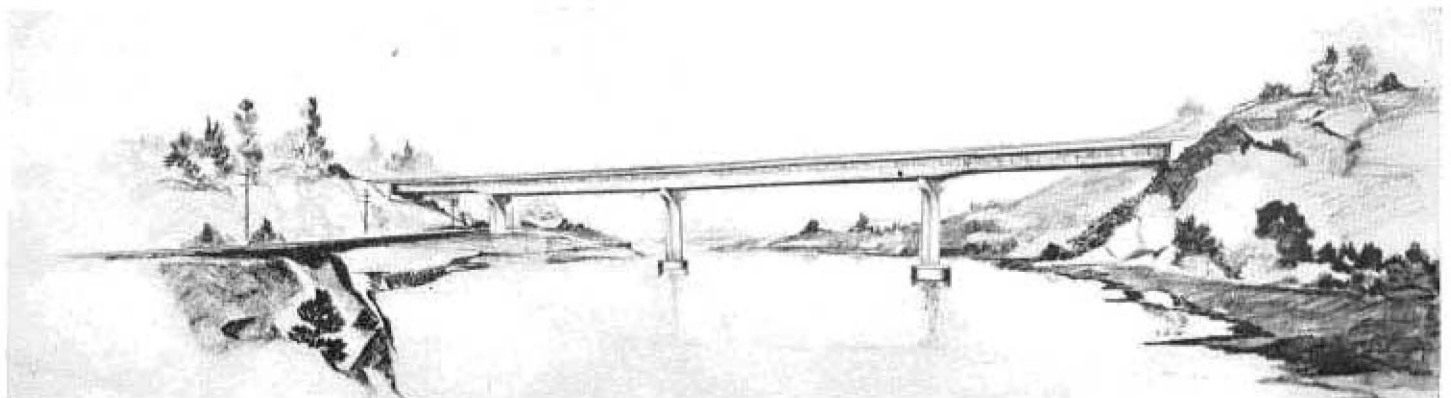
Approximate cost of bridge, including engineering and contingencies \$200,000

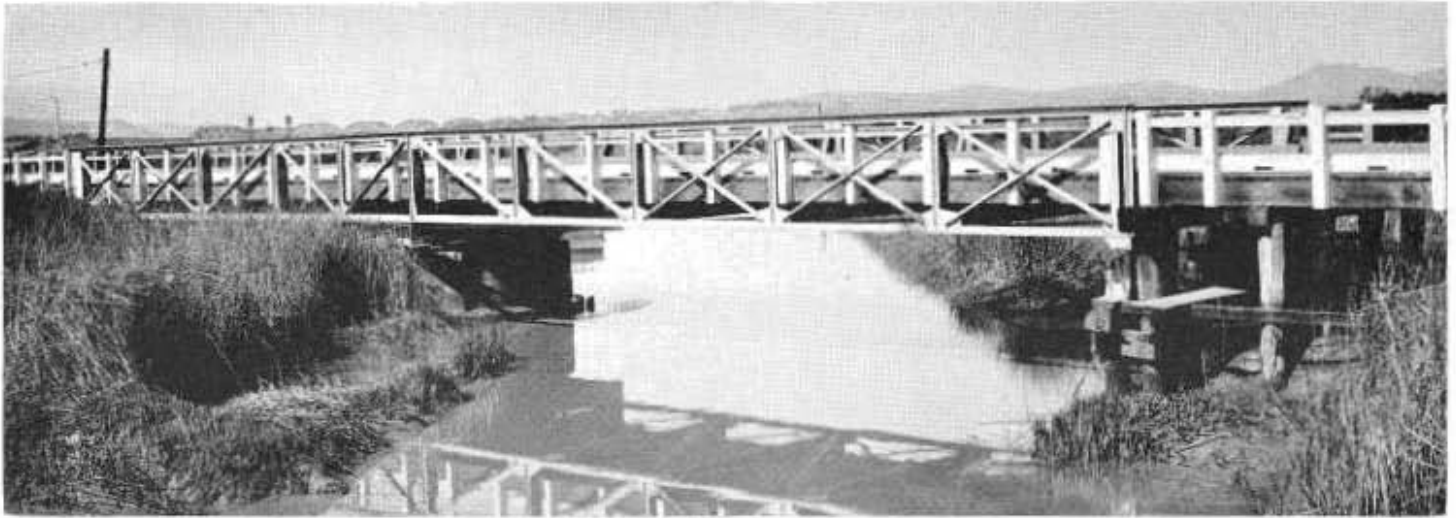
The other bridge project planned for early advertisement is the Grant Line Canal Bridge on the Tracy Island road. (See architectural sketch.) This structure will facilitate the movement of large quantities of fruits and vegetables to canneries. This structure will consist of a 250-foot electrically operated swing span with a 150-foot through steel truss approach span. A clear 24-foot roadway is provided.

The county will handle construction engineering with its own forces.

Approximate cost, including engineering and contingencies.... \$375,000

Santa Clara River Bridge and Southern Pacific Company Overhead. This structure is located in Santa Clara River Canyon, Los Angeles County. It consists of two 145-foot and two 108-foot girder spans. It crosses the canyon on a sharp skew and to simplify girder fabrication, single leg piers are used to eliminate necessity of skewing girders. Designed by county.





Existing bridge across Pacheco Slough Bridge in Contra Costa County which is to be replaced

SANTA CLARA COUNTY

R. B. Chandler, County Surveyor, has two bridge widening projects under construction.

The existing 48-foot concrete arch at Llagas Creek is being widened under a road contract. This job is located just east of Gilroy and the project when completed will serve a rich agricultural area.

The Stevens Creek Bridge about 8 miles west of San Jose is also being widened along with a road project. This structure will facilitate the movement of cement and agricultural products to market.

The State is handling construction for the county on these projects.

Approximate cost of bridge work..... \$75,000

SANTA CRUZ COUNTY

Arnold M. Baldwin, County Surveyor, has the Corralitos Creek Bridge project ready for immediate advertisement. This project is located about one mile north of Watsonville and serves a rich agricultural and recreational area. The structure is a 70-foot reinforced concrete girder frame with two 19-foot cantilever end spans. A 30-foot roadway with two 3-foot 6-inch sidewalks is provided. The county tentatively plans to handle construction engineering with its own forces.

Approximate cost of bridge, including engineering and contingencies \$60,000

SOLANO COUNTY

Will A. Jones, County Engineer, has five bridges for construction. Bids were received March 12th. Two bridges

are across Pleasants Creek, two across Alamo Creek and one on a tributary to Putah Creek. These structures are located in Pleasants Valley, all within nine miles of Vacaville.

This is a farming and recreational area and is especially beautiful in the early spring.

The county will handle construction engineering with its own forces.

Approximate cost, including engineering and contingencies --- \$100,000

SONOMA COUNTY

Marshall M. Wallace, County Surveyor, has two bridges planned. The Russian River at Hacienda (see pic-

ture of existing bridge) is now under construction. It consists of widening existing railroad bridge piers and spreading the 200-foot span railroad trusses to provide for a 24-foot roadway and two four-foot sidewalks. In addition, 330 feet of concrete girder and approach spans are under construction.

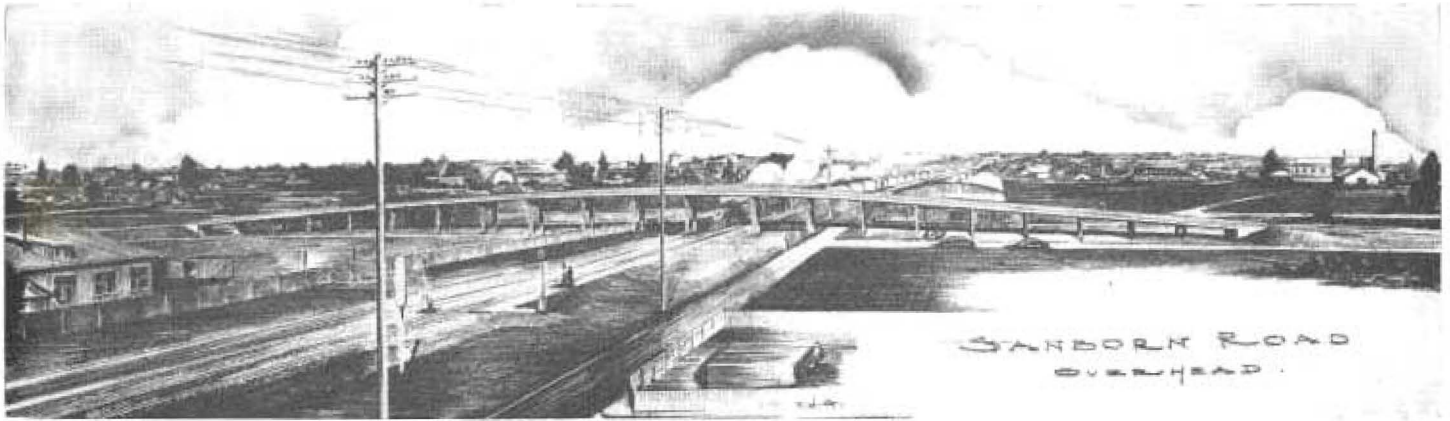
The county is providing construction engineering for the project.

Approximate cost, including engineering and contingencies --- \$140,000

Sonoma County also has plans completed for another bridge across the Russian River. This structure is lo-

Bear Slough Bridge, Sacramento County. This picture shows a portion of the existing structure with construction forms under way for new bridge





Sanborn Road Overhead. Crosses the main line tracks of the Southern Pacific Company south of Salinas, Monterey County. It is a series of steel stringers supported on concrete bents. The overhead is designed for two-lane construction with provisions for widening to a four-lane divided highway. Designed by county

ated a few miles northeast of Healdsburg at Jintown. The county plans to advertise this project early next spring and when completed it will serve a rich farming area facilitating the movement of its produce. The required length of this structure to provide for the flood waters of Russian River is 1,384 feet. The structure consists of 524 feet of continuous 120-foot pony truss spans over the main channel, with 860 feet of concrete girder and slab approach spans.

The county will handle construction engineering.

Approximate cost, including engineering and contingencies --- \$380,000

STANISLAUS COUNTY

George D. Macomber, County Engineer, has plans ready for immediate advertisement for a bridge across the Tuolumne River about five miles east of Modesto, near Empire. This new structure will replace an old bridge in dangerous condition and will facilitate the movement of produce from farm to market and heavy trucking in this rich agricultural area. The new structure will be about 500 feet long and consist of a series of modern 75-foot continuous concrete girder spans.

It is tentatively planned that construction engineering will be handled by county forces.

Approximate cost, including engineering and contingencies --- \$140,000

TEHAMA COUNTY

Charles A. Luning has plans ready for the immediate replacement of six inadequate and structurally unsafe bridges.

Thomes Creek Bridge at Henleyville, proposed for immediate advertisement, will facilitate the movement of forest products from the mountain slopes west of Red Bluff and Corning.

The structure consists of six 50-foot steel stringer spans with a 24-foot roadway.

Final arrangements for construction engineering have not yet been decided on by the county.

Approximate cost, including engineering and contingencies --- \$115,000

The new Reeds Creek Bridge, one mile south of Red Bluff will replace an inadequate and structurally unsafe bridge. When completed, it will facilitate the flow of trucking and farm products.

The new structure will consist of four 50-foot steel stringer spans with a 24-foot roadway.

Arrangements for construction engineering have not yet been decided by the county.

Approximate cost, including engineering and contingencies --- \$80,000

The new Elder Creek Bridge at Gerber will replace another structurally unsafe bridge, and will facilitate the movement of farm products to market.

This new structure consists of four 50-foot steel stringer spans with a 26-foot roadway.

Approximate cost, including engineering and contingencies --- \$80,000

The new Reeds Creek Bridge, two miles west of Red Bluff, will replace another inadequate structure and will

facilitate the movement of farm products.

It will consist of three 50-foot steel stringer spans with a 26-foot roadway.

Approximate cost, including engineering and contingencies --- \$60,000

The new Paynes Creek Bridge at Doles will facilitate the movement of forest products from the forest north east of Red Bluff. The structure will consist of four 50-foot steel stringer spans with a 24-foot roadway.

Approximate cost, including engineering and contingencies --- \$90,000

The new Thomas Creek Bridge at Paskenta, will facilitate the movement of ranch and forest products from the west of Corning and Red Bluff. The structure will consist of 50-foot steel stringer spans with a 24-foot roadway.

Approximate cost, including engineering and contingencies --- \$75,000

TULARE COUNTY

Tulare County has an extensive bridge construction program planned for immediate construction. T. W. Switzer is County Surveyor.

The county program calls for the construction of ten bridges: Kings River, White River, Porter Slough, Deep Creek, Outside Creek, Irrigation Canal, two bridges across the St. Johns River and two across the Tule River. These projects will all serve the rich agricultural lands of Tulare County and facilitate the movement of fruits, vegetables and grain to market.

