



CALIFORNIA
HIGHWAYS AND PUBLIC WORKS

ARTISTS' DRAWING FROM ENGINEERS' PLANS OF PIT RIVER
BRIDGE ACROSS SITE OF SHASTA DAM RESERVOIR

NOVEMBER
1939

IRD
in California

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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State Joins U. S. in \$3,200,000 Contract for Highway Relocation Around Shasta Dam Reservoir

By C. H. PURCELL, State Highway Engineer

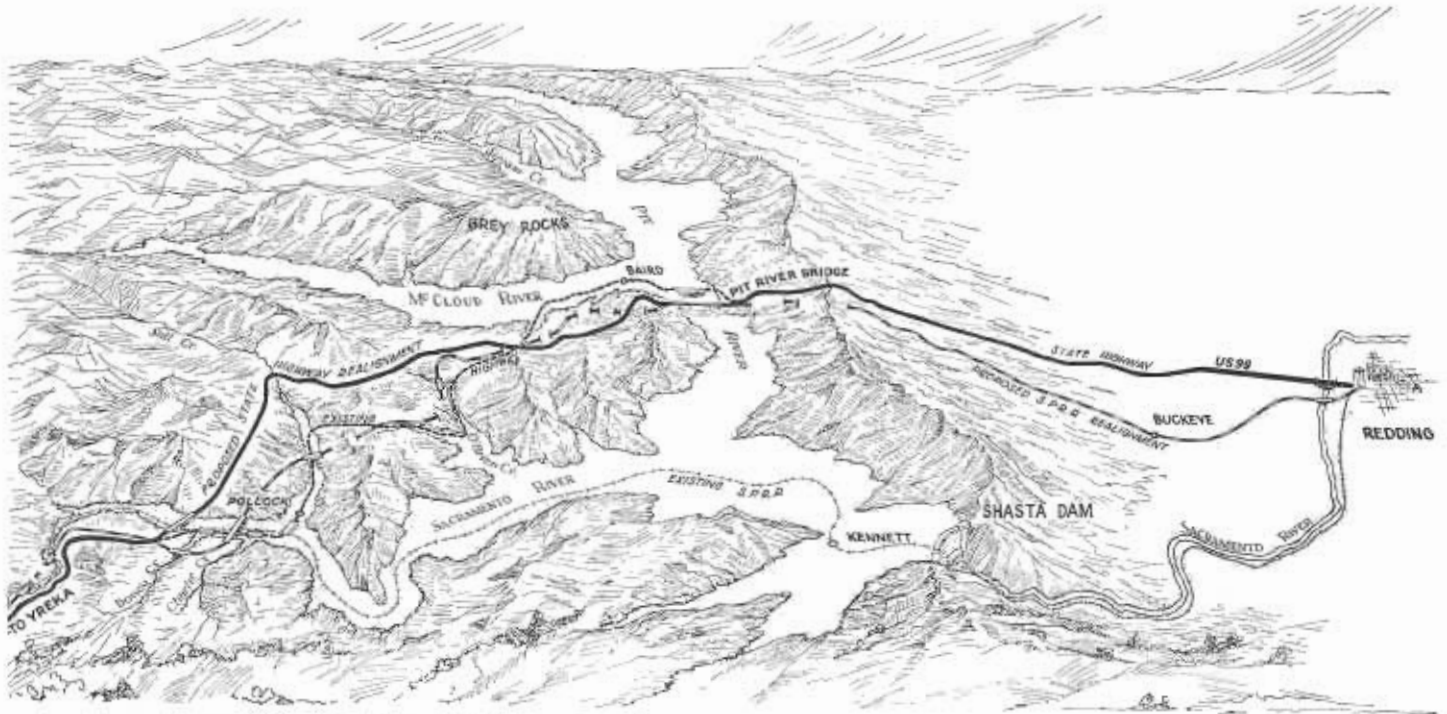
FURTHER participation by the State of California in the Central Valley project was inaugurated this month when Director of Public Works Frank W. Clark signed a contract between the U. S. Department of the Interior and the Department of Public Works providing for the relocation around Shasta Dam of the Pacific Highway, U. S. 99. At the

share of the expense of these projects will be contributed by the Federal government, the Department of the Interior has requested the State to do the actual construction work.

When Shasta Dam across the Sacramento River about thirteen miles from Redding is completed, the reservoir formed back of it will have a high water level of 1065 feet and will

miles of the Pacific Highway (State Highway No. 3) will be abandoned and will be replaced by 15.35 miles of new construction which may cost approximately \$3,200,000, including engineering, rights of way and construction.

This estimated figure includes no portion of the cost of the mammoth Pit River Bridge, an important unit



Map showing relocation of State Highway (U. S. 99) from Redding north around and across Shasta Dam Reservoir.

same time Mr. Clark instructed the Division of Highways to advertise for bids for realigned highway construction between Bass Hill and O'Brien Summit and the erection of a bridge across the Sacramento River near Antlers, both projects in Shasta County.

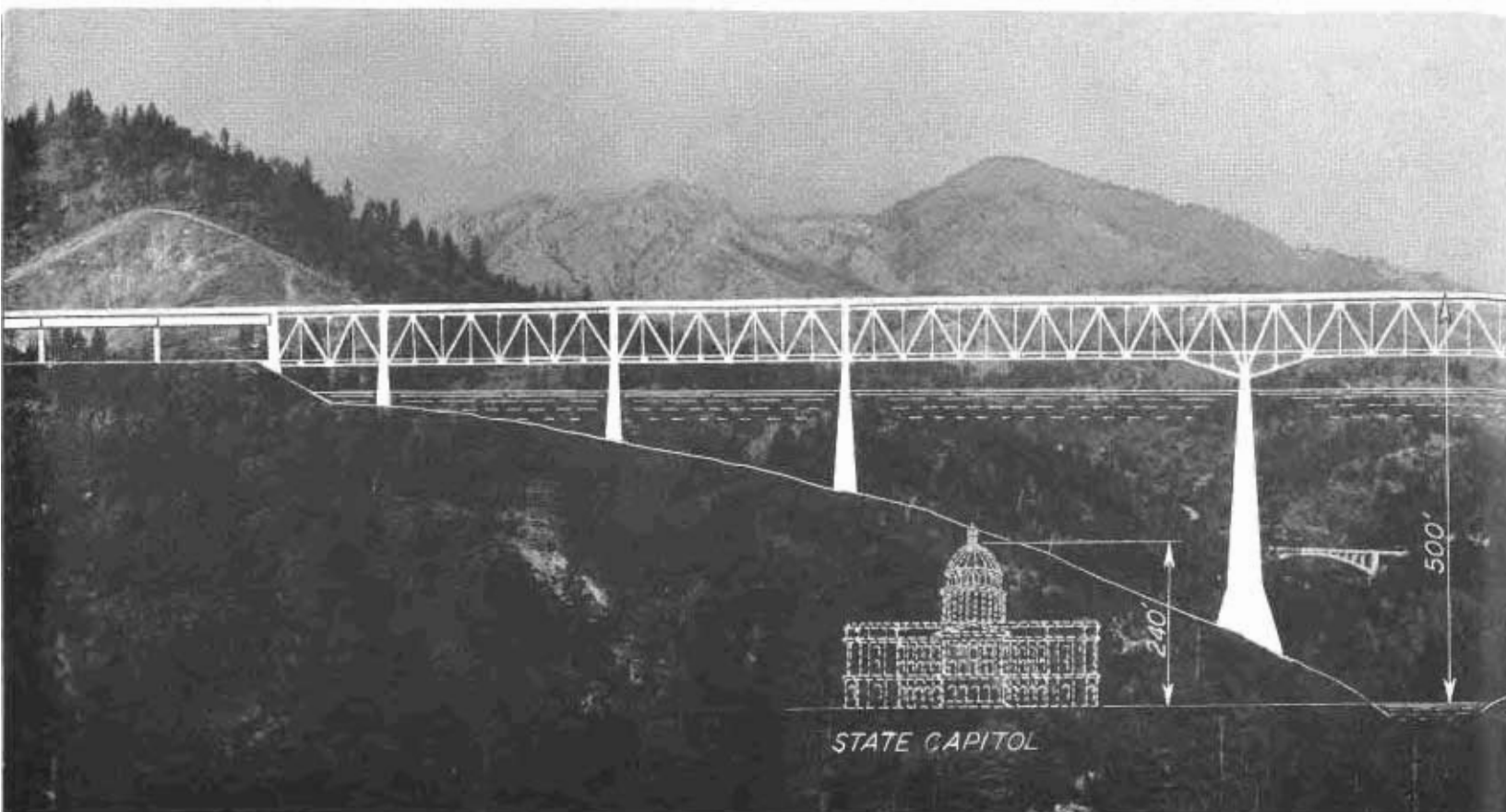
These two units of the highway relocation will cost approximately one million dollars. While the greater

flood the canyons of the Pit, McCloud and Sacramento Rivers for many miles. This will necessitate relocation of a number of existing utilities, among which are the Southern Pacific Railroad, telephone, telegraph and power transmission lines, county roads and a portion of the Pacific Highway.

To clear the flooded area and to avoid conflict with the relocation of the Southern Pacific Railroad, 19.5

of the relocation program which will be constructed by the U. S. Bureau of Reclamation.

Negotiations between the Bureau of Reclamation and the State relative to the replacement of the highway extended over a period of eighteen months. The agreement recently signed by Director Clark sets forth the terms under which the new highway will be located and constructed



Sketch of Pit River bridge on photo of site showing double-decked, highway-railroad structure, 3,587 feet long and 500 feet high, as seen in background and inset sketch of State Capitol.

and provides the formulae for division of cost.

All location work is being done by the State. All but two parcels of right of way are being acquired by the Bureau of Reclamation. One of these parcels acquired by the State extends beyond the area of Bureau participation, and the other is across an Indian allotment where the State is handling the transaction for technical reasons.

STATE AND U. S. SHARE COST

One construction contract 2.3 miles in length is being handled by the Bureau of Reclamation. The remainder of the construction, exclusive of the combination railroad and highway bridge across the Pit River, will be done by the State.

Because of minor extensions of the highway relocation beyond the exact limits necessary to clear the Central Valley features and because of some improvements in standards of location over those of the existing highway, the State will contribute to the cost of relocation, although the greater portion of the cost, or approximately 85 per cent, will be borne by the Federal government.

For many years reclamation and flood control works essentially the

same as those embodied in the Central Valley project have been the dream of engineers and the hope of the citizens of California. During this period many studies and estimates were made, among which were tentative proposals for relocation of the highway and estimates of its cost. Early in 1935, when it appeared that the actual construction of the project was near at hand, more intensive studies for highway relocation were undertaken by the Division of Highways, and preliminary surveys were authorized.

It was apparent from the start that the requirement given us of keeping the location above the 1100-foot contour necessitated the development of a new location in a forbidding territory, through which no one would have the temerity to locate a highway by choice. While all possible alternate locations were investigated, it soon became evident that one location, formidable though it was, stood out above all others as the economic and preferable one. Since the beginning in 1935, studies have been carried on almost continuously until at this time the final location has all been determined, and the last of the plans is nearing completion.

The beginning of this relocation is

on the Pit River side of the divide at Bass Hill, 12.5 miles from Redding. About 0.6 of a mile from Bass Hill, the relocation crosses the Pit River on the upper deck of a long, high bridge that carries the Southern Pacific Railroad on its lower deck. After crossing the Pit River, the relocation follows the broken range that forms the divide between the Sacramento and McCloud River drainages.

There will be three distinct summits on the highway relocation, the highest of which will be 605 feet above the highest level of the lake. About 10 miles from Bass Hill the relocation descends and crosses the Sacramento River near the present railroad station of Antler, thence under the relocated Southern Pacific Railroad and northerly about three miles farther. The necessity for reconstructing the latter three miles arises from conflict of the relocation of the Southern Pacific Railroad with the existing highway.

ROAD ON HIGH GROUND

Contrary to popular conception, the relocated highway will not be a lakeshore drive. The elevation of the highway ranges from 35 to 605 feet above the highest elevation of the lake. There will be but few locations



feet above river bed. Two piers will be highest concrete piers in world exceeding 350 feet. Existing bridge is State Capitol gives a height comparison.

where any portion of the lake is visible from the highway.

The northerly 2.3 miles of relocation is necessary because the railroad relocation occupies portions of the old highway. To avoid conflict between contractors, which would be inevitable if two simultaneous contracts were let, it was decided that this 2.3 mile unit would be built by the Bureau of Reclamation and would be included in the contract for grading the adjoining portion of the railroad relocation. Since there were seasonal limitations on the time in which the highway work could be done and since the highway had to be completed before portions of the railroad grading could be done, it seemed the wise policy to sell to a single contractor, the job of coordinating the two jobs.

The contract that included this unit of highway was awarded by the Bureau of Reclamation to Granfield, Farrar and Carlin in March, 1939. The contract is nearing completion. Weather permitting, the job should be finished this month.

The remaining 10.2 miles will be constructed by the State. The present plan calls for four contracts. One on which bids will be opened on November 22, is for grading from Bass Hill northerly for 4.73 miles to O'Brien

Summit. There will also be included in this contract a concrete bridge 377 feet long, located on a very steep hillside some 290 feet above the portal of one of the railroad tunnels. The grading to be done under this contract is on either side of the Pit River. The Bureau of Reclamation has awarded a contract for the substructure for the Pit River bridge, and this contract provides for the construction of the highway abutments in time for the highway grading contractor to make the approach fills. The construction of this unit includes 1,018,000 cubic yards of excavation.

The second contract, on which bids will also be opened November 22, will be for the construction of a highway bridge across the Sacramento River at Antler. This bridge will be 1330 feet long and will be constructed on an average of 3.6 per cent grade. The portion of the bridge over the channel will be 210 feet above the river bed.

The bridge will consist of five continuous deck trusses with the central span of 272.8 feet flanked by spans of 251.8 and 189 feet and cantilever arms 42 feet long. From the abutments to the cantilever arms are suspended girder spans of 52 and 39.7 feet.

BRIDGE DESIGN

Piers will be hollow concrete construction. The largest will be 172.65 feet high, 18 by 44 feet at the base and 8 by 40 feet at the top.

Foundation tests by the open pit method showed all piers but one to have hard andesite bedrock for foundation and the one to have firm rock unaffected by water.

The roadway across the bridge will be 50 feet wide flanked by two 2-foot 6-inch sidewalks. The bridge will be constructed on a 5000-foot radius curve compounding about 80 feet from the southerly end to an 800-foot radius curve. A slight crown provided by appropriate vertical curves and a specially designed, elongated superelevation is expected to eliminate all appearance of distortion at the point where the 800-foot and 5000-foot radii compound.

Construction of this bridge will require 18 months, and it will be completed in May, 1941.

FUTURE CONTRACTS

The third contract will be let early in 1940 and will be for grading 8.31 miles between O'Brien Summit and the contract just completed by the Bureau of Reclamation. The grad-

ing of this unit involves 1,500,000 cubic yards of excavation.

The fourth contract, which will be let as early as possible in 1941, will consist of surfacing the 13.04 miles involved in the two grading contracts. Except for a short stretch of portland cement concrete pavement, a portion of which through the subway under the Southern Pacific railroad at Antler will be four-lane divided, the surfacing will consist of 6 inches of crusher run base over the entire roadbed, 22 feet by 21 feet of plant-mixed surface and crushed rock shoulders. The gross width of the roadbed will be 30 feet. The graded width and type and stability of surface will be comparable to that on the

structure, including the separate approaches, is 3587.7 feet. The roadway will be 44 feet wide with sidewalks 2.5 feet wide on each side.

The highway grade will be in excess of 530 feet above the river bed. However, after Shasta Dam is completed about eight miles down stream from the bridge, water eventually will back up in the tributary Pit River canyon to within 35 feet of the lower deck of the bridge.

MAMMOTH PIERS

Two of the Pit bridge piers will exceed 350 feet in height and will be among the highest in the world. The tallest pier will be 358 feet high and 95 by 90 feet in size at the base.

backfill, placing 95,000 cubic yards of concrete, and eleven million pounds of reinforcement bars, installing 27,000 pounds of tubing for concrete cooling and 20,000 pounds of miscellaneous metal work.

The existing Pit River bridge, an old concrete structure, is not worth salvaging and will be submerged by the reservoir waters backed up by Shasta Dam.

The United States Government will retain title to the new bridge and all land, rights of way, and appurtenances necessary for the operation and maintenance of the structure, but the Federal government will grant to the State, under the agreement signed by Director Clark, a



One section of newly completed relocation of State Highway 3 (U. S. 99), north of La Moine in Shasta County.

existing highway which will be relinquished to the Bureau on completion of the relocation.

PIT RIVER BRIDGE

A major unit of the new highway will be the Pit River Bridge to be constructed by the Bureau of Reclamation. The central portion of this bridge will consist of a central 630-foot cantilever truss span, two 497-foot, three 282-foot, two 141-foot deck truss spans, one 150-foot and four 141-foot deck girder spans.

Provision will be made for two railroad tracks through the trusses and for a four-lane highway over the top. At the end of the major spans, the railroad and highway will go their own separate ways by special design that separates them horizontally.

The total length of the highway

Another pier will be 356 feet high and 95 feet square at the base, and a third, 271 feet high and 72 by 58 feet at the base. The concrete in these three largest piers will be artificially cooled by the circulation of river water through metal tubing embedded in the structures, a practice developed by the Bureau of Reclamation and heretofore used only in the construction of giant dams.

The substructure of the Pit River bridge will include four concrete abutments—two for the railroad and two for the highway—and ten concrete piers to support the double deck steel structure that will total two-thirds of a mile in length.

The substructure job, for which 16½ months will be allowed for completion, will include 276,000 cubic yards of excavation, 243,000 cubic yards of

perpetual easement sufficient for highway purposes, this grant to be made at or prior to the time the State abandons its existing highway facilities and reroutes highway traffic to the relocated highway.

MAINTENANCE COST SHARED

It is agreed that the cost and expense of maintaining the Pit River bridge shall be borne by the Federal government and the State, California to bear that portion of the total cost and expense as is equitably attributable to the operation of highway facilities. The apportionment of this cost will be the subject of a separate contract to be entered into between the United States and the Department of Public Works prior to the date the State abandons its present highway facilities.

(Continued on page 16)



Construction scenes on highway relocation in Shasta County, showing grading operation, a completed section and building fill over large culvert.



Section of new highway in Kings River Canyon between Grizzly and Boulder Creek showing glimpse of rugged south wall of canyon.

Kings River Canyon Highway Opened

By E. T. SCOTT, District Engineer

OPENING up thousands of square miles of wilderness recreational areas, the Kings River Canyon Highway was officially dedicated to public service on Sunday, October 29.

California Highway Commission members, representatives of the U. S. Forest Service, officials of chambers of commerce of Fresno, Tulare and neighboring counties, automobile clubs and civic organizations and legislators joined with many visitors in dedicatory ceremonies held at Cedar Grove, where a luncheon was served.

Completion of the Kings River Canyon highway climaxes ten years of construction work.

With the exception of about five miles of early construction, the project has been built to a roadway width of twenty feet. The entire roadway width has been surfaced with native material. On a large portion of the highway, this surfacing consists of disintegrated granite placed to a depth of seven inches.