Bids are to be received for the White River Bridge on April 16th. It consists of four concrete slab spans with a total

(Continued on page 20)

Controlled Settlement of Steel Transmission Towers by Use of Explosives

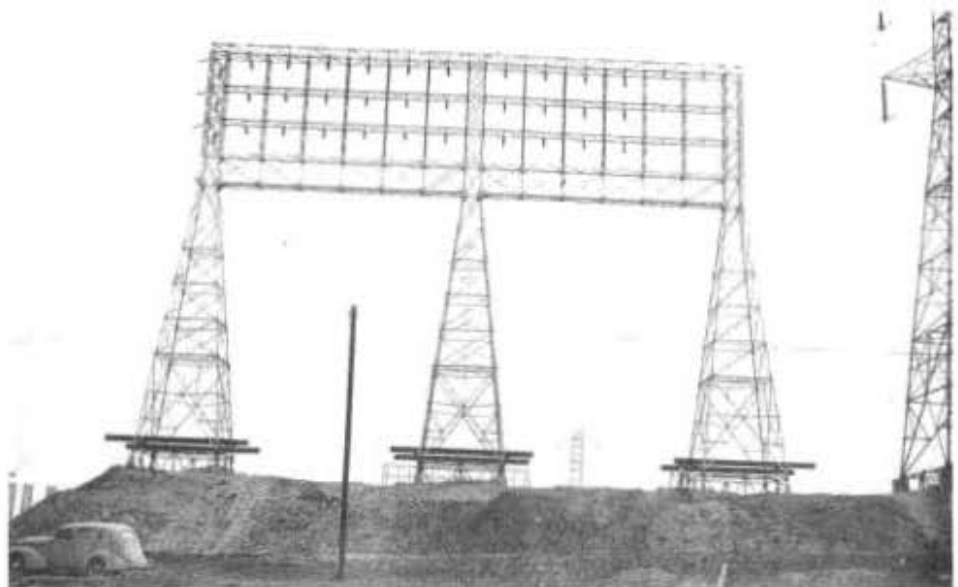
By S. V. CORTELYOU, District Engineer

ON A PORTION of Route 60, in Long Beach, the State has under contract a section of roadway which eliminates grade crossings at an intersection with the new Terminal Island Freeway. Overhead crossings are to be provided for at the Terminal Island Freeway, Union Pacific Railroad tracks, and the Los Angeles Harbor Department classification tracks.

Plans include relatively high fills on unstable ground between overhead structures. Located just west of the Union Pacific track and adjacent to the new Pacific Coast Highway is a three-tower transmission structure owned by the Southern California Edison Company. The structure shown on the above photograph is one of the Edison Company's 66,000-volt transmission line towers.

In order to provide rapid settlement of highway fills, sand drains excavated to an approximate depth of 40 feet were placed beneath embankments at

Detail of base plate installed by Southern California Edison Company for final tower adjustment



South view of three tower transmission structure showing counterweight fill. I-beam attached to tower bases are for final jacking and leveling

approximately 12-foot centers. Also, sand drain with counterweight fill is provided around the Edison Company's transmission towers. Tower legs were encased with concrete to the height of the counterweight.

Agreement between the State Division of Highways and the Edison Company provided for leveling of the towers by means of base plates of variable length, bolted above the new ground line after final settlement. It was further provided, however, that differential settlement during the placing of the counterweight fill must be limited to three inches in line with the three towers and to one-inch transverse to the tower structure.

After completion of sand drains and placing a portion of the counterweight fill around the towers it became apparent that, due to the proximity of the Union Pacific tracks and the existing roadway to the east tower, differential settlement of the structure could not be controlled by surcharge alone. The east tower appeared to offer more resistance to settlement where additional load could not be placed.

At the suggestion of Mr. Jordan Q. Lummis, Transmission Engineer for

the Southern California Edison Company, it was decided to try placing a small explosive charge beneath each of the east and center tower footings where the rate of settlement had decreased. At this time the east tower of the structure had settled about 0.35 foot, the center tower about 0.45 foot, and the west tower about 0.60 foot. The west tower was continuing to settle about 0.02 foot per day while the others were practically stationary.

The following day eight four-inch pipes were jettied beneath the four footings of the east and center towers. Approximately five feet beneath each 4-foot by 4-foot concrete spread tower footing of the east tower, an average of $\frac{1}{4}$ of a stick of 40 percent dynamite was placed. The center tower was similarly loaded through the four-inch pipes with an average of $\frac{1}{2}$ of a stick beneath each footing. Pipes were raised and partially backfilled with sand before charges were exploded. Charges were placed below ground water level.

Except for a slight movement of the insulators no vibration in the tower structure was visible.

(Continued on page 28)

U. S. Highway 99 Reconstructed in Redlands

RECONSTRUCTION of U. S. Highway 99 through East Redlands has been recently completed and is being used by public traffic. This modern, four-lane, divided limited freeway has been designed to serve the heavy mixed types of traffic efficiently with abutting commercial development prevented. The roadside and divided strip were effectively seeded and planted to prevent destructive erosion, as well as to preserve the natural beauty of the area.

Through traffic has long had difficulty and delays passing through the Redlands area. The sharp turns and steep grades on the old two-lane route made overtaking and passing difficult for the faster cars, with continuous congestion being the rule.

Redlands is situated in a picturesque and fertile orange growing area. It is the first point at which tourists entering the State by the southern route admire the typical Southern California scene, dominated by orange groves and palm trees.

This project, 2.8 miles long was constructed by contract (Matich Bros.) at a cost of \$310,000. The limited access right of way was acquired for an additional \$40,000.

The new highway follows through hilly terrain and carries traffic from the Los Angeles metropolitan area through Colton toward the Beaumont Junction of U. S. Highways 60 and 70.

A number of utilities, mostly water lines, had to be re-routed or lowered where they crossed the job. The most difficult of these was a 24-inch irrigation main which leads down from Big Bear Lake and irrigates hundreds of acres of citrus orchards in the Redlands region. The nearest shut-off valve was at Big Bear, at least 15 miles from the job. With bulldozers and carryalls working on nearby excavation, the possibility of an accidental break of this line was so pronounced that Project Manager John Matich decided to locate the line definitely and get it re-routed as soon as possible. It was surveyed and then located by a gang of laborers working with shovels. Once having flagged, the line was undisturbed, where it crossed the highway right of way, until a new re-location could be placed by construction forces.

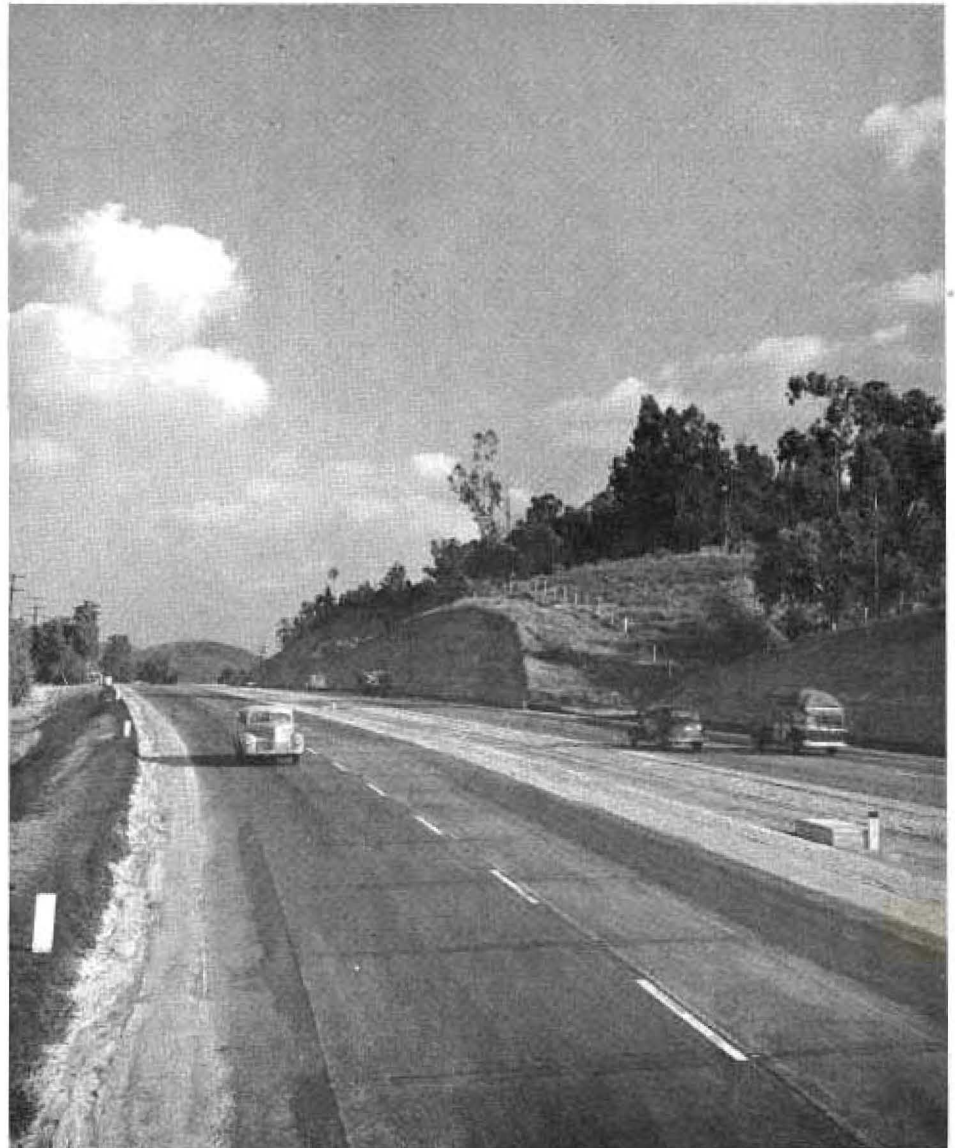
The water was shut off at Big Bear 24 hours in advance of the joining of the new-laid section, and the surplus water drained off through a bypass siphon.

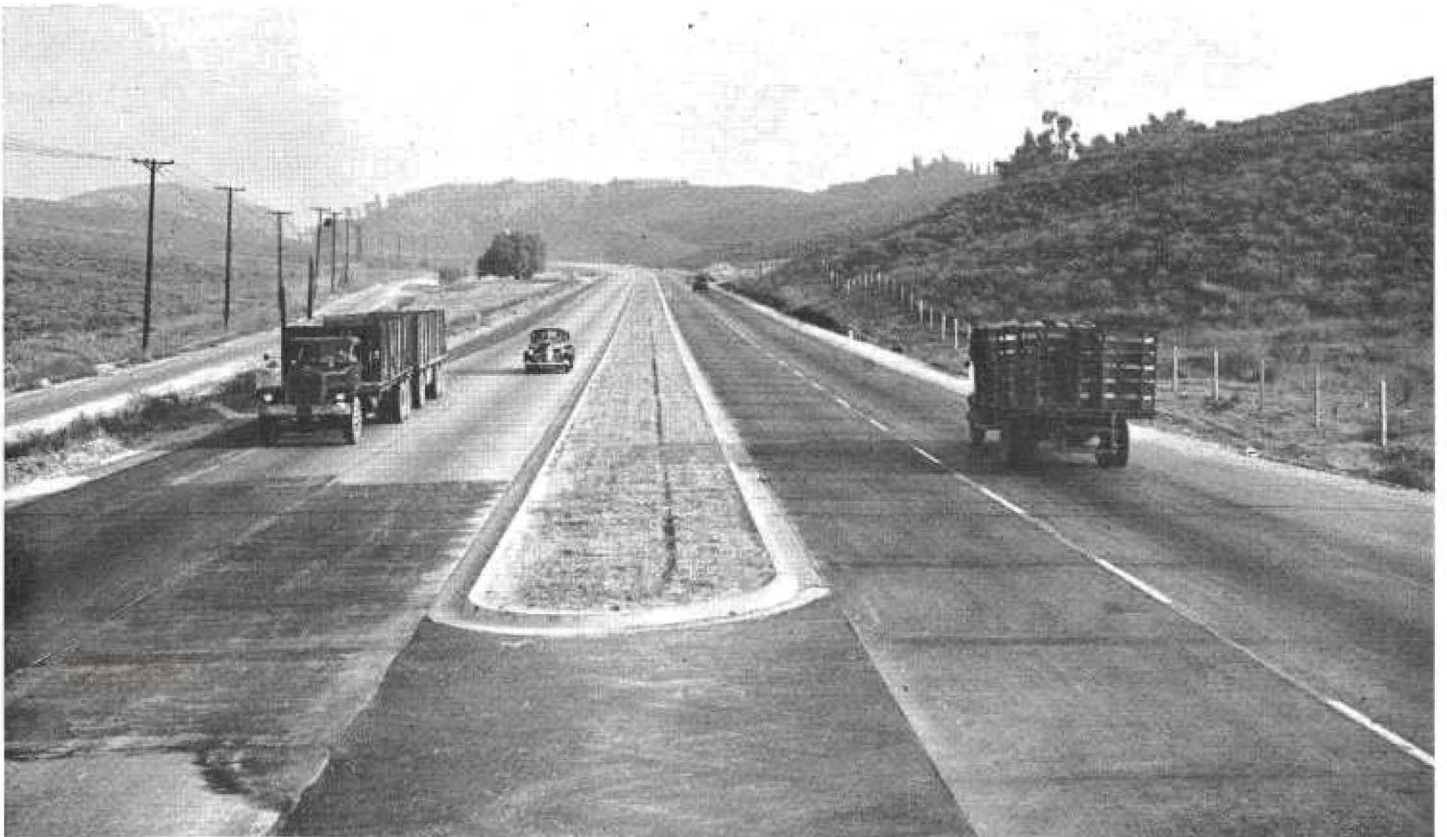
Three bulldozers were used to pioneer the heavy portions of highway cuts where the top of the backslope met the existing ground. As soon as a bench had been opened up wide enough to allow carryall passage, three 30-cubic-yard carryalls were brought in and hooked to the tractors. The cuts through this section consisted of an

8-foot crust of clay, then a 20-foot layer of alluvial conglomerate, turning into sand at the bottom of the cuts.