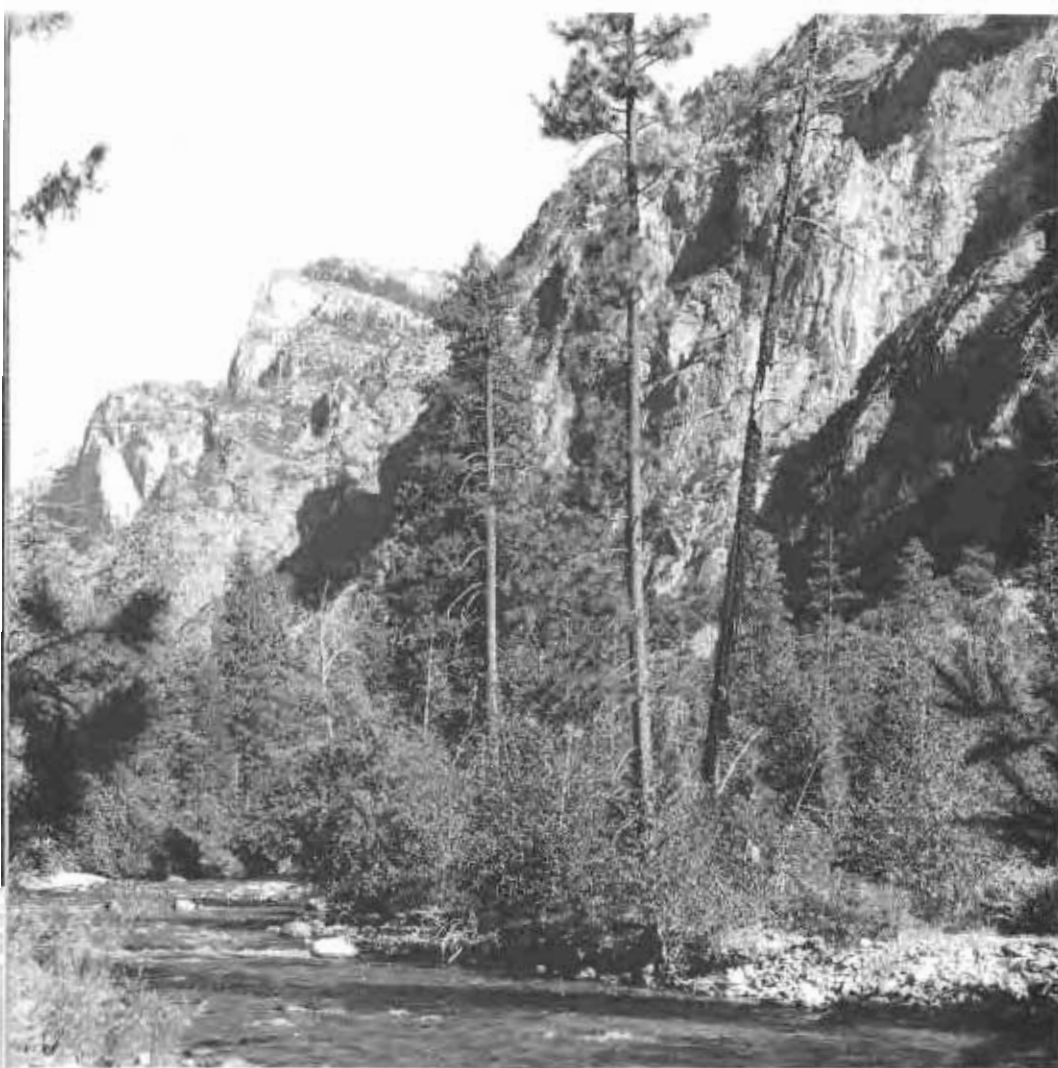
Two contracts for bituminous treatment of the surfacing have been completed as the final work on furnishing

a modern mountain highway up the canyon. One contract involved a road-mix surface treatment to 47.3 miles from Stafford's Corner, north of Woodlake, in Tulare County on State Route 129, to General Grant National Park and east of the park to the South Fork of Kings River. The other contract provided a similar treatment from the Kings River bridge over the 6.5 miles to Deer Cove Creek.

Dropping deep into the canyon from heights among the clouds overlooking the expanse of the San Joa-



Parking area at confluence of North and South Forks of Kings River showing new highway winding down into South Fork Canyon.



quin Valley to the west, and High Sierra to the east, the Kings River Canyon Highway offers panoramic views of mountain grandeur not easily to be forgotten, such as views of mountain massives, peaks of sheer granite rising to dizzy heights, pinnacles and deep canyons, and all on a tremendous scale.

The highway extends from the northerly boundary of General Grant National Park through Indian Basin, dropping down to Lookout Point, where a gorgeous panoramic view unfolds, and thence winds on down grade to Yucca Point. Here an inspiring view is to be had of the river named by the Spaniards in 1805, El Rio de los Santos Reyes (River of the Holy Kings). From here one can see the confluence of the Middle Fork and the South Fork of the Kings River, both extending miles back into steep walled gorges, scoured by glaciers in ancient times.

Winding on down hill on gentle grades and easy curves the highway is carved in the granite of the canyon wall of the South Fork of Kings River. The river is finally reached at Windy Cliff, about eighteen miles distant from General Grant Park.

Here the rock formation suddenly changes. A great limestone dike rises almost vertically to a height of fifteen hundred feet above the river, exquisite mountain sculpture. Nor are these natural carvings limited to the surface of the limestone formations.

Near Windy Cliff is to be found the entrance to Boyden Cave, a cavern extending several hundred feet into the great dyke. Galleries and grottoes carved in the limestone, ornamented with statuary of weird design; groups of stalactites and stalagmites, increasing in numbers as one walks further into the cavern. Strong currents of air are felt, apparently from crevices not yet explored, perhaps from an outside opening somewhere.

From the foot of the trail leading to Boyden Cave a large parking area has been provided for automobiles. At this point a bridge takes the highway across to the northerly side of the Kings River and thence it follows along the river past Boulder Creek and by Grizzly Creek, where a high

At top—A scene on the floor of the valley east of Cedar Grove where trees and river background against a series of scarred, bulking cliff masses rising straight up toward the skyline. At bottom—Along the river near Deer Cove Creek.

waterfall and spray from that stream can be seen through the trees.

At Deer Cove the highway constructed by the State comes to an end, but the road does not end here. The Forest Service has built the highway from Deer Cove on upstream to Cedar Grove. Here a large area among the trees has been prepared with all conveniences and comforts for a fine picnic and camping grounds.

The highway along the river presents a scenic contrast to views from Lookout Point. Winding gently along shaded aisles of a forest of dense growth, then breaking out into flowery meadows. In a rock walled canyon, through groves of Oak, Incense Cedar, Laurel and Ponderosa Pine. And always towering above the woods, the polished domes and spires of granite, reaching upward. And below the restless mountain torrent swirling down the gorge, its flow checked by deep silent pools, and hindered by long rapids and numerous cascades. This is the South Fork of the Kings River.

This most scenic highway was adopted as a route by vote of the State Highway Commission in 1928. In June of the following year work was commenced and was continued until its completion in October, 1939. Many engineers now in the employ of the Division of Highways have taken part some time or other in this engineering and construction project.

Mr. E. E. Wallace was District Engineer during the location of the Kings Canyon Highway and during the first years of its construction.

Mr. R. M. Gillis was District Engineer from 1933 to 1938, during the heaviest part of the construction work on this project.

The Kings River Canyon project covered a distance of 24.5 miles and was built at a cost of nearly \$2,300,000. Mr. R. C. McFarland was Construction Superintendent during nearly the entire period of work, while Mr. R. S. Badger was District Construction Engineer.

The formal dedication ceremonies were conducted at Cedar Grove attended by approximately 2000 citizens representing civic organizations

(Continued on page 23)

At a bend of the highway east of Boulder Creek a pair of towering, pointed half domes suggestive of Yosemite greet the eye, as shown in top photo. Below—The highway skirts the base of massive cliffs.



Divided Highway Completed Between Colton and Riverside

By A. EVERETT SMITH, Assistant Highway Engineer

A CONTRACT for constructing a portion of State highway from Colton southerly on La Cadena Drive for a distance of three miles was completed October 14.

This project is located between the cities of Colton and Riverside, State Route 43, and is on the Mountains to the Sea Highway via the Santa Ana Canyon. In addition to heavy periods of recreational traffic between the beach areas and the mountain resorts, this highway section serves intensified traffic originating in the San Bernardino and Colton areas on one side and the Riverside and March Field areas on the other.

the project, with curbs forming a central dividing strip between the north and southbound traffic lanes. The old pavement, which is now used by northbound traffic, was, for the major part, unchanged under this contract, except for the addition of surfaced shoulders and curbs.

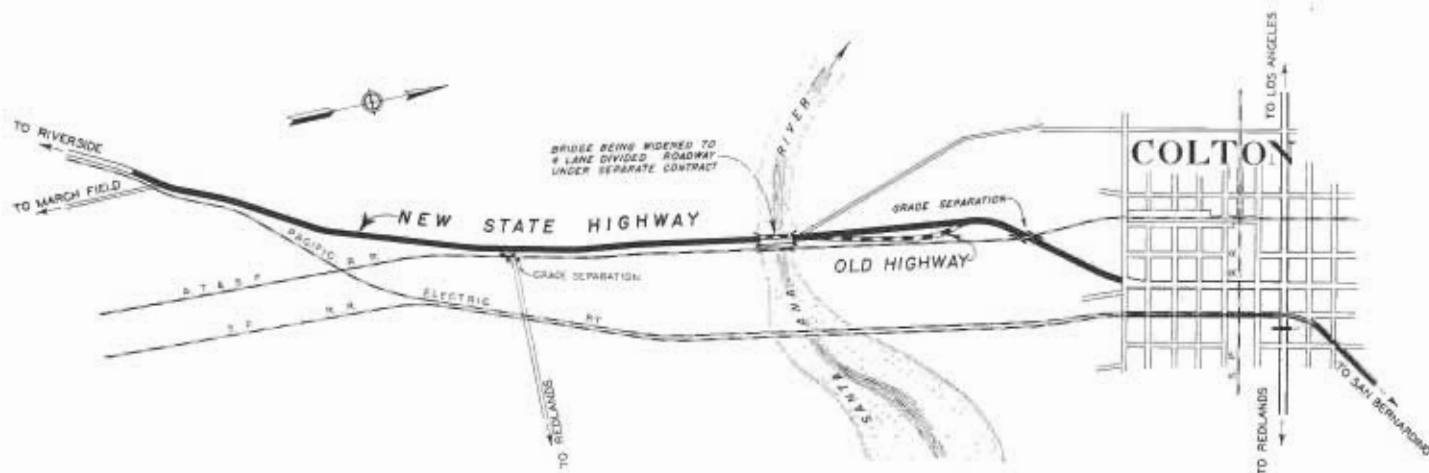
As the new lanes were constructed to modern gradient and alignment standards and as the existing pavement for the most part was unchanged, the highway presents a dual section with a two-level profile, and a variable width between dividing curbs.

By utilizing the existing pavement

timber guard railing was placed at locations where the difference in elevation of the two grade lines was such that steep fill slopes resulted between the two-level roadway sections.

A covering of top soil was placed on sandy cut slopes and between curbs in the divisional strip to facilitate planting, in connection with future beautification work and erosion control of the vulnerable slopes.

The new section for southbound traffic was constructed to the Division of Highways standards for a four-lane, divided highway with the inside lane twelve feet in width and the outside lane eleven feet in width. This



Before this improvement was made there was available to motorists at this point only a two-lane road, which carried traffic that exceeded 8000 vehicles a day by regular traffic count. During such periods of heavy traffic, the rate of speed for all vehicles was reduced to that of the slower vehicles on the road as passing to the left was seriously hindered by oncoming traffic, as well as by numerous limitations of sight distance at horizontal and vertical curves.

To correct these conditions an additional two lanes of pavement were constructed from the Santa Ana River Bridge to the southerly end of

for one-way traffic, considerable economy resulted. The difficulties previously encountered, due to limited sight distance resulting in the impeding of traffic and hazards involved in passing, are now eliminated, the amount of necessary sight distance being greatly reduced as no oncoming traffic is encountered. Thus, the same two-lane pavement section that was inadequate for heavy two-way traffic admits a rapid and uniform flow of two-lane traffic in one direction.

Portland cement concrete curbs for the dividing strip are of the recessed panel type to provide greater visibility during night driving. Laminated

is bordered by a seven-foot surfaced shoulder.

At the intersection with the road leading to Redlands a special design for channelization of traffic was adopted. This design, in addition to facilitating entry to the highway, provides stopping space outside of the driving lanes for cars making left turns across oncoming traffic.

At the Santa Ana River Bridge a separate project is now under way for constructing a bridge adjacent and parallel to the existing bridge to carry the four-lane, divided highway section across the river. This structure

(Continued on page 28)



Top—Recently completed divided highway between Colton and Riverside on State Route 43 showing central dividing strip separating old pavement on the left from new lanes on right and guard rail in place where there is considerable difference in elevation. Center—Treatment of dividing strip transition is shown between locations where highways are on different levels. Bottom—Close up of two different level sections.

Annual Convention of Highway Officials Develops New Ideas

By LAWRENCE BARRETT and L. G. HITCHCOCK, State Highway Commissioners

California was represented at the twenty-fifth annual convention of the American Association of State Highway Officials held at Richmond, Virginia, October 9-12, by officials of the Division of Highways and the State Highway Commission designated by Governor Culbert L. Olson and Director of Public Works Frank W. Clark. Chairman Larry Barrett of San Francisco and Commissioner L. G. Hitchcock of Santa Rosa attended as delegates from the Highway Commission and in the following article, jointly written, give some of their impressions of the convention.

ON OCTOBER 3, 1939, our Honorable Governor, Culbert L. Olson, addressed a letter to the State Controller granting permission, as required by law, to the writers of this article and six members of the Division of Highways, Department of Public Works, to attend the Twenty-fifth Annual Convention of the American Association of State Highway Officials at Richmond, Virginia.

In that letter the Governor stated: "It is believed desirable that these officials of the State Highway Department be permitted to attend this Convention for the purpose of acquainting themselves with the functions of this Association, and the assistance it will render them from an administrative standpoint in such matters as public relation, coordination between State Highway Departments and various Federal agencies, future Federal participation, advantages and disadvantages of limited State highway mileages, or control over the entire road system in a State."

In thus summarizing the advantages to be gained by the highway officials in participating in this convention, the Governor again displayed that farsightedness in the approach to public problems that has been so evident in his administration of the affairs of this State. For it can be said now that all of the reasons given by the Governor in his letter of October 3 were substantiated by actual accomplishments during the five days of the convention held in Richmond.

The California official party composed of the writers of this article and Charles H. Purcell, State Highway Engineer; Fred J. Grumm, Engineer of Surveys and Plans; T. H.

Dennis, Maintenance Engineer; F. W. Panhorst, Bridge Engineer; S. V. Cortelyou, District Engineer of District VII; T. E. Stanton, Materials and Research Engineer; and C. C. Carleton, Chief Attorney of Division of Contracts and Rights of Way, met on the opening day of the session at eight o'clock a.m. with more than five hundred representatives from all States in the Union at a breakfast held at the Raleigh Hotel in Washington, D. C., October 9th, to honor the twenty-fifth anniversary of the founding of this great association of highway officials.

At this breakfast meeting, certificates of appreciation were presented by President W. W. Mack, of Delaware, to fifteen of the surviving founders of the Association. All addresses and speeches were dispensed with at this meeting and the personnel of the Association used the time to great advantage in renewing old friendships and acquainting themselves with the new officials who were attending for the first time.

GROUP MEETINGS

The Association was escorted by the Virginia officials, in a caravan, over the beautiful skyline drive from Washington to Richmond. This highway is a monument to the national park service work in highway construction throughout the nation. It traverses the entire length of the Shenandoah National Park, which has often been described as being more beautiful than the Alps.

The trip, however, was a long one and, although abounding in beauty, at its end many of the delegates had a difficult time in bringing conviction

to their own minds that the group meetings scheduled for the evening of October 9th on administrative problems should be carried on as per schedule. However, in the true spirit of duty, the various group meetings got under way and it was long past eleven p.m. before the weary delegates retired to their respective rooms.

It will be interesting to the lay reader as well as the highway workers throughout the State to note some of the administrative problems that were gone into in these group sessions, and although it was impossible for each member of the California delegation to attend all of the group sessions, it can be said that California was well represented throughout the convention.

MANY SUBJECTS DISCUSSED

Some of the group sessions as designated on the program of the convention were: Compensation Insurance for Highway Department Employees with Discussion of Compensation for Superannuated Highway Employees; Public Relations, Particularly in Connection with Selection of Routes on the Basis of Public Need; Control and Operation of the State Highway Patrol by State Highway Departments; Should Cooperative Projects Between Highway Departments and WPA be Carried Out on New Construction or Should They Tend to Be on Additions and Betterments Which Would Relieve Highway Departments of Future Maintenance Costs? Zoning of Rural Highways as Protection Against Advertising and Commercial Use, and the Legislative Control of Billboards Adjacent to the Highways; Methods to Provide Co-

ordination Between the State Highway Departments and Various Federal Agencies; Methods for Insurance of Proper Right of Way for Future Widening of City Streets; Experience of the Various State Highway Departments in the Operation of Divided Four-Lane Highways; Matters of Traffic Control and Safety, Public Relations and Publicity, Uniform Accounting, Matters on Right of Way; Matters of Bridges and Structures, in which our own Bridge Engineer, F. W. Panhorst, read the principal report of the session; Matters of Road Design, Road Construction, Materials and Research, Maintenance and Equipment, Roadside Development.

WELCOMED IN VIRGINIA

The whole field of highway construction and development in America was covered and discussed to the end that new thoughts and new ideas were conveyed from one to the other and implanted in the minds of the highway officials of America to be drawn upon at a future time as opportunity or necessity demands.

On Tuesday morning, October 10th, in the air-cooled auditorium of the Hotel John Marshall, the regular convention session got under way with President Mack, of Delaware, presiding. Following the invocation by Bishop F. D. Goodwin, General S. M. Downs gave the official address of welcome, representing Governor James H. Price, of Virginia, who had been detained in Washington on official business of State.

General Downs paid high tribute to the highway officials of America and to the work they have accomplished. He recalled the condition of the highways of Virginia only a few years ago and then called our attention to the beautiful highways that exist in that State today, and we, of California, who were able to compare the Virginia roads of the present with the Virginia roads of old, can testify that great improvements have been made in that State.

PURCELL LAUDED

It is proper to mention at this time that throughout the entire nation insofar as we were able to discern in so short a space of time, rapid strides, both in design and construction, have been made by the highway departments of the various states, in cooperation with the United States Bureau of Roads, so that today, we do have

For National Defense

The following resolution recommending construction of an adequate system of Highways for National Defense was passed by the American Association of State Highway officials at its recent annual convention in Richmond, Va.:

Whereas, International conditions are unsettled throughout the world and a state of war exists in many countries, which tend to focus national attention on the subject of Adequate National Defense; and

Whereas, Any well considered plan for National Defense will require a comprehensive system of improved highways for the rapid and efficient transportation of men, equipment, and supplies; and

Whereas, Any system of highways that will serve adequately the military needs of the Nation will likewise be of immediate and continuing value to our people in times of peace, and will be a sound economic investment, whether ever needed for National Defense or not; and

Whereas, The building of a system of highways that is adequate for National Defense will not only add to our tangible national wealth in full proportion to expenditures made, but will also provide sorely needed employment of a diversified nature throughout the Nation; therefore, be it

Resolved, That the attention of the President and the Congress be called to this vital phase of our National Defense problem; and be it further

Resolved, That this Association hereby tenders its service to the President and the Congress, and respectfully suggests that the Public Roads Administration and the State Highway Departments of the several States, the road building agencies of this Nation, are at their disposal for carrying out any road-building program that might be considered essential to a National Defense program.

a highway system throughout the nation of which every citizen of the country can be proud.

Following the address of welcome by Mr. Mack, the convention paid tribute to our own highway engineer, Charles H. Purcell, past president of the Association of State Highway Officials. The excellent work of our own department has been well publicized throughout the United States and were it not for our own modesty, we would say that California is considered one of the leading States in the union in the development of highway engineering and construction.

Some of the notables who attended the convention were Governor Henry H. Blood, of Utah, a past president of the Association of State Highway Officials, who addressed the convention Wednesday, October 11th; Congressman Wilburn Cartwright, of Oklahoma, an ardent advocate of federal assistance in the matter of highway construction, who, with Lindsay C. Warren, of North Carolina, and James W. Mott, of Oregon, represented the House of Representatives at the convention.

CONGRESS REPRESENTED

It is a noteworthy fact that this was the first time in the history of Congress, that both the Senate and House by joint resolution and without a dissenting vote, sent a delegation to a convention of the Association of State Highway Officials. This delegation, in addition to the representatives above named, consisted of Senators Carl Hayden, of Arizona; Harry Flood Byrd, of Virginia, and Charles W. Tobey, of New Hampshire.