Excavation work was speeded up considerably by pre-watering the borrow. Water percolated through the conglomerate very satisfactorily, resulting in better loading of carryalls and faster compaction where the borrow was processed in fills. A 25-cubic yard earthmoving scraper with a D-8 prime mover was also brought in and used on tractor excavation.

Freeway relocation of U. S. Highway 99 looking easterly from the City of Redlands. On opposite page—Upper—View at the beginning of the divided highway, showing the Fern Street channelization at grade and new alignment in background. Lower—Typical revision of existing modern two-lane highway to a four-lane highway. Expansion was performed with virtually no loss of investment





New Methods Developed for Joint and Crack Sealing of Concrete Pavements

By H. L. COOPER, Assistant Maintenance Engineer

IT IS generally agreed that the sealing of all joints in concrete pavements is the best insurance, from an economic standpoint, for satisfactory base conditions and that a longer service life for concrete pavements will result.

Proper sealing prevents the entrance of pebbles and fine inert material which in time would fill the joints and decrease the designed allowance for expansion of the concrete and result in spalling or even occasional "blow-ups."

The most serious result of open joints is the tendency for water to collect during rains and penetrate to the subgrade in the joint areas. This applies to joints along the pavement edges, as well as the transverse joints, if both are not properly sealed. This water if allowed to remain starts what is commonly known as "pumping" with subsequent pavement failure.

IMPORTANCE OF JOINT SEALING

The desirability of using a joint sealing material which will provide for continued satisfactory performance of concrete slabs is important. It has been found that various joint fillers of the asphalt type will not effectively seal joints in concrete pavement under all conditions. Some mixtures become brittle in cold weather and do not adhere to the concrete. In warm weather, some materials may become so soft as to flow onto the shoulders or extrude from the crack and be tracked away by traffic.

Several years ago, an asphalt-latex mixture was used to fill joints on new construction. This material contained rubber and was very effective in sealing joints. It retained its ductility within the temperature ranges required and adhered to the walls of the joint as well. The war stopped the use of this material on account of the rubber shortage and it is only recently that it has become available.

Experiments are now under way by Headquarters Laboratory and the Maintenance Department, using various types and combinations of asphalts and commercial rubber synthetic latex

products. These tests include use of filler materials to determine the best and most economical materials for use as a joint filler, which will be reasonably ductile within normal temperature ranges, which will remain adhesive to the walls of the joint and will neither become so brittle as to chip out in cold weather nor so soft as to extrude in hot weather.

TWO MIXTURES USED

Until such time as the ideal product is determined, State Maintenance forces are using in general a mixture of 70 percent 31-40 penetration air-blown asphalt and 30 percent SC6 liquid asphalt. For some sections of the State, this mixture has been found to be too brittle and a 60 percent-40 percent mix is more suitable.

Maintenance crews have mixed the two grades in the field in the past with varying degrees of success. In 1946 it was possible for the first time to purchase state specification joint sealing compound in five-gallon cans, already blended. This procedure has resulted in a more uniform and acceptable filler. In a few cases, it has been arranged to purchase the blended material direct from the refinery delivered to the tank truck at the desired temperatures.

Previous to this year, all joints and crack sealing was done with hand pouring cornucopias, the material being heated in the 110-gallon or 165 gallons asphalt kettles. The work was slow and tedious by this method. In 1946, an effort was made to increase the output and decrease the cost of the work by using a full circulating hose and nozzle arrangement connected direct to the hot asphalt supply. The assembly was made up in the Headquarters Shop, using two $\frac{3}{4}$ inch metallic hoses connected to a $\frac{1}{4}$ inch nozzle having a long handle, consisting of two sections of pipe and a wheel 10 inches in diameter, mounted ahead of the outlet to carry the weight of the unit.

The nozzles have a quick opening needle valve, operated by means of a ratchet hand throttle from the top of the long handle which permits a steady

control of the low flow of asphalt into the joint. This discharge tip has been improved and as now constructed divides the flow into two streams. The smaller stream ahead tends to drive the air out of the joint and the second stream then fills the joint without side splash.

Two of these full circulating assemblies were attached to the rear end of the special 940-gallon heating tank arrangement which had been developed for use on asphalt sub-sealing work. These large units were used in the development work as they were available; however, a 400-gallon asphalt kettle in District VI has been equipped with these nozzles. It appears that use of these kettles instead of the large outfit will be more economical. After a period of trial with the new equipment, it was evident that the metallic hose arrangement was somewhat unwieldy and even presented some hazard to operators of the equipment as the material must be applied at a temperature of from 350 degrees to 400 degrees Fahrenheit, although pressures used are the minimum required for flow of the material. At these temperatures, a burn could result from casual contact with the hose and if a hose should break and an operator be sprayed with the hot asphalt the burn could be a serious one. Fred Bushling, mechanic in the District VII, then designed a full circulating pipe assembly to replace the hose unit. Swivel joints constructed to operate under high temperatures were used in the assembly to provide for sufficient side movement of the nozzle and allow the operator to follow the joint easily. This assembly is attached to the rear and side of the tank. Whenever work is stopped at the end of the day, a valve is closed at the tank and the pipe assembly disconnected and flushed out with distillate so that it is clean and ready for the new start.

NEW EQUIPMENT

The truck carrying this equipment is operated at a speed of from one and one-half to less than two miles per hour so that the nozzle men can follow along

on foot. However, a seat consisting of a plank and later of bucket type metal seats were soon installed for their convenience.

The center longitudinal joint and the joint along the pavement edge can be filled in one operation with a return trip necessary to fill the opposite pavement edge. During the return trip, the second nozzle is used to fill any sections of the center not completely filled on the first trip. An efficient job of joint sealing is obtained with the equipment operating at a speed of from 1.5 to 1.8 miles per hour. The asphalt is poured at a temperature of from 350 degrees to 400 degrees Fahrenheit. District VII has poured an average of 13½ miles of longitudinal joints per day with a maximum of 19¼ miles of longitudinal joints poured on one day.

No improved method has been devised to date to pour the transverse joints and cracks with the above equipment, consequently, all transverse joints are poured by hand with the cornucopias. However, in some cases the work has been expedited by the use of the large heating tank to replenish the supply in the asphalt kettles for the men using the hand pouring pots.

COSTS VARY GREATLY

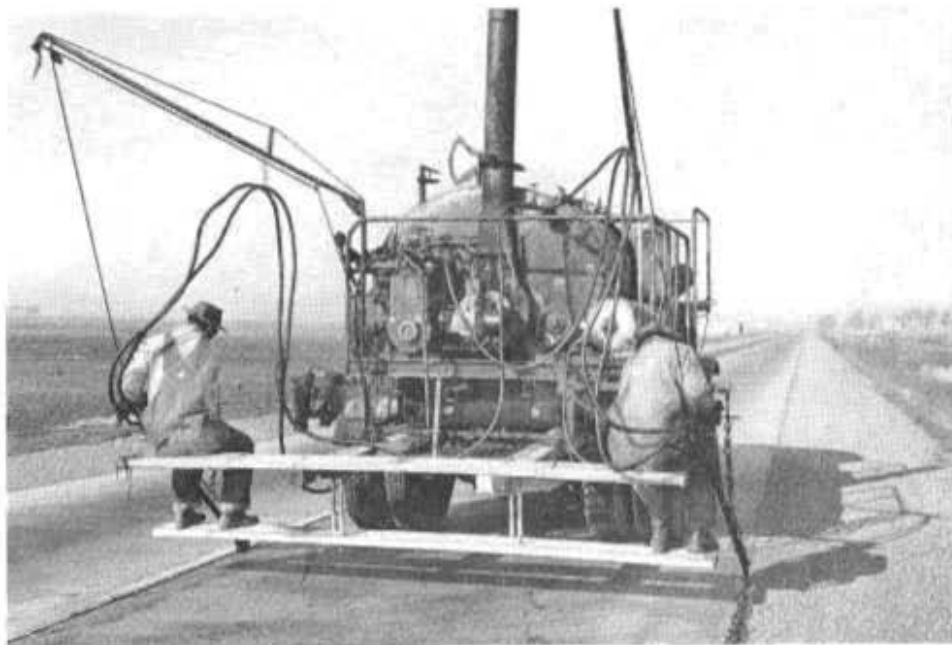
The costs of filling joints and cracks in concrete pavement vary greatly. This depends upon the extent of cracking, the time that has elapsed since the joints and cracks were last filled, as well as the amount of asphalt required to properly fill them.

Costs this year for filling joints entirely by hand in three districts average about \$67.00 per mile for a two lane pavement.

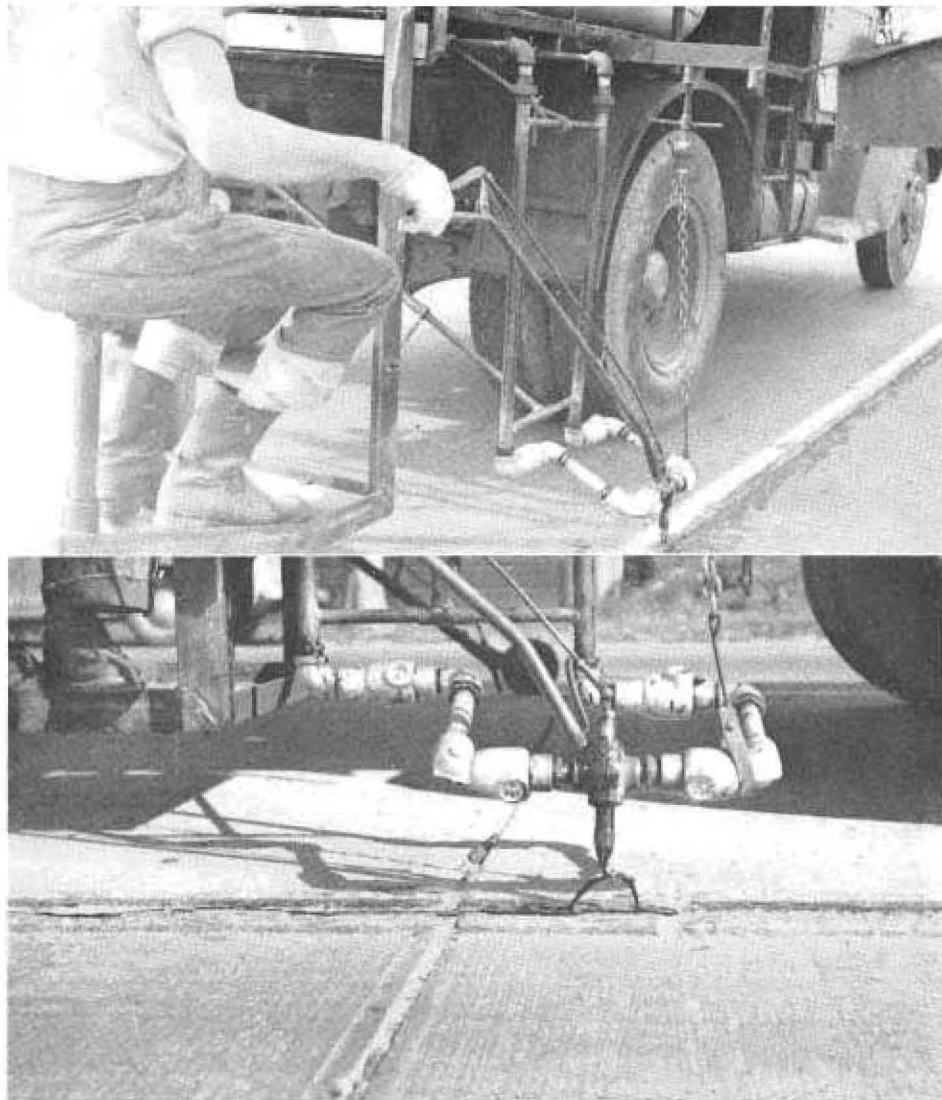
In order to obtain a definite comparison between costs of filling longitudinal joints in a two lane pavement by hand pouring methods as against filling with the large tank and special equipment, costs were kept in two districts. Results showed that filling longitudinal joints only, entirely by hand averaged \$14.30 per joint-mile, while the average cost of similar work using the large tank and special equipment was \$8.25 per joint-mile, a saving of \$6.05 per joint-mile or approximately 42 percent.

SAVINGS ARE EXPECTED

As three longitudinal joints are filled on a two-lane pavement, the savings would amount to about \$18 per pavement mile. The finished joint poured



Upper—Using full circulating metal covered hose and nozzle arrangement on 940-gallon tank assemblies for longitudinal joint sealing. Center—Two types of assembly used for joint sealing. Old type in operation on left, new type on right. Lower—Latest improvement of full circulating type assemblies with swivel joints for longitudinal joint sealing



Upper—New type of assembly and nozzle used in joint sealing. Lower—New type of assembly using four swivel type Chikson valve. Note two streams of asphalt from nozzle

by the special nozzle on the large tank also presents a neater and truer line. Moreover, due to the fact that many more joint miles can be poured by the large tank than by hand, the work can be completed during the cold weather when the joints are open the greatest extent and when other conditions are favorable.