On Wednesday evening, the members of the Association and their ladies were the dinner guests of the Virginia State Highway Department. This dinner was attended by Governor Price who expressed the deep feeling of gratitude that he felt in having the State of Virginia chosen as the place for holding the 25th annual convention of the Association.

The last business session of the convention was held on Thursday, October 12th, and the morning session opened with an address by Henry F. Cabell, of Oregon, on the aims and accomplishments of the state highway departments in promoting safety. This address was fol-

(Continued on page 16)



Heavy equipment constructing underpass for Figueroa Street while traffic proceeds on Temple Street in Los Angeles.

Figueroa-Temple Street Grade Separation in City of Los Angeles

By R. C. MYERS, Assistant District Office Engineer

IMPROVEMENT of one of the most congested intersections in the Los Angeles metropolitan area is being made by the State Division of Highways at Figueroa and Temple Streets in the city of Los Angeles. Grades of these two important thoroughfares are being separated to eliminate the congestion and delay which increasing traffic has gradually brought about over a period of years.

The natural grade of Temple Street at this intersection is somewhat higher than that of Figueroa Street, forming a summit in the grade of the latter street. This topographic feature makes an ideal location for a grade separation, as a comparatively slight lowering of the grade of Figueroa Street as it approaches Temple Street will permit passing under the grade of Temple Street which will be carried

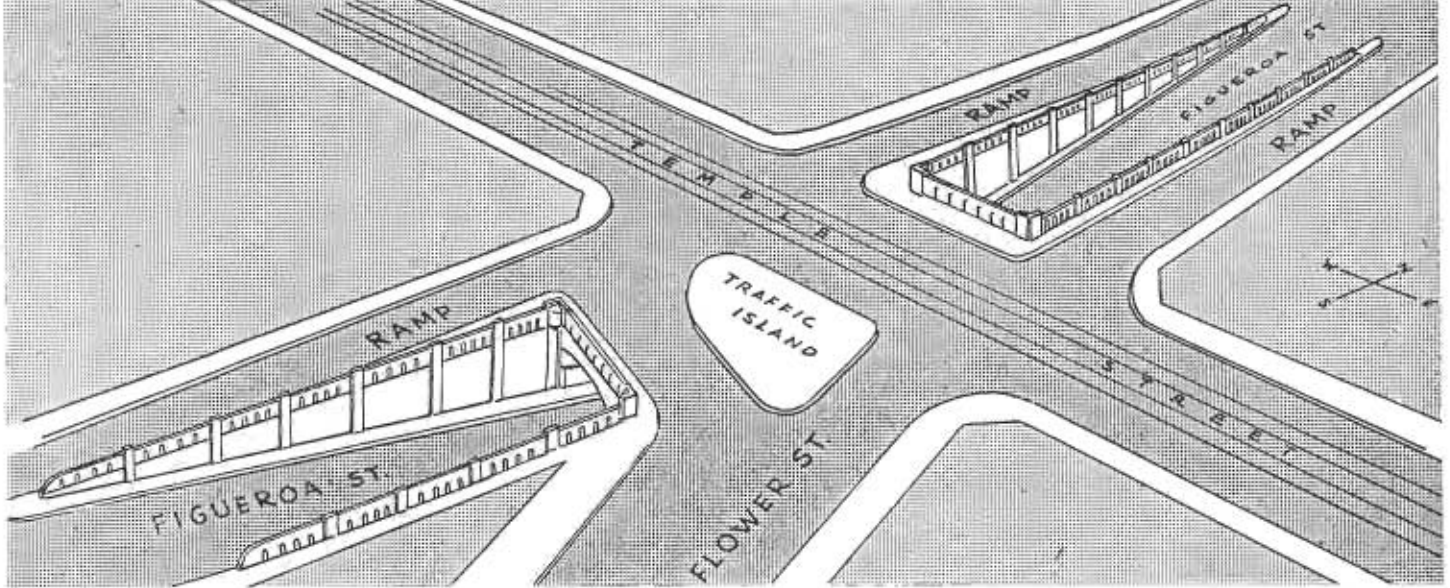
over Figueroa Street on a new bridge being built as a part of the present project.

The new bridge along Temple Street will be a reinforced concrete rigid frame structure having a width between curbs of 56 feet to conform to the width of this street on either side of the structure. The length of the improvement from Sunset Boulevard to Diamond Street is 0.4 mile, which is being constructed to a width of six traffic lanes with the exception of the portion through the underpass crossing Temple Street, which will be four traffic lanes in width.

A heavy reinforced concrete retaining wall on either side of this section will support ramps. Two of these ramps (one on each side) will parallel Figueroa Street northerly of Temple Street, making connection between the grades of these two streets for

both north and southbound traffic. Likewise, a ramp along the west side of Figueroa Street will connect the grades of the two streets southerly of Temple Street. A direct connection to Flower Street will be made at this intersection. Surfacing of the entire length of the project will be of asphaltic concrete.

It is worthy of note that the State, in cooperation with the city, is exercising extreme care in the handling of traffic through the job. The first step in construction was the building of retaining walls, closely followed by the paved ramps so that the large volume of traffic on Figueroa Street could be passed through the job with a minimum of inconvenience. All this was done before excavation was started for the underpass along Figueroa Street, which put the old traveled way out of service.



Sketch of grade separation project at intersection of Figueroa, Temple and Flower streets in Los Angeles.

In order to accommodate Temple Street traffic, the bridge crossing Figueroa Street is being built one-half width at a time. The street car tracks and all traffic are carried over the half not under construction. During the morning and evening rush periods traffic officers of the city of Los Angeles direct traffic at the intersection.

As a part of the present construction contract a drainage system is being built to drain storm waters from the low area south of Temple Street and bounded by Flower Street on the east and Fremont Avenue on the west. Some very heavy reinforced concrete pipe (72 in. and 84 in. in diameter) was used in this installation, which will relieve the

heavy accumulation of water occurring after each rain.

The cost of the contract will be about \$297,000. The required date for completion is December 17, 1939.

This project will, in the near future, be joined on the south by a city of Los Angeles contract from Diamond Street to Second Street, under which the grades of Figueroa and First streets will be separated. These present and pending improvements of Figueroa Street, together with improvements which have recently been made northerly of Sunset Boulevard, will greatly increase the capacity of this street and cut down the traveling time. The usual hazards and delays where major thoroughfares intersect

at grade will be largely eliminated. Driving time will be cut by the resulting continuous flow of traffic at normal speeds rather than by dangerously excessive speeds.

The principal function of this portion of Figueroa Street, from the Los Angeles River north of the tunnels to Second Street, will be to provide an unrestricted outlet into downtown Los Angeles from the Arroyo Seco Parkway, now under construction between Los Angeles and Pasadena.

The "Parkway" will probably be completed early in 1941 and will be a "Freeway" closely following the Arroyo Seco channel ending at the Los Angeles River where connection will be made via Figueroa Street.

Permanent ramps built before excavation began permit Figueroa Street traffic to proceed during construction of underpass.



Annual Convention of Highway Officials

(Continued from page 13)

lowed by a business session wherein the reports of the various committees were made, announcements were read, officers installed, and on reaching the hour of noon, the convention adjourned.

VISIT HISTORIC SIGHTS

Thereafter, the good people of Virginia exemplified further their hospitality by guiding the delegates and their ladies to the various historical points of interest in and around Virginia.

On the following day, many of the State officials journeyed to the historic town of Williamsburg as the guests of Mr. Kenneth Chorley, President of Williamsburg Restoration, Incorporated, and there made a tour of the restored buildings. This great project should be seen by every person in America who is at all interested in our early colonial history.

We believe it was the consensus of the delegates assembled in Richmond that there has been a general tendency on the part of government, both state and federal, to divert funds collected for highway use to purposes other than that for which they are intended and, in this respect, the convention passed a resolution deploring such diversion and urging the Congress of the United States to authorize for expenditure through the Public Roads Administration all the Federal income from the highway users for the construction of the Federal Aid System, forest roads, park roads and public land roads. It may be noted here that it was reported at the convention that the sum of approximately \$150,000,000 per annum has been diverted to purposes other than highway construction.

NATIONAL DEFENSE PROBLEM

It may be further noted that the delegates strongly urged upon the Congress of the United States the matter of considering the highway problem as it is applicable to our national defense, and the Association, by resolution, tendered its services and the services of the road building agencies of the nation to the President and the Congress insofar as that would be possible in the development

and planning of a road-building problem in connection with our national defense program.

It might be pointed out also that during the convention it was brought to the attention of the delegates that throughout the nation and, particularly in the east, there has been a growing tendency on the part of the state governments to secure revenue through exacting tolls and building highways subject to toll. The attitude of the State highway officials is that the United States can be best served by having all its state highways free of tolls and passed a resolution to that effect.

FREEWAYS FAVORED

In line also with the pioneering work done by our California highway officials, the convention went on record in favor of legislation to permit the state highway authorities to build limited access highways in suitable locations; or, in other words, to follow the program already instituted in California of building freeways wherever they are practicable.

The association also recommended to the legislatures of the several states that they enact a uniform code of motor vehicle laws and that cities enact a uniform system of traffic ordinances throughout the nation.

In general, the State highway officials of the United States have recognized that the matter of highway construction and development is no longer a local problem; that if we are to have free and uninterrupted commerce between states, between communities and between farm and market, we must have throughout the United States an integrated system of highways, a safe system of highways, a system of highways that is kept abreast of the technical developments in transportation, and which will give to the average citizen the advantage and pleasure of traveling throughout the length and breadth of the United States in a safe and comfortable manner.

And so we left the State of Virginia instilled with the thought that we could return to California and do a better job for our State and the people living therein, and we are thankful to Governor Culbert L.

Olson and to Frank W. Clark, Director of Public Works, for granting permission to the officials of the department to attend this, the greatest convention ever held by the American Association of State Highway Officials.

State Joins U. S. in \$3,200,000 Contract

(Continued from page 4)

A second structure to be built by the Bureau of Reclamation for highway use is the subway under the relocated Southern Pacific Railroad just north of the Sacramento River bridge near Antler. This structure will consist of a continuous through girder 95 feet 8 inches long, spanning both roadways, with a center support in the dividing strip. Both railroad and highway are on curves at the crossing, and the angle of intersection is 31 degrees 56 feet. Two roadways each 28 feet wide will be provided. The dividing strip 8 feet wide will extend about 230 inches each way from the structure to provide for safety to traffic.

The construction schedule for the several contracts to be let by the Division of Highways contemplates completion of the entire project in October, 1941, or one month after the completion of the relocation of the railroad.

Pit River Bridge Contract Awarded

Announcement was made on November 6 by the office of Secretary of the Interior Harold L. Ickes that the contract award of \$1,138,288 had been made to the Union Paving Company of San Francisco for the construction of the superstructure of the Pit River Bridge. The contractor, it was reported, will begin work next month.

The contract calls for four abutments and ten piers. It requires the superstructure to be completed in 16½ months.

Cities Receive Quarterly Gas Tax Funds for Streets of Major Importance

APPORTIONMENT of the October, 1939, payments of the $\frac{1}{4}$ -cent gasoline tax funds to municipalities for expenditure on streets of major importance has been made by the State Division of Highways of the department of Public Works.

Allocations were made under provisions of the Streets and Highways Code. The cities will receive an additional $\frac{1}{4}$ -cent of the gasoline taxes for use on State highways within their municipal boundaries. These moneys will be expended under supervision of the Division of Highways and will be available when contracts have been entered into between the cities and the State.

The distribution of funds for improvement of streets of major importance is as follows:

District I

City	Population	Amount
Del Norte County:		
Crescent City	1,720	\$449.23
Humboldt County:		
Arcata	1,709	\$446.36
Blue Lake	555	144.95
Eureka	15,752	4,144.12
Ferndale	889	232.19
Fortuna	1,239	323.60
Trinidad	107	27.95
Totals	20,251	\$5,289.17
Lake County:		
Lakeport	1,318	\$344.24
Mendocino County:		
Fort Bragg	3,022	\$789.29
Point Arena	385	100.55
Ukiah	3,124	815.93
Willits	1,424	371.92
Totals	7,955	\$2,077.69
Totals District I	31,244	\$8,160.33

District II

Lassen County:		
Susanville	1,358	\$354.69
Modoc County:		
Alturas	2,338	\$610.64
Plumas County:		
None		
Shasta County:		
Redding	4,188	\$1,093.83
Siskiyou County:		
Dorris	762	\$199.02
Dunsmuir	2,610	681.68
Etna	379	98.99
Fort Jones	302	78.88
Montague	507	132.42
Mount Shasta	1,063	277.63
Tulelake	300	78.35
Yreka	2,201	574.86
Totals	8,124	\$2,121.83

District II—Continued

City	Population	Amount
Tehama County:		
Corning	1,377	\$359.65
Red Bluff	3,517	918.57
Tehama	190	49.62
Totals	5,084	\$1,327.84
Totals District II	21,092	\$5,508.83

District III

Butte County:		
Biggs	463	\$120.93
Chico	7,961	2,079.26
Gridley	1,941	506.95
Oroville	4,742	1,238.52
Totals	15,107	\$3,945.66
Colusa County:		
Colusa	2,116	\$552.66
Williams	869	226.96
Totals	2,985	\$779.62
El Dorado County:		
Placerville	2,367	\$618.22
Glenn County:		
Orland	1,195	\$312.11
Willows	2,024	528.63
Totals	3,219	\$840.74
Nevada County:		
Grass Valley	3,817	\$996.92
Nevada City	1,701	444.27
Totals	5,518	\$1,441.19
Placer County:		
Auburn	2,661	\$695.00
Colfax	912	238.20
Lincoln	2,094	546.91
Rocklin	724	189.09
Roseville	6,425	1,678.09
Totals	12,816	\$3,347.29

Quarterly Gas Tax Paid Cities to Improve

District III—Continued

City	Population	Amount
Sacramento County		
North Sacramento	2,652	\$692.65
Sacramento	93,750	24,485.70
Totals	96,402	\$25,178.35
Sierra County:		
Loyalton	837	\$218.61
Sutter County:		
Yuba City	3,605	\$941.56
Yolo County:		
Davis	1,243	\$324.65
Winters	896	234.02
Woodland	5,578	1,456.86
Totals	7,717	\$2,015.53
Yuba County:		
Marysville	5,763	\$1,505.18
Wheatland	479	125.11
Totals	6,242	\$1,630.29
Totals District III	156,815	\$40,957.06

District IV

Alameda County:		
Alameda	35,033	\$9,149.95
Albany	8,569	2,238.06
Berkeley	82,109	21,445.29
Emeryville	2,336	610.12
Hayward	5,530	1,444.33
Livermore	3,119	814.62
Oakland	284,063	74,191.80
Piedmont	9,333	2,437.60
Pleasanton	1,237	323.08
San Leandro	11,479	2,998.09
Totals	442,808	\$115,652.94
Contra Costa County:		
Antioch	5,183	\$1,353.70
Concord	1,125	293.83
El Cerrito	3,870	1,010.77
Hercules	392	102.38
Martinez	7,931	2,071.42
Pinole	781	203.98
Pittsburg	9,610	2,509.95
Richmond	20,759	5,421.85
Walnut Creek	1,014	264.84
Totals	50,665	\$13,232.72
Marin County:		
Belvedere	500	\$130.59
Corte Madera	1,027	268.23
Fairfax	2,925	763.95
Larkspur	1,241	324.13
Mill Valley	4,164	1,087.56
Ross	1,355	353.90
San Anselmo	4,650	1,214.49
San Rafael	8,022	2,095.19
Sausalito	3,667	957.75
Totals	27,551	\$7,195.79
Napa County:		
Calistoga	1,000	\$261.18

District IV—Continued

City	Population	Amount
Napa	6,437	\$1,681.22
St. Helena	1,582	413.19
Totals	9,019	\$2,355.59
San Francisco County:		
San Francisco	634,394	\$165,691.52
San Mateo County:		
Atherton	1,324	\$345.80
Bayshore	1,149	300.10
Belmont	999	260.92
Burlingame	13,270	3,465.87
Daly City	8,435	2,203.06
Hillsborough	1,891	493.89
Lawndale	369	96.38
Menlo Park	2,254	588.70
Redwood City	8,962	2,340.70
San Bruno	3,610	942.86
San Carlos	1,132	295.66
San Mateo	13,456	3,514.45
South San Francisco	6,193	1,617.49
Totals	63,044	\$16,465.88
Santa Clara County:		
Alviso	381	\$99.51
Gilroy	3,502	914.66
Los Gatos	3,168	827.42
Morgan Hill	908	237.15
Mountain View	3,308	863.99
Palo Alto	13,883	3,625.97
San Jose	62,805	16,403.46
Santa Clara	6,302	1,645.96
Sunnyvale	3,094	808.09
Totals	97,351	\$25,426.21
Santa Cruz County:		
Santa Cruz	14,395	\$3,759.70
Watsonville	8,641	2,256.86
Totals	23,036	\$6,016.56
Sonoma County:		
Cloverdale	759	\$198.24
Healdsburg	2,296	599.67
Petaluma	8,245	2,153.44
Santa Rosa	10,759	2,810.04
Sebastopol	1,762	460.20
Sonoma	980	255.96
Totals	24,801	\$6,477.55
Totals District IV	1,372,669	\$358,514.76

District V

Monterey County:		
Carmel	2,260	\$590.27
King City	1,483	387.33
Monterey	9,141	2,387.45
Pacific Grove	5,558	1,451.64
Salinas	10,464	2,733.00
Soledad	594	155.14
Totals	29,500	\$7,704.83
San Benito County:		
Hollister	3,757	\$981.26
San Juan	772	201.63
Totals	4,529	\$1,182.89

Major Streets Other Than State Highways

District V—Continued

City	Population	Amount
San Luis Obispo County:		
Arroyo Grande	892	\$232.97
Paso Robles	2,573	672.02
Pismo Beach	1,572	410.58
San Luis Obispo	8,276	2,161.53
Totals	13,313	\$3,477.10
Santa Barbara County:		
Lompoc	2,845	\$743.06
Santa Barbara	33,613	8,779.07
Santa Maria	7,057	1,843.15
Totals	43,515	\$11,365.28
Totals District V	90,857	\$23,730.10

District VI

Fresno County:		
Clovis	1,316	\$343.71
Coalinga	2,851	744.63
Firebaugh	506	132.16
Fowler	1,171	305.84
Fresno	53,851	14,064.84
Kingsburg	1,322	345.28
Parlier	564	147.31
Reedley	2,589	676.20
Sanger	2,967	774.92
San Joaquin	163	42.57
Selma	3,047	795.82
Totals	70,347	\$18,373.28
Kern County:		
Bakersfield	26,015	\$6,794.62
Delano	2,632	687.43
Maricopa	1,071	279.73
Shafter	1,263	329.87
Taft	3,442	898.98
Tehachapi	736	192.23
Totals	35,159	\$9,182.86
Kings County:		
Corcoran	1,768	\$461.77
Hanford	7,028	1,835.58
Lemoore	1,399	365.39
Totals	10,195	\$2,662.74
Madera County:		
Chowchilla	847	\$221.22
Madera	4,665	1,218.41
Totals	5,512	\$1,439.63
Tulare County:		
Dinuba	2,968	\$775.18
Exeter	2,832	739.66
Lindsay	3,878	1,012.86
Porterville	5,303	1,385.04
Tulare	6,207	1,621.15
Visalia	7,263	1,896.96
Totals	28,451	\$7,430.85
Totals District VI	149,664	\$39,089.36