Experiments, as indicated earlier in this article, which have been undertaken at various times to determine the advantages of different materials available for joint sealing lead to the belief that a rubber latex compound gives definite promise of giving satisfactory results. This compound at present is very expensive. Furthermore, special equipment such as a machine to cut out and remove the old fillers to a reasonable depth, as well as a special heat

controlled machine for its application, are necessary for its use. It may be, therefore, that the use of the latex compound will be too expensive for a time, except possibly on the more important routes.

Steel Operating Rate at High Level

The operating rate of steel companies having 94 per cent of the steel capacity of the industry was 94.4 per cent of capacity for the week ending March 8, compared with 94.4 per cent the week before, 93.4 per cent the month before, and 76.7 per cent one year ago. This represented no change from the preceding week. The week's operating rate was equivalent to 1,651,900 tons of steel ingots and castings, compared to the same figure for the week before.

Public Should Be Awakened to Huge Auto Traffic Toll

SAFETY experts have the proper prescriptions to curb the annual slaughter on our streets and highways, but as yet haven't found a way to overcome public indifference toward their application, according to W. Earl Hall, chairman of the National Committee for Traffic Safety.

"The American public ought to be impressed by the fact that our annual bill for accidents runs into the billions, but most people yawn and say it is no concern of theirs. They have a disease called 'other fellowitis,'" Mr. Hall said.

The safety expert pointed out that during the Christmas holiday season an epidemic of airplane disasters throughout the world brought death to 250 persons. These tragedies, the greatest of which was in far-away China, made the headlines in all the daily newspapers.

"In the same two weeks on the highways of the United States alone—not the world—approximately five times that number of persons met death in traffic accidents," Mr. Hall said. "You probably weren't aware of it. Except in isolated cases, the item didn't get into the newspaper headlines.

"Last summer in Naperville, Ill., a streamlined train telescoped into another streamlined train, bringing death to 47 passengers. For three days that item was banner-lined in every daily newspaper in America.

"During those same three days, almost 300 human beings were killed on the streets and highways of our country. Again, you probably weren't aware of it unless some of the victims were from your family or your neighborhood."

"From Pearl Harbor to V-J Day, Americans killed in battle totaled 261,608; the number of people in the United States killed in all types of accidents in the same period was 355,000—almost 100,000 more killed by mishaps on the homefront than by enemy action abroad.

"Another and even more shocking contrast: The number of wounded in the last war was 651,911. The number of persons in the United States injured in accidents—brace yourself for this figure—was 36,000,000, a ratio of 55 to 1."



This is how the White's Bridge looked after it was wrecked. The 119-foot truss was completely destroyed

Bridge Job Rushed to Eliminate Long Detour

By A. J. STOCKS, Associate Bridge Engineer

WHEN an efficient contractor, with good crew and equipment, and a young resident engineer, with three years experience in the Seabees, team up to get something done in a hurry, quick work is to be expected. Just that occurred in the recent rebuilding of White's Bridge, across Kings Slough, on Route 41, 30 miles west of Fresno.

At about 12.20 p.m., December 20, 1946, the main 119-foot steel truss span collapsed under a truck weighing 14,000 pounds, pulling a tractor on a low-bed trailer, weighing a total of 37,000 pounds, all belonging to Fresno

County. This caused a serious disruption to traffic, making immediate replacement imperative.

The bridge was posted for a load limit of eight tons per vehicle or 12 tons per semitrailer combination, so there was definitely an overload. Furthermore, there was a derrick, with 21-foot boom mounted on the rear end of the tractor and, according to Mr. George Henfling, who was waiting in his car at the west end of the bridge for the load to cross, this boom stuck up, caught a lateral strut and appeared to pull the top chords together causing, or contributing to the cause of collapse.

Mr. Henfling went out and flagged traffic until assistance arrived. Mrs. Jessie Seanes, working in a small store and restaurant at the east end of the bridge at the time, was attracted by the crash, rowed out and brought the driver ashore. He was standing on the cab of the truck, unhurt, and knee deep in water when rescued.

State Highway Maintenance Forces of District VI, Fresno, were immediately dispatched to the scene. They barricaded the bridge, blocked off that section of road and routed traffic over county roads through Tranquility.

(Continued on page 32)

Looking northeast at White's Bridge following record reconstruction





California Division of Highways Exhibit at San Bernardino National Orange Show

By Budd Hinton, Traffic Department

SAN BERNARDINO'S National Orange Show has easily surpassed its past record of producing one of California's most glittering and colorful expositions. The 287,785 persons attending this thirty-second Orange Show, first since 1941, were amazed at the spectacular color and displays which covered more than five acres of floor space. The designer's ingenuity in creating a most colorful exposition was in character with the beauty of the locale which is set in an amphitheatre of snow covered mountains carpeted by a limitless expanse of orange groves and blossoming trees.

The National Orange Show provided an opportunity for 143 exhibitors to reach a huge collective audi-

ence of over a quarter million people. The progress and development of highways is of continuing interest to all citizens who, incidentally, are the owners of the highway system.

In view of the widespread interest in highway improvements at the present time this exhibit of the Division of Highways has served to present graphically some of the more important factors which enter into consideration of this problem.

This exhibit was necessarily confined to four sections. The first section was designed to point out the fact that "Not So Long Ago" the highway system was attuned to the transition from the horse and buggy to the horseless buggy. Much interest was centered on

this panel which featured a collection of photographs taken about 30 years ago, which, to the younger generation, must have appeared to be from the gay 90's era.

The second panel depicted "Increasing Factors" in which comparative photographs, old and recent, point out the increase in various factors such as miles of travel, registrations, fuel consumption, parking needs, construction costs, congestion, commercial use, and traffic increase. A "Transportation Facility to Serve" panel was based on origin-destination of travel in which the highway serves regional, suburban, homes, industry, business, and recreation.



The concluding panel, of course, is "Freeways Are Needed Now."

Surmounting the "back of the eight-ball" problem is the freeway design which utilized photographs of existing freeways to emphasize the modernity of some of our highways.

A detailed model in exact scale of the four-level structure to be constructed at the intersection of Arroyo-Seco and Hollywood Freeways in Los Angeles was prominently exhibited.

A plexi-glass model showing Traffic-Flow bands on the State Highway System continues to attract attention wherever shown. It is significant that this technical model has proven to be of such general interest to the lay public.

All of the material for this exhibit was designed and constructed in the Headquarters Office of the State Highway Department. The structure model is now on display in the District Office at Los Angeles, while the traffic flow model is at Sacramento.

These photographs show sections of the attractive exhibit shown by the State Division of Highways at the San Bernardino National Orange Show, which was attended by over a quarter of a million persons. The Division of Highways now is working on a comprehensive exhibit to be shown at the forthcoming State Fair in Sacramento



Relocation of Roosevelt Highway Is Proceeding at Rapid Rate

RECONSTRUCTION and relocation of five miles of State Highway Route 60, the Roosevelt Highway, from a point north of Malibu Creek, 12 miles north of Santa Monica, to Latigo Canyon along the Los Angeles County shore line, rapidly is being pushed to completion.

The entire project, which is in three units, from westerly of Latigo Canyon to Malibu Creek, when completed, will provide a four-lane divided highway and will eliminate the last remaining portion of the 20-foot pavement on the Coast Highway from its junction with U. S. 101 near Ventura to the

end of the route at its junction with U. S. 101 near Doheny Park.

The first unit consists of a line change around the slide area at Latigo Canyon. The second unit covers the relocation of the highway around slide and slipout areas along the existing highway between Corral Creek and Malibu Creek easterly of the section of Roosevelt Highway between Latigo Creek and Corral Creek, which is the third unit.

The construction now under way consists in general of grading a roadbed 80 feet in width and construction thereon of four lanes of Portland

Cement concrete pavement, providing two lanes of traffic in each direction. There will be a central division strip four feet in width and the area between the curbs will be planted with ice plant. Bituminous surface treatment is proposed for the shoulders with Class "B-Double" seal coat to be placed over the bituminous surface treatment in the gutter areas on grades of two percent or more. Shore protection will be constructed out of selected riprap material. Additional widths of embankment will be constructed on the ocean side of the highway to provide counterweight through

Concrete drainage culvert under construction in Puerto Canyon as a unit of the relocation of the Roosevelt Highway in Los Angeles County





This view is looking north toward the end of the project involving the relocation of Roosevelt Highway north of Santa Monica

the slide area easterly of Solstice Canyon.

The present alignment parallels the beach through slide areas and contains many curves of short radius. The grade of the present highway is flat throughout, the maximum grade being less than 0.5 percent and the elevation of the existing road being approximately 18 feet.

The new construction provides for a highway on a higher elevation with the exception of a short section near the easterly end of the project, where connection is made to the existing grade across Corral Creek Bridge.

Following the storms of 1941 which caused many slides and slipouts along the existing highway, consideration of reconstruction on the present alignment was abandoned.

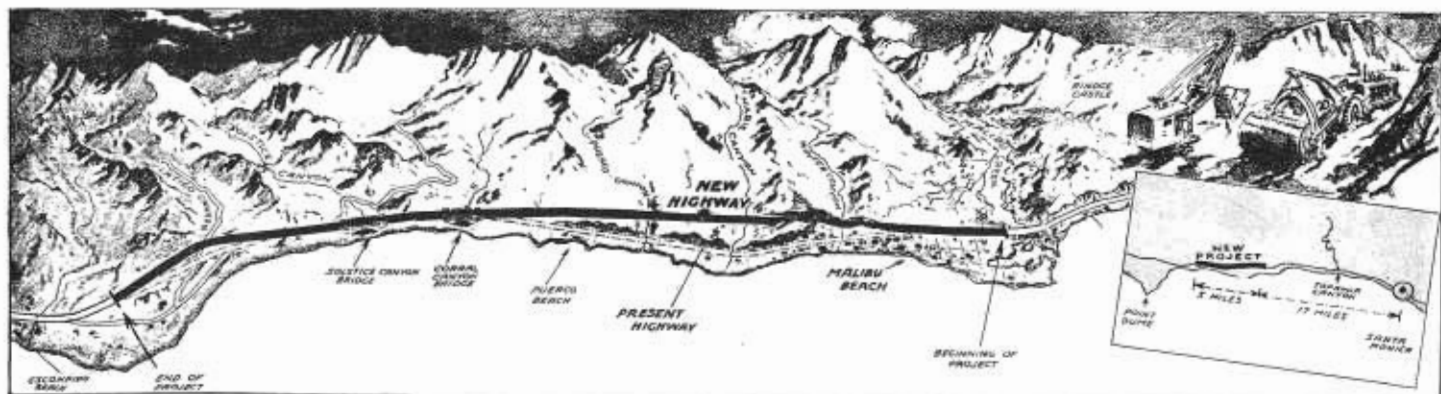
The project passes along the front of the bluffs paralleling the ocean and crosses Solstice Canyon near the middle of the project at an elevation of approximately 30 feet above the stream bed.

The present highway, which was completed in 1926, is graded to a minimum width of 40 feet, paved with 20 feet of Portland cement concrete, with

oil-mixed shoulders six feet in width, all on an 80-foot right of way.

The only drainage area requiring special design is at Solstice Canyon. The existing bridge across the Canyon was widened in 1938 to provide for four lanes of pavement with a four-foot central division strip. In order to meet the various controls and to stabilize slides and slipouts, it is necessary to raise the grade across Solstice Canyon approximately 20 feet above the existing grade, which in turn requires moving the center line of the new construction landward in order

(Continued on page 28)





This shows new alignment of Roosevelt Highway looking south to its junction with existing route

California Counties Launch Construction of 55 Bridges

(Continued from page 8)

length of 86 feet. Roadway is 26 feet wide.

The county plans to handle construction engineering on this structure.

Approximate cost, including engineering and contingencies.... \$15,000

Bids are to be received for two St. Johns River Bridges on April 23d. These structures consist of a series of concrete slab frames 36 and 37 feet long. One structure is 255 feet long and the other 300 feet. Roadway width is 26 feet.

Construction engineering has not yet been decided by the county for these two structures.

Approximate cost, including engineering and contingencies.... \$190,000

Plans for the Kings River Bridge are ready for immediate advertisement. This structure is located about five miles northeast of Kingsburg. The structure is 850 feet long and consists of a series of 40-foot concrete girder spans.

The county proposes to handle construction engineering with its engineering forces for this structure.

Approximate cost, including engineering and contingencies.... \$235,000

Plans are ready for the early advertisement of a bridge across Tule River located a few miles west of Porterville. Structure is 510 feet long and consists of a series of 40-foot slab frame spans on a 45 degrees skew.

The method of handling construction engineering has not yet been decided by the county.

Approximate cost, including engineering and contingencies.... \$130,000

In addition to the above major bridge jobs, the county has five smaller structures ready for advertisement. These structures are across Porter Slough, Deep Creek, Tule River, Outside Creek and Irrigation Canal. These structures are located directly south of Visalia.

Construction engineering for these jobs has not yet been decided on by the county.

Approximate cost, including engineering and contingencies --- \$65,000

YOLO COUNTY

John Roberts, County Engineer, has one project under construction consisting of the extension and improvement to the Cache Creek bridge at Capay.