District VII

Los Angeles County:		
Alhambra	29,472	\$7,697.52
Arcadia	5,216	1,362.32

District VII—Continued

City	Population	Amount
Avalon	1,897	\$495.46
Azusa	4,808	1,255.76
Bell	7,884	2,059.15
Beverly Hills	17,429	4,552.12
Burbank	16,662	4,351.79
Claremont	2,719	710.15
Compton	12,516	3,268.94
Covina	2,786	727.65
Culver City	5,669	1,480.63
El Monte	3,479	908.65
El Segundo	3,503	914.92
Gardena	7,044	1,839.76
Glendale	62,736	16,385.44
Glendora	2,761	721.12
Hawthorne	6,596	1,722.75
Hermosa Beach	4,796	1,252.62
Huntington Park	24,591	6,422.70
Inglewood	21,421	5,594.75
La Verne	2,860	746.98
Long Beach	142,890	37,320.12
Los Angeles	1,240,575	324,014.35
Lynwood	7,323	1,912.63
Manhattan Beach	1,891	493.89
Maywood	8,426	2,200.71
Monrovia	10,890	2,844.26
Montebello	5,498	1,435.97
Monterey Park	6,406	1,673.12
Pasadena	76,362	19,944.29
Pomona	20,804	5,433.60
Redondo Beach	9,347	2,441.26
San Fernando	7,567	1,976.35
San Gabriel	7,299	1,906.36
San Marino	3,730	974.20
Santa Monica	37,146	9,701.82
Sierra Madre	3,550	927.19
Signal Hill	2,932	765.78
South Gate	19,632	5,127.50
South Pasadena	13,730	3,586.01
Torrance	8,834	2,307.27
Vernon	1,269	331.44
West Covina	997	260.40
Whittier	14,846	3,877.49
Totals	1,898,789	\$495,927.19
Orange County:		
Anaheim	11,013	\$2,876.38
Brea	2,435	635.98
Fullerton	10,860	2,836.42
Huntington Beach	3,690	963.76
Laguna Beach	1,981	517.40
La Habra	2,273	593.66
Newport Beach	2,203	575.38
Orange	8,066	2,106.68
Placentia	1,606	419.46
San Clemente	667	174.21
Santa Ana	30,322	7,919.52
Seal Beach	1,156	301.93
Tustin	926	241.86
Totals	77,198	\$20,162.64
Ventura County:		
Fillmore	2,893	\$755.60
Ojai	1,468	383.41
Oxnard	6,285	1,641.52
Santa Paula	7,452	1,946.32
Ventura	11,603	3,030.48
Totals	29,701	\$7,757.33
Totals District VII	2,005,688	\$523,847.16

(Continued on page 22)

Another Grade Crossing Peril Removed by Overpass in Bakersfield

By W. A. DOUGLAS, Associate Bridge Engineer

ELIMINATION of another hazardous grade crossing from the California Highway System was achieved on October 17 when Director of Public Works Frank W. Clark accepted the completed contract of the United Concrete Pipe Company for the construction of the Oak Street Overpass in Bakersfield.

When the Federal Government in 1935 allocated millions of dollars to the Works Program Grade Crossing

train movements constitute an additional hazard by "piling up" traffic.

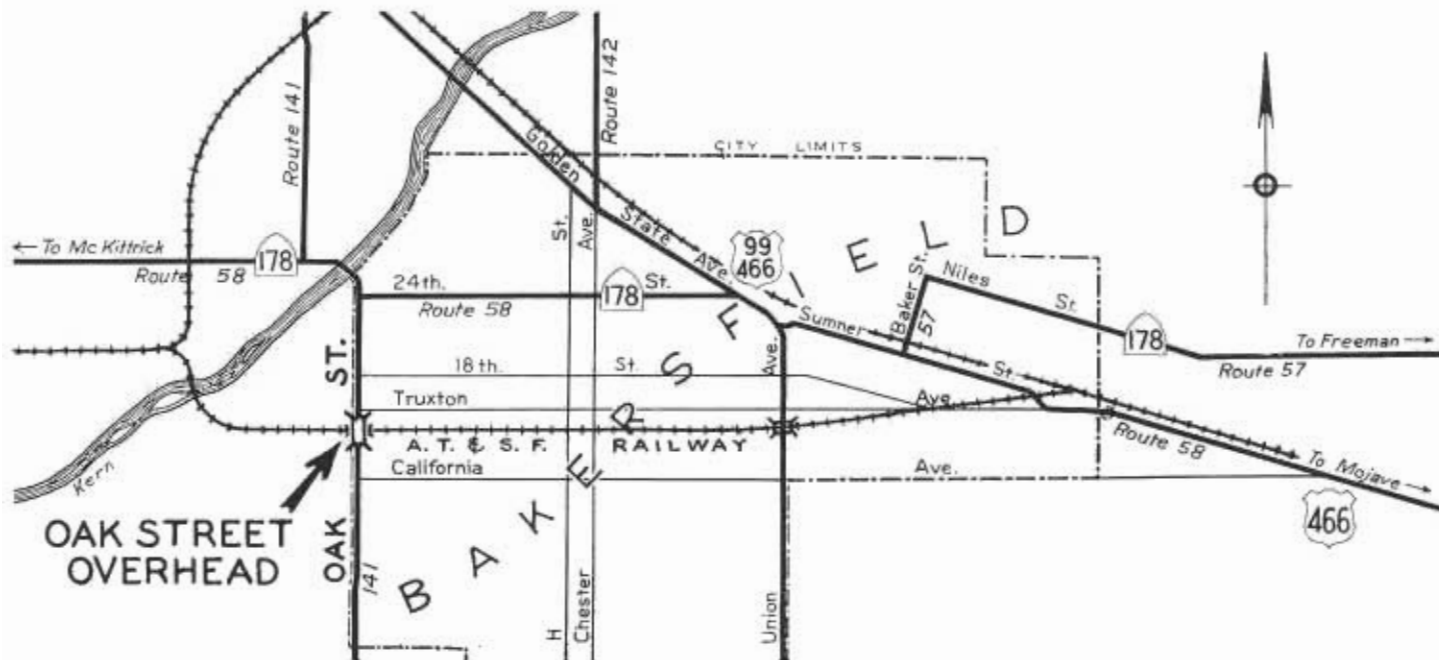
OAK STREET HAZARDS GREAT

This latter hazard is perhaps less fatal in results but nevertheless very important from a standpoint of delays and economic loss. Information from the railroad when traffic studies were being made at Oak Street in Bakersfield indicated six passenger, ten freight and 250 switching move-

Santa Fe tracks was one of the first projects considered for the Federal separation program but, due to various unavoidable delays in necessary adjustment of facilities, acquisition of right of way and requirements as to distribution of funds, was not actually financed until the 1939 allocation was programmed.

HEAVY TRAFFIC

Oak Street is the westerly city lim-



funds and followed in succeeding years with additional though much lesser appropriation to the Federal Aid Grade Crossing funds, the primary prescribed objective of the program was, and is, the elimination of hazards at highway or street grade crossings of railroads.

Crossing hazards are ordinarily thought of as resulting in collision between trains and motor vehicles causing loss or damage to life and property. Crossings that are blocked to highway traffic frequently or for long periods by a large number of

movements per day. If an average of five minutes or even three minutes delay was caused highway traffic for each movement, a very large economic loss would result. The crossing record also shows that in the 13 years prior to separation, 23 accidents occurred, in which one person was killed and five injured. Therefore, it is obvious that the Oak Street project qualified for separation not only because of the existing hazards to life and limb, but also because of the frequent delays.

The separation of grades of Oak Street and The Atchison, Topeka and

its of Bakersfield. It is designated as State Highway Route 141, which connects the Golden State Highway, Route 4, on the north with a number of important local roads and highways south of the city. This route and connections form a convenient alternate route for through traffic to bypass the heavier traveled routes through Bakersfield.

The Oak Street crossing is a focal point for north or southbound traffic crossing the Santa Fe tracks west of Union Avenue. Southbound traffic

(Continued on page 26)



This grade separation structure on Oak Street in Bakersfield carries State Highway 141 over tracks of The Atchison, Topeka and Santa Fe railroad yard. It has an overall length of 1607 feet with a 26-foot roadway and sidewalks and is designed for future widening.

Cities Receive Quarterly Gas Tax Funds

(Continued from page 19)

District VIII

City	Population	Amount
Riverside County:		
Banning	2,767	\$722.69
Beaumont	1,332	347.89
Corona	7,018	1,832.97
Elsinore	1,350	352.59
Hemet	2,235	583.74
Palm Springs	2,553	666.80
Perris	763	199.28
Riverside	29,696	7,756.02
San Jacinto	1,346	351.55
Totals	49,060	\$12,813.53
San Bernardino County:		
Chino	3,118	\$814.36
Colton	8,023	2,095.45
Needles	3,144	821.15
Ontario	13,583	3,547.62
Redlands	14,177	3,702.76
Rialto	1,642	428.86
San Bernardino	39,068	10,203.81
Upland	4,713	1,230.95
Totals	87,468	\$22,844.96
Totals District VIII	136,528	\$35,658.49

District IX

Inyo County:		
Bishop	1,159	\$302.71
Mono County:		
None.		

District X

Amador County:		
Amador City	171	\$44.66
Jackson	2,005	523.67
Plymouth	343	89.58
Sutter Creek	1,013	264.58
Totals	3,532	\$922.49
Calaveras County:		
Angels	915	\$238.98
Mariposa County:		
Hornitos	62	\$16.19
Merced County:		
Atwater	917	\$239.50
Dos Palos	930	242.90
Gustine	1,016	265.36
Livingston	803	209.73
Los Banos	1,875	489.72
Merced	7,066	1,845.50
Totals	12,607	\$3,292.71
Sacramento County:		
Isleton	2,906	\$758.99
San Joaquin County:		
Lodi	7,382	\$1,928.04

District X—Continued

City	Population	Amount
Manteca		
Manteca	1,614	\$421.55
Stockton		
Stockton	47,963	12,527.01
Tracy		
Tracy	3,829	1,000.06
Totals	60,788	\$15,876.66
Solano County:		
Benicia	2,913	\$760.82
Dixon	1,000	261.18
Fairfield	1,131	295.39
Rio Vista	1,309	341.88
Suisun	905	236.37
Vacaville	1,868	487.89
Vallejo	15,277	3,990.06
Totals	24,403	\$6,373.59
Stanislaus County:		
Ceres	981	\$256.22
Modesto	14,079	3,677.16
Newman	1,269	331.44
Oakdale	2,112	551.61
Patterson	905	236.37
Riverbank	803	209.73
Turlock	4,276	1,116.81
Totals	24,425	\$6,379.34
Tuolumne County:		
Sonora	2,278	\$594.97
Totals District X	131,916	\$34,453.92

District XI

Imperial County:		
Brawley	10,439	\$2,726.47
Calexico	6,299	1,645.18
Calipatria	1,554	405.87
El Centro	8,434	2,202.80
Holtville	1,758	459.16
Imperial	1,943	507.47
Westmorland	1,476	385.50
Totals	31,903	\$8,332.45
Riverside County:		
Blythe	1,020	\$266.41
Indio	2,601	679.33
Totals	3,621	\$945.74
San Diego County:		
Chula Vista	3,869	\$1,010.51
Coronado	5,425	1,416.90
El Cajon	1,050	274.24
Escondido	3,421	893.50
La Mesa	2,513	656.35
National City	7,301	1,906.88
Oceanside	3,514	917.79
San Diego	151,694	39,619.56
Totals	178,787	\$46,695.73
Totals District XI	214,311	\$55,973.92

Auto Jobs Employ 6,380,000

Employment generated by the automobile manufacturing industry provides a livelihood for 6,380,000 per-

sons, according to the twenty-first edition of "Automobile Facts and Figures," annual publication of the Automobile Manufacturers Associa-

tion. Almost ten times as many people are employed in selling, servicing and driving as are engaged in producing them.