The other structure under construction consists of a new bridge across Moody Slough located about one mile northeast of Winters. This structure consists of two 24-foot concrete slab frame spans.

The county is handling construction engineering.

Approximate cost, including engineering and contingencies --- \$90,000

YUBA COUNTY

Yuba County has plans ready for early advertisement of two bridges, one across Best Slough and Dry Creek. These bridges are located south of Marysville and about six miles east of Wheatland. They will facilitate the movement of farm produce in this area.

The two bridges are of the reinforced concrete slab type. Construction engineering has not yet been worked out with the county.

Approximate cost, including engineering and contingencies --- \$60,000

Coast Highway Relocated Between Santa Barbara and Elwood Overhead

By J. C. ADAMS, Associate Highway Engineer

THREE jobs recently completed in Santa Barbara County provide 9.3 miles of new two-lane and four-lane modern highway in District V and U. S. Route No. 101, which is the major highway coast route between Los Angeles and San Francisco.

The new construction starts about one mile northerly from the city limits of Santa Barbara and extends to Teolote Canyon near the so-called Elwood Overhead. It replaces the present route through the town of Goleta between the Hollister Underpass and the Elwood Overhead. The old highway will become a county road.

The right of way was obtained on a limited access freeway basis so that 3.4 miles is of two-lane construction so positioned as to constitute the southbound lanes of the future four-lane divided highway.

Shortly after Pearl Harbor, the United States Navy took over area and facilities that the City of Santa Bar-

bara had been developing as a municipal airport at Goleta for expansion into a Marine Corps air station. Not having been designed to handle the large volume of air traffic involved in its operation as an air training base, it was necessary to expand the airport several fold so that it extended along the Coast Highway from Goleta to Stoney Creek, a distance of about 1½ miles.

This expansion included the development of a warehouse and repair shop area adjacent to the railroad on the easterly side of the highway opposite the airport proper so that in effect, the highway passed through the base. Highway traffic and operation of the base so conflicted with each other that the United States Navy requested relocation of this section of the Coast Highway to a location on the easterly side of the railroad. However, some delay in securing final Navy approval of financing was experienced.

Surveys and preparation of plans were undertaken immediately upon consummation of agreement with the Public Roads Administration covering financing of engineering, right of way and construction costs.

PROJECT IN THREE UNITS

In order to expedite letting of contracts, the project was divided into three units so that each unit might be advertised for bids as soon as the plans for it were completed rather than await completion of plans for the entire project. Subsequently it was decided to let furnishing and installation of the vehicle actuated signals at the Hollister Wye as a fourth separate contract because of the specialized nature of the work and extended delays anticipated in obtaining delivery of required equipment under current condition.

The new construction utilizes a portion of the old road at the Santa Barbara end of the projects, and 0.90 of

Channelization of Hollister Avenue intersection with signal installation in progress





Looking northerly along completed relocation of U.S. 101 in Santa Barbara County

a mile of the new work consists of four lanes divided by a division strip of variable width. Adjacent thereto, local traffic between Santa Barbara and Goleta via Hollister Avenue is routed over an outer road 22 feet wide with 8-foot shoulders.

Acceleration and deceleration lanes are provided to facilitate turning movements to and from Hollister Avenue and to keep their interference with through traffic on U. S. 101 at a minimum.

The new alignment parallels the main coast line of the Southern Pacific

Railroad on the easterly side for approximately eight miles.

Near the Elwood Overhead the two lanes become four lanes with a variable to 26-foot width dividing strip, changing to two lanes at connection with the existing U. S. 101. The one-fourth mile section of four-lane divided highway was provided at the Elwood Overhead intersection of the existing highway because of limited sight distances which could be obtained.

The old road contained 17 curves, six of which had radii of less than 1,500 feet, eight curves with less than 3,000

feet and two curves of 400 feet and 575 feet radii respectively.

The old grade line was undulating with grades up to 6 percent and had several sharp summit vertical curves with restricted sight distance.

Excluding the transitions from the new construction at both ends and the transitions from four lanes to two lanes, the new alignment has six curves with radii of 4,500 feet to 20,000 feet.

The grade line has modern design sight distance. The maximum grade is 1.7 percent with the exception of the northerly end where the new grade con-

This view is looking northerly along the new location from San Jose Creek Bridge



forms to the existing 5 percent grade of the old road for 1,000 feet.

THE DESIGN

The native soils consisted of clay and sandy clays with inherent low bearing ratio values.

Imported borrow subbase material having a minimum bearing value ratio of 50 percent was used. The imported borrow was obtained locally and was applied to the roadbed in depths varying from 9 inches to 15 inches.

A nonrigid or flexible type of base supported three inches of plant-mixed surfacing. This supporting base consisted of six inches of untreated commercial gravel having bearing value ratios of 80 percent and 70 percent at 0.10 inch and 0.50 inch penetrations. All bearing ratios were based on California Bearing Ratio Method.

The two lanes of 11 feet and 12 feet were constructed on the standard 1½

percent slope, the crown being one way so as to serve as the southbound lanes of the ultimate four-lane divided highway.

At the Santa Barbara end of the three projects, adjacent to the Hollister Wye, the dividing strips and islands were enclosed by concrete curbs. At locations where the lanes were not edged by concrete curbs, a parting strip 36 feet wide separates the north and southbound traffic lanes.

Ice plant cuttings were planted in the dividing strips and islands.

Soil erosion treatment was applied to the cut and fill slopes and to all areas that had been denuded of a vegetation cover. The denuded or raw areas were not given the standard treatment but were sown with barley seed.

At the Hollister Wye, the traffic flow will be controlled by traffic actuated signals. A fourth contract is now under

way for the installation of the signal system and it is believed that this installation will be completed by May 1, 1947.

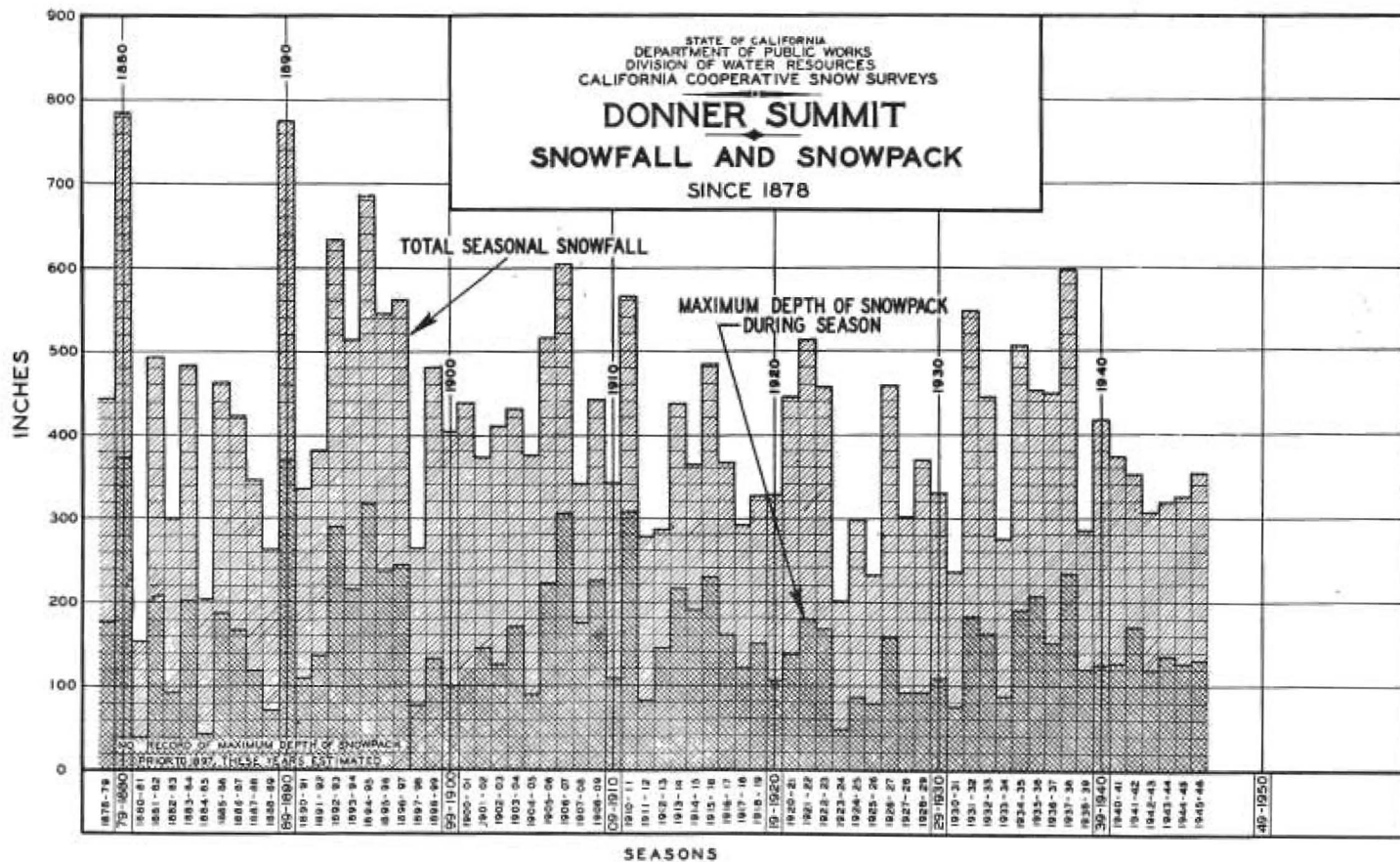
CONSTRUCTION

The new work traverses, in general, the narrow coastal plain lying between the Southern Pacific Railroad and the Los Prietos Range of the Coast Mountains.

Fifteen creeks required concrete structures as follows: Two large bridges of the concrete bent girder type, five small bridges of the double box type, three arch culverts and five standard box culverts.

The existing channels of Maria Ygnacio Creek and Glenn Anne Creek which more or less followed the new alignment were reconstructed by channel changes.

(Continued on page 28)



SNOW removal on U. S. Highway 40 is one of the jobs of the State Highway Maintenance Department. Its giant Sno-gos keep the road over Donner Summit to the East, open all winter, storms or no. In this connection it is interesting to cogitate on the relative intensity of the winters nowadays with the winters of long ago. In the interests of scientific truth the diagram above has been reproduced.

The upper bars of the diagram indicate the total seasonal snowfall at Donner Summit—a total of the amounts recorded daily. The lower cross-hatched portion of the bar indicates the greatest depth of snow measured on the ground at any time during the winter. Thus during the winter of 1937-38 the total snowfall was 597 inches and the deepest reported snow that winter was 234 inches on February 15th.

Bridge Replacements by Culvert and Fill

By M. H. Godwin, Associate Bridge Engineer

FOR MANY years the California Division of Highways has been carrying on a regular replacement program directed at the removal of some rather large and no longer needed structures and their replacement by culverts and fills.

Studies are continually being made to determine the necessity for many of these old and inadequate structures. In recent years, due to compilation of more complete and reliable records, it has been possible to substitute small structures for many of our larger ones, and in some instances, to remove a few of these larger structures entirely.

Based on better records, waterway requirements can be looked into more



SMALL BUT IMPORTANT PROJECTS

Considered as individual units, these small projects create no unusual comment and receive little, if any consideration or publicity; yet viewed collectively over a few bienniums, they constitute an appreciable factor in the general over-all picture of improved highway standards and service. They likewise represent a substantial item in reduced maintenance charges.

Costs of such projects are relatively minor, considered as individual units, and they are completed in a short



carefully and consideration then given to the possibility of reducing the size of the structure originally built. When such reductions in waterways can be made, considerable benefits, in the form of reduced first cost and maintenance will result. Improved road standards in the form of line, grade and width will also be obtained.

Table 1 shows roughly what has been accomplished along these lines within the last three bienniums alone, or for the six-year period from July, 1939, through June, 1945.

Period	Number of structures replaced	Costs	
		Total per period	Average per project
July 1939-June 1941	118	\$537,000	\$4,550
July 1941-June 1943	79	425,000	5,390
July 1943-June 1945	28	180,000	6,420
Six-year period	225	\$1,142,000	\$5,075





time. This is done without any particular inconvenience to traffic caused by long, expensive and time-consuming detours.

Replacements of some of the larger structures, with small culverts and fills, at times might be the cause of questionable comment from those not familiar with local conditions or the previous history relating to the stream and its characteristics. **Photo No. 1-A** shows a structure before its removal. It was a rather long and narrow bridge on difficult alignment and was posted for restricted loads. **Photo No. 1-B** shows the situation after replacement by a pipe and fill. Elimination of the cost that would have been necessary to have replaced the old bridge with a new one of comparable spans.

INCREASED ROADWAY WIDTH

Records over a considerable number of years had demonstrated that the long spans in the old structure were not necessary. This stream carried neither large drift nor any considerable quantity of water, even in the years which were considered as being above normal in rainfall. Benefits obtained are increased roadway width, a considerable improvement in local alignment and complete removal of a severe load restriction. The original structure was built in a locality where timber was a main industry. Furthermore, it was low in cost and easily obtainable in any size or quantity.

Before the advent of rapid and low-cost dirt moving equipment, it was easier and cheaper to bridge these steep ravines with such timber structures than it was to construct heavy

fills over concrete or metal culverts. For these reasons, such structures were often originally built even though culverts would have been adequate to carry the flows. Today, such

problems are handled in different fashion.

SIDEHILL VIADUCT REPLACED

In some instances, the present necessity for any structure at all has ceased to exist and it can be entirely removed. Such a situation is pictured in **Photo No. 2-A** which shows an old sidehill viaduct built many years ago. A railroad line was located adjacent to the highway, at a tight spot in the topography. This made it necessary to construct the trestle shown in order to gain support for the roadbed at this location. After the railroad ceased operations and removed its tracks, it was possible to bench the highway into the hill, occupy portions of the old railroad alignment and thus completely eliminate the need for any highway structure at this point.

Photo No. 2-B shows conditions after the change had been made. The old viaduct consisted of a series of





short spans for a total length of more than 200 feet. It was very old and weak and entirely inadequate for the heavier vehicles that desired to use this highway. It had been posted for restricted loads and its removal has eliminated not only a restrictive and hazardous structure, but an expensive maintenance problem as well.

CATTLEPASSES REPLACED

Many small structures are found throughout the highway system which were built to accommodate the passing of stock from one side of the road to the other. Such cattlepasses are required by the provisions of the right-of-way agreement and so constructed. Often, the present necessity for such a facility no longer exists and it may be eliminated. When such a structure has deteriorated to a point requiring complete reconstruction, and before any action is taken toward its replace-

ment, the owners are contacted and if they agree the structure is no longer necessary, it is removed. It may be replaced by a fill only, or if condi-

tions require, a small pipe is also installed to take care of local drainage. The removal of structures of this type has been of frequent occurrence during recent years.

Where the structure is still found to be necessary, replacement is made to higher standards and with a more permanent type of construction. **Photos No. 3-A and 3-B** show a small structure, typical of this classification, in the "before" and "after" stages. This small bridge not only acted as a cattlepass but also as a farm road undercrossing. Any number of like replacements have been completed on the entire road system during the last several bienniums with individual projects attracting little attention beyond that given to them by the parties directly concerned.

CONCRETE ARCH BETTER

Photos No. 4-A and 4B show another typical case, wherein a short span trestle has been replaced by a small concrete arch. A considerably smaller total length of structure has been used to replace the old one, a much higher standard of construction being employed than that used in the original bridge. This, again, is representative of a great deal of work which has been and is now being done along this line.

Photo No. 5-A shows a rather long trestle which has been replaced by the new structure shown in **Photo No. 5-B**. Studies here again pointed to the fact that a much smaller structure could handle the stream flow and it was replaced with the culvert indicated. Again, it is evident that a very material savings was realized in





first cost and maintenance as well as increased benefits obtained in roadway standards. Photos No. 6-A and 6-B show yet another typical installation which has been used in a great

number of cases with all the attendant benefits noted.

In general, the cost of replacing these small structures is a small part of that which would be required to



replace the original bridge to like dimensions and no great expense is required, either in design or construction features, to carry the project to completion. These small costs usually can be taken care of without disturbing the general budget allocations to any material degree.

Installations, to replace these old and inadequate structures, have been made using various types of construction materials, as dictated by the economic requirements of the site. The most common types are metal pipes, both full circle and sectional plate; concrete pipes, boxes and small arches and timber boxes.

It will probably be conceded that money so spent yields as much in improved roadway standards as can be realized in any other lines of highway expenditures.

Future programs are being drawn along these lines which will provide definite sums for this type of work.

Control of Noxious And Pest Weeds Of Importance

CONTROL of noxious and pest weeds growing within the highway right of way is of economic importance to the State. Some of this work is mandatory when ordered by proper authorities, but in any case it is the general policy for Division of Highways forces to cooperate with owners of adjoining property or with local authorities in any campaign for control of weed infestations.

In several counties agreements have been entered into with the county agricultural commissioners, and county forces did the work at state expense. In this way the program is coordinated with similar control on adjoining lands and county roads with mutual satisfaction.

Contact is maintained with state and federal authorities and every effort is made to keep advised of the need of as well as new methods of control, looking toward improvement of the service. Expenditures for this type of work approximated \$37,200 during the last biennium.

Coast Highway Relocated In Santa Barbara

(Continued from page 23)

Work was begun on the first unit in October 10, 1945, and completed on January 17, 1947. This job extended between Teolote Creek and Fairview Avenue.

On January 23, 1946, work was started on the second unit which extended between Fairview Avenue and More Road. This unit was completed on March 11, 1947.

The third unit, extending between More Road and the Hope Ranch Road, was started on July 24, 1946, and completed on March 19, 1947.

The work on the three units consisted of the excavation of 790,000 cubic yards of roadway material, 7,690,000 station yards overhaul, 106,000 cubic yards imported borrow, 57,500 tons untreated gravel base, 45,000 tons of plant-mixed surfacing, 2,700 cubic yards of Portland cement concrete for structures and 227 tons of bar reinforcing steel.

Soil erosion treatment was applied to 78,000 square yards of cut and fill slopes. There were 54 tons of straw and 2½ tons of western rye grass seed used in this work.

The total cost of the work, including the installation of the signal system at the Hollister Wye, was \$1,214,000.

Dimmitt and Taylor were the contractors on the westerly two units and Jesse Smith was contractor on the Hollister Wye unit.

Relocation of Roosevelt Highway Is Proceeding At Rapid Rate

(Continued from page 19)

to reduce to a minimum the amount of shore protection required. In meeting these controls the present bridge cannot be utilized and will be replaced with a new structure.

On one section the new alignment crosses a slide which was active in the spring of 1941. This slide area is composed of clay material which tends to flow rather than slide. A sand drain is being installed to reduce saturation of the original ground.

The new highway, which is being constructed under the supervision of S. V. Cortelyou, District Engineer of

In Memoriam

Carl Nelson

Carl Nelson, Highway Maintenance Superintendent of the Division of Highways with headquarters at Visalia in District VI, died suddenly on February 28, 1947. His passing was as he would have wished, while on his regular round of duty near Visalia.

Rich in variety of colorful experience, his had been a full life.

Mr. Nelson was born in Malmo, Sweden, March 11, 1881, and followed his two older brothers to the United States in 1900. He was naturalized a United States citizen in San Diego in 1910.

Carl worked his first three years in the United States with his older brother in a pattern making shop in Seattle, Washington; after this he attended a business school in Topeka, Kansas; he then attended Northwestern University. His first schooling in Sweden included apprenticeship in butter and cheese making.

After finishing his schooling in the United States he went into the creamery business which covered a span of his life from 1905 to 1914. During this time he won several national prizes in the art of butter and cheese making, and also in the planning and construction of creameries in the San Joaquin Valley, which are still in operation.

Carl often told stories about his experiences in the fire and earthquake of 1906 in San Francisco.

Mr. Nelson had been with the Division of Highways since December 19, 1916, with the exception of 18 months during the first world war, when he was working in a ship building yard in the Bay area, and in 1923 when he was farming in Mariposa County. He started with the Highway Department as a carpenter and worked his way up to maintenance superintendent, which position he held from October, 1928, to the time of his death.

Mr. and Mrs. Nelson were married in Visalia, July 4, 1911. He is survived by his widow Mrs. Dollie Nelson; two daughters, Mrs. Elizabeth Montersino of Merced, Mrs. Dottie Martin of Berkeley; and four sons, C. Alvin Nelson of Bakersfield, Dennis Nelson of the United States Navy and Alfred and Floyd Nelson of Visalia.

As a conscientious and capable superintendent, the Division of Highways has sustained a great loss in the death of Carl Nelson. His many friends will miss him.

the Division of Highways (and Frank B. Cressy, District Construction Engineer), will break a serious traffic bottleneck. E. L. Seitz is the Resident Engineer. Peter Kiewit Sons Company is the Contractor. The project will cost \$1,652,000.

Articles on the Missions Will Be Off the Press Soon

CALIFORNIA Highways and Public Works continues to receive many requests for back issues of the magazine containing the articles on California Missions. The supply of these issues has been exhausted. The mission stories, with a foreword by Governor Earl Warren, are being published in brochure form by the California Mission Trails Association, Ltd., a nonprofit organization, and will be off the press May 1st.

Those desiring the brochure may write to Mr. Ray Hewitt, General Manager, Mission Trails Association, Ltd., 520 West Sixth Street, Los Angeles 14, California.

Controlled Settlement of Steel Transmission Towers By Use of Explosives

(Continued from page 9)

Immediately following the detonation, measurements indicated that the east tower had settled 0.02 foot, the center tower 0.01 foot and the west tower 0.00. Two days later the east tower had settled 0.21 foot, the center tower 0.15 foot and the west tower 0.07 foot.

In short, the differential settlement between the east tower and the west tower had been reduced by about 0.13 foot as a direct result of the explosive charge.

Two subsequent charges were detonated after further surcharge embankment had been added to within four feet of the planned height and further unequal settlement had exceeded the three-inch limit. Additional settlement of towers by this method, however, proved to be progressively less effective, probably due to the inability to jet additional material from beneath the footings.

The writer and F. B. Cressy, District Construction Engineer, and W. D. Eaton, Resident Engineer, are in charge of this project for the State.

Highway Bids and Contract Awards for February and March, 1947

February, 1947

GLENN COUNTY—Across East Branch Rasoer Slough and across Sacramento River near Butte City, a bridge and portions of a bridge to be constructed and about 0.6 mile of approaches to be graded and bituminous surface treatment applied. District III, Route 45, Sections B, C. Lord & Bishop, Sacramento, \$385,356.50; E. B. Bishop, Orland, \$146,335.70; Guy F. Atkinson Company, South San Francisco; \$512,135.10. Contract awarded to Johnson Western Co., Alameda, \$359,150.60.

LOS ANGELES COUNTY—On Santa Ana Parkway between Kearney and Soto Streets, about 1.5 miles to be planted. District VII, Route 2. Contract awarded to Jannock Nurseries, Altadena, \$66,011.80.

LOS ANGELES COUNTY—At the intersections of Sepulveda Blvd. with Center Street and Gould Lane in the cities of Manhattan Beach and Hermosa Beach, traffic signal systems to be furnished and installed. District VII, Routes 60, 175. C. D. Draucker Co., Los Angeles, \$24,845. Contract awarded to Econolite Corp., Los Angeles, \$24,719.

MARIN COUNTY—An undercrossing on Linden Lane, under the tracks of the Northwestern Pacific Railroad and the freeway in San Rafael, to be constructed, and about 0.15 mile to be graded and surfaced with Portland cement concrete, crusher run base, and plant-mixed surfacing. District IV, Route 1. Carl N. Swenson Co., San Jose, \$239,230.85; Dan Caputo & Edward Keeble, San Jose, \$268,186.50; Chas. L. Harney, San Francisco, \$282,239.25; Guy F. Atkinson Co., South San Francisco, \$311,565.50. Contract awarded to Parish Bros., Benicia, \$234,826.90.

SAN DIEGO COUNTY—Between 0.9 mile east of Santa Ysabel and 2.4 miles west of Julian, about 1.3 miles, portions to be graded and bituminous surface treatment applied. District XI, Route 78, Sections B, C. Warren Southwest Inc. & C. G. Willis Sons, Inc., Los Angeles, \$117,622.88; Shea & Fisher, Inc., Indio, \$139,048; Macco Corp., Clearwater, \$147,323.90; Spencer Webb Co., Inglewood, \$153,294; Vinnell Co., Alhambra, \$169,803.55; Clyde W. Wood, Inc., North Hollywood, \$196,169; Griffith Co., Los Angeles, \$202,413; Daley Corp., San Diego, \$203,929.90; R. E. Hazard Contracting Co., San Diego, \$209,498.80. Contract awarded to Clifford C. Bong & Co., Arcadia, \$113,813.55.

SAN MATEO COUNTY—On Bayshore Freeway, between South San Francisco and Burlingame, substructures for four overcrossings to be constructed. District IV, Route 68, Section F, Burl. Healy Tibbitts Construction Co., San Francisco, \$388,895.45; Dan Caputo & Edward Keeble, San Jose, \$404,408.36; Parish Bros. & Lew Jones Construction Co., Benicia, \$405,312; Butte Construction Co., & Hass & Rothschild Construction Co., San Francisco, \$425,209.54; Barrett & Hulp, San Francisco, \$426,513.80; Macco Corp. & Morrison Knudsen Co., Inc., San Bruno, \$427,144.20; M & K Corp., San Francisco, \$433,790.54; Carl N. Swenson Co., San Jose, \$458,232.20; Harry J. Oser & Peter Sorensen, Redwood City, \$463,329.50; Guy F. Atkinson Co., South San Francisco, \$465,545.10; Chas. L. Harney, San Francisco, \$486,987.72; Underground Construction Co., Oakland, \$497,943.60; Clinton Construction Co., San Francisco, \$524,021.01; Stolte Inc. & The Duncanson Harrelson Co., San Francisco, \$595,837.60; Contract awarded to Carrico & Gantier, San Francisco, \$378,633.20.

SANTA CLARA COUNTY—On Bayshore Freeway at Santa Clara Street Underpass in the City of San Jose, about 0.5 mile to be planted and a sprinkler system to be furnished and installed. District IV, Routes 68, 2. Leonard Coates Nurseries, Inc., San Jose, \$14,018.12; Tyson & Watters Co., Sacramento, \$25,169.50; Bay Nursery, San Mateo, \$39,471.40. Contract awarded to Huettig & Schromm, Palo Alto, \$13,072.35.

SHASTA COUNTY—The substructure for a bridge across the Sacramento River to be constructed. District II, Route 20, Section C. John C. Gist, Sacramento, \$318,340; Lord Bishop, Sacramento, \$335,731; United Concrete Pipe Corp. & Ralph A. Bell, Baldwin Park, \$348,925; Macco Corp., Clearwater, \$367,740; Guy F. Atkinson Co., South San Francisco, \$368,697; Johnson Western Co., Alameda, \$374,419; E. B. Bishop, Orland, \$387,783; George Pollock Co., Sacramento, \$446,669; Pacific Bridge Company, San Francisco, \$465,835. Contract awarded to James I. Barnes Construction Co., Santa Monica, \$317,106.

March, 1947

BUTTE COUNTY—Across South Fork Feather River at Bidwell Bar a reinforced concrete girder bridge to be constructed. District III, Route 1046. E. H. Peterson & Son, Richmond, \$123,582.70. Contract awarded to Dey Contracting Co., Menlo Park, \$94,394.

CONTRA COSTA AND SOLANO COUNTIES—Construction of maintenance railings, ladders and platforms on the Carquinez Bridge. District X, Route 7, Sections A, F. Herrick Iron Works, Oakland, \$30,240; William B. Willett Co., San Francisco, \$40,405; Westco Steel Fabricators, Inc., Oakland, \$49,938; E. H. Peterson & Son, San Pablo, \$57,148; Moore Dry Dock Company, Oakland, \$59,186; Schrader Iron Works, Inc., San Francisco, \$61,420. Contract awarded to Minton & Kubon, San Francisco, \$23,904.

HUMBOLDT COUNTY—On Elk River Road, between junction with State Route 1 south of Eureka and Elk River School, about 2.2 miles in length to be graded and a Class "B-Single" seal coat applied. District I, Route 970. Browne & Krull, Palo Alto, \$60,412.75; W. C. Railing, Redwood City, \$61,421.72; John Burman & Sons, Eureka, \$67,931.50. Contract awarded to Mercer Fraser Co., Eureka, \$59,983.

HUMBOLDT COUNTY—Between 1.2 miles east of Korbel Road and 2.7 miles east of Redwood Summit, portions about 10 miles in length, imported base material to be furnished and placed and at various locations sand and screenings to be furnished and stockpiled. District I, Route 20, Section B. Fahey-Hammond, Inc., and R. A. Farish, San Francisco, \$99,925; Mercer Fraser Company, Eureka, \$105,625. Contract awarded to W. C. Railing, Redwood City, \$98,320.

MENDOCINO COUNTY—On Longvale-Covelo Road, between 1.5 miles easterly and 5.4 miles easterly of Dos Rios, about 2.9 miles, to be graded. District I, Route 505. John Burman and Sons, Eureka, \$172,033; H. Earl Parker, Marysville, \$205,632.75; A. R. McEwen and C. M. Syar, Willits, \$209,479; Morrison Knudsen Co., Inc., San Francisco, \$236,657.50; Eaton & Smith, San Francisco, \$236,372; Louis Biasotti & Son, Stockton, \$245,827.55; Fredrickson & Watson Construction Co., Oakland, \$324,237.50; Fredrickson Bros., Emeryville, \$328,463.95; Piombo Construction Company, San Francisco, \$344,919.40. Contract awarded to N. M. Ball Sons, Berkeley, \$170,927.80.

NAPA AND LAKE COUNTIES—Between one-tenth mile southerly and 1.5 miles northerly of the Napa-Lake County line, portions only, about 0.8 mile in length, to be graded, road-mixed surfacing to be placed and two bridges to be constructed. District I, Route 49, Sections A, A. Parish Bros. & Lew Jones Construction Co., Benicia, \$225,733.40; C. M. Syar & A. R. McEwen, Geo. M. Carr and Battista Rocca, Vallejo, \$221,841; A. Soda & Son, Oakland, \$224,061.84; Fredrickson & Watson Construction Co., Oakland, \$224,351.05; Fredrickson Bros., Emeryville, \$247,239.40; Guy F. Atkinson Company, South San Francisco, \$282,402. Contract awarded to Piombo Construction Company, San Francisco, \$218,280.10.

LOS ANGELES COUNTY—On Santa Ana Parkway at Soto Street, in the City of Los Angeles, a reinforced concrete box girder undercrossing to be constructed. District VII, Route 2. Oberg & Cook, Los Angeles, \$198,220; W. J. Distell, Los Angeles, \$204,911.50; Haddock Co., Pasadena, \$210,130.50; Byerts & Dunn, Los Angeles, \$214,759; Carlo Bongiovanni, North Hollywood, \$244,557; The Contracting Engineers Co., Los Angeles, \$225,863; Guy F. Atkinson Co., Long Beach, \$228,759; Johnson Western Co., San Pedro, \$256,294. Contract awarded to Oberg Bros., Inglewood, \$195,933.

LOS ANGELES COUNTY—Between Palomas Creek and Violin Saddle, about 2.6 miles, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 4, Section G. A. Teichert & Son, Inc., Sacramento, \$834,593; C. G. Willis & Sons, Los Angeles, \$911,282; James I. Barnes Construction Co., Santa Monica, \$934,050.10; Ralph A. Bell & A. F. Heinze, Alhambra, \$995,112.50; Morrison-Knudsen Co., Inc., Los Angeles, \$1,026,021.25; Bressi & Bevanda Constructors, Inc., Los Angeles, \$1,030,889.25; Vinnell Co., Alhambra, \$1,034,201; N. M. Ball Sons, Berkeley, \$1,083,228.50. Contract awarded to Clyde W. Wood, Inc., North Hollywood, \$763,297.50.

LOS ANGELES COUNTY—At 14 intersections on Elena Avenue and El Camino Real in the cities of Redondo Beach and Hermosa Beach, traffic signal systems to be furnished and installed. District VII, Route 60, Econolite Corp., Los Angeles, \$50,098. Contract awarded to C. D. Draucker Co., Los Angeles, \$46,805.

LOS ANGELES COUNTY—In the City of Los Angeles, on Arroyo Seco Parkway, between College Street and Bernard Street, about 0.3 mile in length, trees, shrubs, and ground cover to be furnished and planted. District VII, Route 165. Contract awarded to Jannock Nurseries, Altadena, \$10,914.25.

ORANGE COUNTY—Near Irvine about 6 miles south of Trustin, two culverts to be constructed. District VII, Route 2, Section B. O'Brien & Bell Construction Co., Santa Ana, \$55,492.50; Walter H. Barber, La Mesa, \$58,643; Oberg & Cook, Gardena, \$58,659; E. G. Perham, Los Angeles, \$59,490; Vido Kovacevich Co., South Gate, \$59,952.50; O. B. Pierson, Bellflower, \$60,690; C. B. Tuttle Co., Long Beach, \$61,530; Clifford C. Bong & Co., Arcadia, \$67,258.50; Haddock Engrs., Ltd., Oceanide, \$77,080; E. S. & N. S. Johnson, Fullerton, \$78,424. Contract awarded to Catalina Construction Co., Covina \$48,554.20.

PLACER COUNTY—Between Wise Canal and Rock Creek, about 1.9 miles to be graded and surfaced with crusher run base and plant-mixed surfacing, an underpass to be constructed and an existing bridge to be widened. District III, Route 17, Section C. N. M. Ball Sons & H. W. Ruby, Berkeley, \$237,419.45. Contract awarded to Fredrickson & Watson Construction Co., Oakland, \$230,004.80.

RIVERSIDE COUNTY—On "B" Street and Crestmore Road, between State Highway, Route 19 in West Riverside and San Bernardino County line, about 2.9 miles to be graded and surfaced with Portland cement concrete pavement and plant-mixed surfacing. District VIII, Route 706. Matich Bros., Colton, \$120,011.50; Griffith Co., Los Angeles, \$137,266.10. Contract awarded to E. L. Yeager, Riverside, \$104,799.

RIVERSIDE COUNTY—Between Mira Loma and 2½ miles west of Riverside, 5.9 miles, seal coat to be furnished and applied. District VIII, Route 19, Section A. Matich Bros., Colton, \$9,685.50; Vinnell Co., Alhambra, \$10,682.50; A. A. Veit, Tujunga, \$11,603; Pacific Pipe Line Construction Co. and Engineers, Ltd., Los Angeles, \$10,751.50. Contract awarded to Geo. Herz & Co., San Bernardino, \$8,525.70.

SACRAMENTO COUNTY—On Howe Avenue between Fair Oaks Blvd. and Arden Way, about 1.6 miles to be graded and surfaced with crusher run base on imported borrow; and the existing pavement to be widened with crusher run base and surfaced with plant-mixed surfacing. District III, Route 937. A. Teichert & Son, Inc., Sacramento, \$59,516.85; McGillivray Construction Co., Sacramento, \$64,213; Harms Bros., Sacramento, \$69,302.75; C. M. Syar, Vallejo, \$71,905.75; J. R. Reeves, Sacramento, \$72,402.70; Browne & Krull, Palo Alto, \$73,859.50. Contract awarded to Westbrook & Pope, Sacramento, \$47,828.50.

SAN DIEGO COUNTY—Over Switzer Canyon in the City of San Diego, a portion of an overhead crossing to be repaired. District XI, Route 2. Johnson Western Co., Coronado, \$44,949; Oberg & Cook, Los Angeles, \$45,424; Carroll & Foster, San Diego, \$58,840; M. H. Golden Construction Co., San Diego, \$67,270.40. Contract awarded to C. B. Tuttle Co., Long Beach, \$44,333.60.

SAN JOAQUIN COUNTY—At Calaveras River about 8 miles north of Stockton about 0.4 mile to be graded and surfaced with plant-mixed surfacing, and a steel girder bridge to be constructed. District X, Route 97, Section A. Northup Construction Co., Long Beach, \$74,466.50; Louis Biasotti & Son, Stockton, \$76,181; Stockton Construction Co., Stockton, \$76,459; Claude C. Wood Co., Lodi, \$77,129.50; Dan Caputo & Edward Keeble, San Jose, \$81,865.60; M. J. B. Construction Co., Stockton, \$86,822; Charles MacClosky Company, San Francisco, \$88,797. Contract awarded Elmer J. Warner, Stockton, \$73,631.50.

SAN BERNARDINO COUNTY—Between 1 mile east of Victorville, and Victorville, about 1.4 miles to be graded and bituminous surface treatment to be applied. District VIII, Route 43, Section L. Clifford C. Bong & Co., Arcadia, \$96,183.70; T. M. Page, Monrovia, \$97,793; Silva & Hill Construction Co., Los Angeles, \$104,358.40; Vinnell Co., Alhambra, \$107,248.40; A. F. Heinze, Alhambra, \$116,791; Mike Radich & Co., Burbank, \$118,184; C. G. Willis & Sons, Los Angeles, \$119,174.92; George Herz & Co., San Bernardino, \$139,434.90. Contract awarded to Matich Bros., Colton, \$94,486.

SAN BENITO COUNTY—Between 2.5 miles south of Hollister and Hollister, about 2.6 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District V, Route 119, Section E. Clements & Co., and Edward Keeble, San Jose, \$147,748.50; Fahey-Hammond Inc. and R. A. Farish, San Francisco, \$161,904; Granite Construction Co., Watsonville, \$163,281; Ted F. Baum, Fresno, \$174,911; A. A. Edmondson, Glendale, \$177,367.45; A. Madonna, San Luis Obispo, \$177,518.80. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$137,527.50.

SAN BERNARDINO COUNTY—From 11 miles east of Needles to Red Rock Bridge, about 2.9 miles to be graded and surfaced with bituminous surface treatment. District VIII, Route 58, Section P. A. A. Edmondson,

Glendale, \$77,688.26; T. M. Page, Monrovia, \$80,652; Jesse S. Smith, Glendale, \$83,113; Dimmitt & Taylor, Los Angeles, \$88,133.80; Herz Paving Co., San Bernardino, \$88,329.40; Vinnell Co., Alhambra, \$89,737; MacArthur & Son, Palmdale, \$95,482; Warren Southwest Inc., Los Angeles, \$103,297. Contract awarded to Arthur A. Johnson, Laguna Beach, \$65,237.

SANTA BARBARA COUNTY—Over the tracks of the Southern Pacific Company at Salspuedes Street in the City of Santa Barbara, the substructure for an overhead crossing to be constructed. District V, Route 2. C. B. Tuttle Co., Long Beach, \$238,816.90; R. M. Price Co., Huntington Park, \$241,178.50; Carl N. Swenson Co., San Jose, \$242,133.05; John C. Gist, Sacramento, \$264,453.50; Johnson Western Co., San Pedro, \$279,728.45; Winston Bros. Company, Los Angeles, \$289,838.50; United Concrete Pipe Corp. & Ralph A. Bell, Baldwin Park, \$307,702. Contract awarded to Maceo Corporation, Clearwater, \$231,305.50.

SANTA CLARA COUNTY—On North Fourth Street, between Route 68 and San Jose, about 1.2 miles to be graded and paved with asphalt concrete. District IV, Route 1159. A. J. Raiser Paving Co., San Jose, \$65,804.10; Union Paving Co., San Francisco, \$78,692; Edward Keeble, San Jose, \$78,273. Contract awarded to Piazza & Huntley, San Jose, \$63,558.50.

TULARE COUNTY—Across White River Sink, about 2 miles south of Earlimart, a bridge and approaches to be constructed. District VI, Route 4, Section A. Thorsten & Dahl, Santa Monica, \$36,205; Griffith Company, Los Angeles, \$37,304.25. Contract awarded to Wheller Construction Co., Oakland, \$29,324.

SACRAMENTO COUNTY—Across Arcade Creek on Madison Avenue, about 10 miles northeast of Sacramento, a reinforced concrete slab bridge to be constructed. District III, Route 537. Chittenden & Chittenden, Auburn, \$21,534.25; G. M. Carr & Bati Rocca, Santa Rosa, \$22,975; Wheeler Construction Co., Oakland, \$24,389; A. L. Miller, Sacramento, \$27,705; Charles MacClosky Co., San Francisco, \$31,645. Contract awarded to Wm. E. Thomas Construction Co., Sacramento, \$18,713.

TULARE COUNTY—At Yokohl Creek, about 4 miles north of Exeter, a steel beam span bridge to be constructed and approaches to be graded and surfaced. District VI, Route 129, Section E. Charles MacClosky Co., San Francisco, \$114,783. Contract awarded to R. M. Price Co., Huntington Park, \$92,921.

TULARE COUNTY—Between Packwood Creek and Route 10, about 2.3 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District VI, Route 132, Section A. Vis. Ted F. Baum, Fresno, \$229,389; Brown-Doko, Pismo Beach, \$238,429.50; Fahey-Hammond, Inc. and R. A. Farish, San Francisco, \$239,736. Contract awarded to R. M. Price Co., Huntington Park, \$226,365.50.

YOLO COUNTY—Across Moody Slough about 2 miles northeast of Winters and at Cache Creek about 0.2 mile north of Capay, a reinforced concrete slab bridge to be constructed and an existing reinforced concrete bridge to be reconstructed. District III, Routes 1154 and 1152. Charles MacClosky Company, San Francisco, \$113,744. Contract awarded to Chittenden & Chittenden, Auburn, \$70,193.75.

VENTURA COUNTY—At intersection of Ventura Blvd. and Telephone Road, intersection illumination to be furnished and installed and at intersection of Ventura Blvd. and Telegraph Road, traffic signals and intersection illumination to be furnished and installed. District VII, Routes 2, 9, 79, Sections C.A. Ven. Econolite Corp., Los Angeles, \$40,438; C. D. Draucker Co., Los Angeles, \$41,705. Contract awarded to L. H. Leonardi Electrical Construction Co., San Rafael, \$34,914.

New Deflector Barrier Gives Added Safety

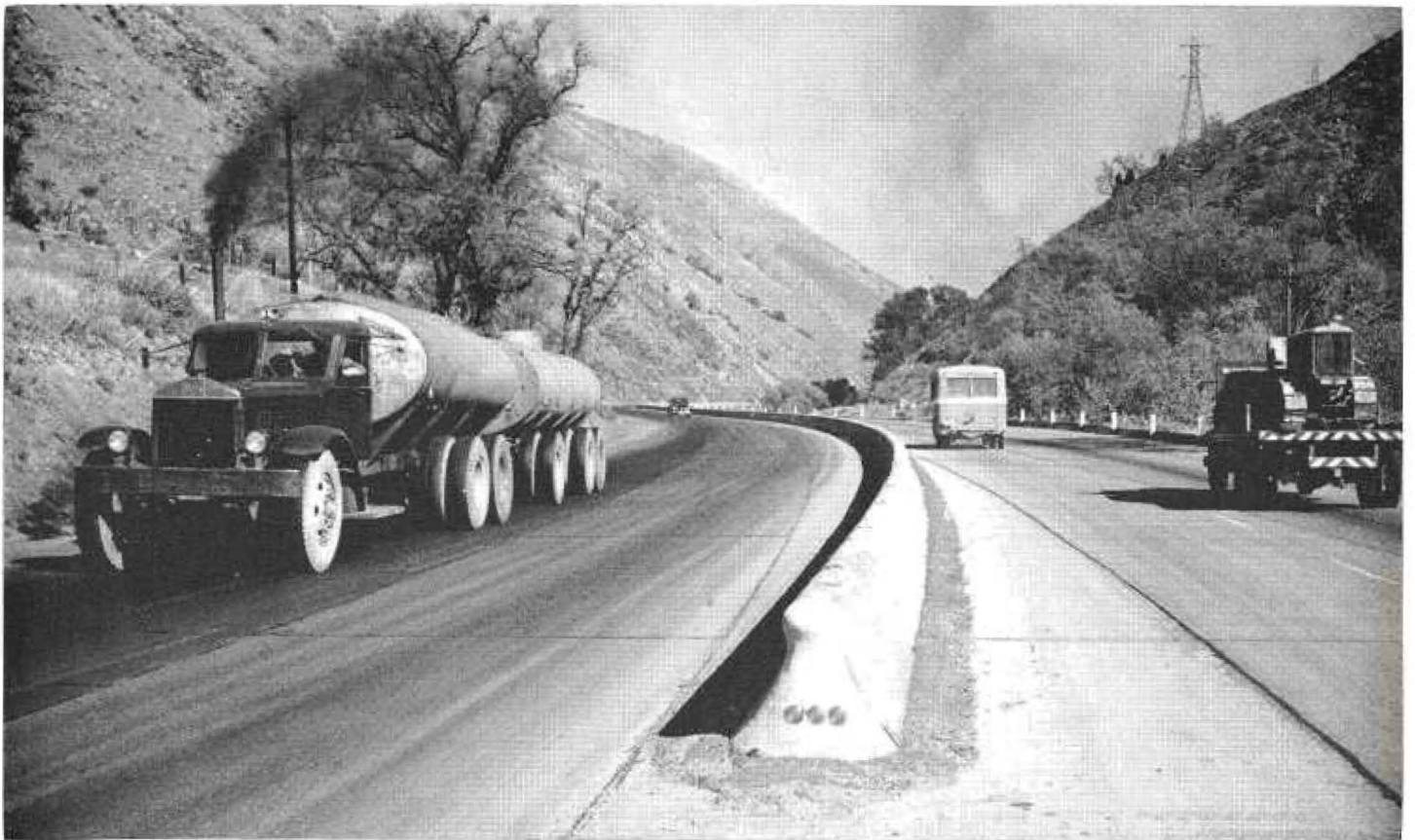
AN EXPERIMENTAL concrete deflector barrier has recently replaced a section of metal barrier wall on the hazardous Grapevine grade on U. S. 99 in Kern County, approximately halfway between Fort Tejon and Grapevine Station. A concrete barrier was selected in an attempt to reduce high maintenance costs of the former metal rail as well as to provide additional assurance against head-on collisions.

The 4.9-mile-long, 6 percent Grapevine grade has been the site of a number of accidents. The volume of traffic on this section of highway averages 7,000 vehicles per day; of these 1,000 are trucks, a large proportion of which approach the legal maximum.

Division between the north and southbound lanes was formerly provided by guard rails of metal and wood and a division strip. However, these barriers failed to prevent heavy runaway trucks coming down the steep grade from crossing over into the opposing stream of traffic.

Speeding trucks or those out of control habitually used the former guard rail as a rubbing strip to reduce speed. This constant scuffing and rubbing was extremely detrimental to the rail and, consequently, maintenance and replacement costs were excessive. The new barrier is designed so that trucks cannot rub against it; the parabolic base repels truck wheels from the barrier without permitting rubbing action.

The new concrete dividing barrier is constructed of precast units 10 feet long and weighing approximately 3000 pounds. The total length of barrier constructed for the experimental project was almost 2,000 feet at a cost of \$20,000. Since the barrier which was completed October, 1946, has been in place a relatively short time, it has not been possible to arrive at any definite conclusions regarding its merits. However there have been no fatalities recorded since its installation and relatively few scars as a result of impact are evident to date.



Two views of new concrete center barrier for traffic protection on Ridge Route section of U.S. 99

Record Made on Bridge Job

(Continued from page 15)

The length of this detour was 37.8 miles, leaving Route 41 eight miles east of the bridge and rejoining it at the north city limits of Mendota. The distance between the same two points via State Highway Route 41 is 11.9 miles. Thus the increased distance over the detour was 25.9 miles, and the consequent inconvenience to traffic is obvious.

A survey of the damage showed the twisted wreckage of the main span snarled up with old pile stumps and trash in 18 feet of water. Its piers were tipped and damaged to an extent which rendered them unsafe for reuse.

The deck of the four west approach spans had been pulled 18 inches east. It had been pulled off of the west bridge seat and the steel caps had slid along on their supports. One cap was just hanging on one corner of its support and looked as if it would drop off into the water at the slightest jar, carrying all with it.

The floor system of the four east approach spans was displaced in a like manner, though not to so great an extent.

It was only intended to use this bridge and adjacent road as a state highway for about three more years. By that time it was planned to have it replaced by a new bridge, about 500 feet northeast of the present structure, on new alignment and built to modern standards of construction. Consequently, it was decided to restore the structure only to its original width and of sufficient strength to carry legal loads, by the quickest and least expensive practical means.

The Bridge Department in Sacramento started at once to draw plans, write the contract and specifications, locate materials and contact contractors who might be interested in bidding on the work. The contract was advertised January 2, 1947, just 13 days after the accident.

During this time interval, materials were located in stock at various state highway maintenance yards. Bridge timbers and flooring were at Walnut Creek, Contra Costa County; railing and wheel guard at Rio Vista and creosoted piles at Hollis Street, Oakland. Transportation of materials to the job was made part of the contract.

Contractors were busy and reluctant to bid on a relatively small job that

promised so much grief. It took quite a thorough canvass of contractors to locate any bidders.

Lord & Bishop of Sacramento submitted the low bid—\$17,600. The contract was awarded to them January 8th. They were given 21 working days in which to complete the job, making the contract date for completion, February 10, 1947. Mr. Harry Lord, one of the partners, assumed active superintendence of the job. He got his crew together, moved equipment and supplies to the job and was set up ready to go in five days. Mr. T. J. Dunn, Associate Highway Engineer, was assigned the duties of Resident Engineer. Work started January 13, 1947.

What appeared difficult at first—getting the end spans back into place—was done with ease. They were partially lifted by a 15-ton truck crane and slid back by two 30-ton pull jacks.

West approach spans were back in place by noon of the second day, January 14th. Then it took until the following morning to move, via detour, around to the other end of the job, just 250 feet away. It was then but a matter of a few hours to lift and slide the east approach spans back into place. After that, the crane could go out on them, work from them and tackle the job of removing the wrecked main steel span.

The original plan was to partially sink some steel pontoons, slip them under the old span, unwater them and float it. It could then have been towed clear and dismantled at leisure while the work of reconstruction was in progress. Early in this operation, however, the timber floor became unfastened from the steel work and floated to the surface. With this loss of buoyancy, this scheme could not be made to work.

The floating timber floor was easily removed, and when out of the way, the steel skeleton was no hindrance to pile driving. The crane was then equipped with a 3,000-pound drop hammer operating in swinging leads from the end of the boom.

COMPLETED IN 17 DAYS

Fifty-four foot creosoted Douglas fir piles were driven. Then, by the same piece of equipment, caps, stringers and flooring were, in turn, hoisted into place and spiked by the crew. The

Expressways Save On Consumption Of Gasoline

POSITIVE evidence that the 50,000 motorists who daily travel the Arroyo Seco Parkway between Los Angeles and Pasadena save a half-gallon of gasoline in each 20 miles of driving by using the high-speed expressway in preference to existing surface streets has been demonstrated in an engineering study conducted by the Automobile Club of Southern California. The tests were carried out over two driving runs—one on the Arroyo Seco Parkway and the other on a parallel route via surface streets.

Using an Akroflo meter, which accurately checks on gasoline consumption up to 5/100ths of a gallon, the club's test car consumed 0.80 gallon of gasoline in travelling 16.59 miles via the expressway as compared to 1.30 gallon of gasoline used in driving 17.90 miles of surfaced streets. At this rate, the club study revealed, a 20-mile trip would consume 1.0 gallon of gasoline via expressway and 1.5 gallon of gasoline via travel on existing surface streets.

As a result of the study, the club estimated that motorists who use the Arroyo Seco Parkway save better than 10 cents per 20 miles of travel.

crane thus traveled out over completed bridge as the work progressed.

The old span was then dismantled and taken out in pieces, by the crane operating from the completed trestle.

By Wednesday, January 29th, all work was completed except for asphalt surfacing, some bolting of the railings and miscellaneous cleanup. Most of the old span had been hauled off the job.

At noon, January 29th, the District VI Maintenance Crew started placing the asphalt surfacing. By five o'clock that afternoon, January 29, 1947, 12 days ahead of schedule, all work was completed and the bridge opened to traffic.

Total construction time—17 days.

Total time bridge out of service—40 days, 5 hours.

Total cost of contract plus state furnished materials—\$23,000.

State of California
EARL WARREN, Governor

Department of Public Works

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

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CALIFORNIA STATE HIGHWAY SYSTEM



~ LEGEND ~
 Primary Routes 
 Secondary Routes 
 Proposed Routes 