Official group at Kings River Canyon dedication, left to right: C. B. Morse, Assistant U. S. Regional Forester; J. E. Elliott, Superintendent Sequoia Forest; David Peckinpah, Fresno Chamber of Commerce; R. M. Gillis, State Highway Construction Engineer; M. A. Benedict, Superintendent Sierra Forest; Iener W. Nielsen, State Highway Commissioner; L. V. Campbell, Engineer City and Cooperative Projects; George McCoy, Assistant State Highway Engineer; Secretary Scott, Highway Commission; District Engineer Scott; Fred Grumm, Engineer Surveys and Plans; Highway Commissioner L. B. Hitchcock; C. C. Carleton, State Highway Attorney.

Kings River Canyon Highway Opened

(Continued from page 9)

throughout the San Joaquin Valley. Sponsors were the San Joaquin Valley Regional Council of California, State Chamber of Commerce, Fresno County

Chamber of Commerce and the Associated Chambers of Tulare County.

The speakers included State Highway Commissioner Iener W. Nielsen of Fresno; Supervisor J. E. Elliott of Sequoia National Forest, in which the canyon is situated; W. A. Collins, Chairman of the Fresno County Board of Supervisors; Chester H. Warlow of the Fresno Chamber of

Commerce; Associate State Highway Engineer George T. McCoy, representing State Highway Engineer C. H. Purcell; R. M. Gillis, State Highway Construction Engineer; C. B. Moss, Associate Regional Forester, United States Forest Service; Fred Grumm, State Highway Engineer of Plans and Surveys; and former Congressman D. S. Church of Denver

Bay Bridge Anniversary Report Shows Record Traffic and Toll Earnings

TOPPING all toll bridges in annual earnings and ranking among the first three in traffic, the San Francisco-Oakland Bay Bridge observed its third anniversary Sunday, November 12.

From the moment President Franklin D. Roosevelt pressed the "go" signal in Washington, at 12.30 o'clock noon, November 12, 1936, traffic has sped in an unceasing flow, day and night, across the 4½-mile span, piling up an enormous total of 28,650,000 vehicles in the succeeding three years.

The only toll bridges higher in traffic volume, according to 1938 totals, are the Delaware River Bridge and the Triborough in New York. The Bay Bridge topped the George Washington Bridge last year by a million vehicles.

Director of Public Works Frank W. Clark, reporting to Governor Olson, chairman of the California Toll Bridge Authority, announced

that in the period November 12, 1936, to November 12, 1939, total revenues from the bridge (including tolls paid by the interurban, rents and interest) approximated \$15,300,000.

He said the bridge now carries 78 per cent of all vehicular traffic crossing between San Francisco and Alameda counties (exclusive of Treasure Island traffic).

He pointed out that if the vehicles that have crossed by bridge and ferry since the bridge opened (34,178,300) had paid the average toll charged by the ferries (\$0.78) just before the bridge opened, they would have paid a total of \$26,659,000 instead of the actual amount totaling \$16,391,000. Thus, Mr. Clark said, the bridge has effected a saving of \$10,268,000 to motorists. Tolls, he said, have been reduced by approximately one-half since pre-bridge days.

The interurban system across the bridge increased the number of persons served by the span by approximately 17,000,000 to date, bringing

the total in the last three years to an estimated 80,000,000 persons, more than 60 times the combined population of San Francisco and Alameda counties.

The expansion of commerce across San Francisco Bay since the bridge opened is also indicated in freight figures which show a forty per cent increase in the total amount of transbay tonnage handled, Mr. Clark said.

The bridge has handled some 2,000,000 exposition-bound vehicles, and carried almost half the number of persons going to the fair, Mr. Clark reported.

On the eve of its third anniversary, the San Francisco-Oakland Bay Bridge broke all of its previous monthly records in the amount of traffic carried in October with a total of 1,141,338 vehicles crossing during the 31-day period, making the fourth successive month in which traffic topped the million mark. Preceding months were: July, 1,093,502; August, 1,127,528; September, 1,015,824.

Turlock Overhead Nears Completion Eliminating Dangerous Grade Crossing

By W. J. DEADY, Resident Engineer

ONE of the few remaining dangerous grade crossings on Route 4 will soon be a thing of the past with the construction work on the Turlock Overhead project at the three-quarter point. With the exception of the Cherry Avenue crossing at Fresno, this will complete the program of separating the grades of the highway and main line railroad tracks on the Golden State Highway between Sacramento and Los Angeles.

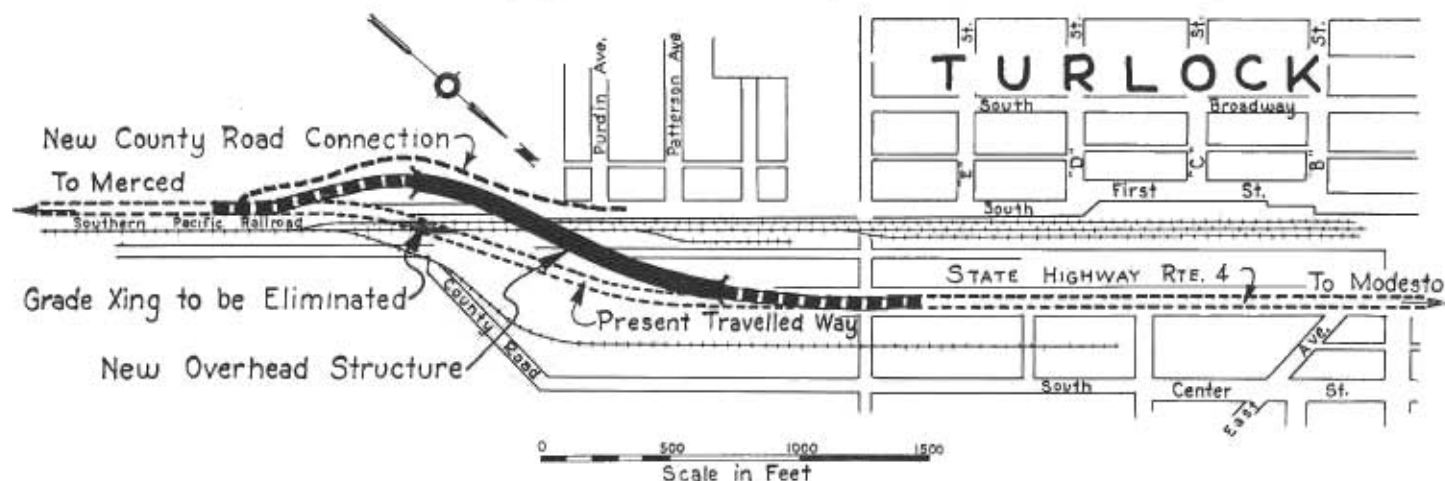
The original crossing of the Southern Pacific tracks south of Turlock was surfaced in 1913. This was a

An overhead crossing was decided upon when studies revealed that a subway would have been a difficult and costly undertaking because of the proximity of the ground waters to the surface. The design finally decided upon is a typical modern example of grace and economy.

On February 8, 1939, bids were opened and the contract was awarded to the Union Paving Company of San Francisco. The total project allotment is \$330,500 with contract items amounting to \$284,100. Excellent progress has been made by the con-

1247 feet long and will rise sufficiently high into the air to provide a 23-foot vertical clearance at the tracks. There will be 23 steel beam spans of various lengths with a reinforced concrete deck.

The composite design selected for the portion of the bridge between bents 7 and 15 is both unique and economical. Here the span lengths are controlled by the legal side clearances at the tracks and the skew angle, which is 24 degrees, 59 feet. Had the common practice of placing all of the beams parallel with center



90 degree crossing with sharp approach curves. In 1934, State Highway alignment through Turlock was greatly improved and the crossing angle was revised to 21 degrees to permit the use of longer and flatter approach curves. This improvement, however, was considered only a temporary expedient that would somewhat lessen the danger of the crossing until such time when funds could be made available for a separation of the grade. In 1938 a Federal Grade Separation Allotment made possible the construction of such a structure. The traffic count at the crossing was at that time 5600 vehicles per 16 hours. It is estimated that this has since increased by at least 10 per cent.

tracting firm and the project is approximately 30 per cent ahead of schedule.

With 75 per cent of the work complete, the project to date has provided approximately 60,000 man-hours of labor. This does not include the labor required to produce the 4500 tons of road gravel, 9000 barrels of cement, 9800 tons of sand and gravel for concrete, 690,000 pounds of reinforcing steel, 1,711,000 pounds of structural steel, 21,000 lineal feet of treated piling, together with form lumber and other materials that will go into the project. There are, in all, 100 miles of reinforcing bars in the job.

The structure will be approximately

line been followed it would have been necessary either to have raised the deck elevation and substituted plate girders for the "I" beams or increased the number of "I" beams beyond all limits of economy.

With the design adopted, a sizeable saving of steel is made by placing a number of the girders normal to the piers. These carry a large portion of the loads. The two girders on the outsides are parallel to center line and are continuous over the piers. These outside girders, which, at best, could only receive a portion of the load that is transmitted to an interior beam, are 36-inch wide flange sections weighing 300 pounds per foot. They are the

(Continued on page 28)



At top—General view of highway overhead structure under construction at Turlock separating grades of Golden State Highway and main line railroad tracks. Lower left shows unique design of placing some girders normal to the piers on skew curve. Bottom—Laying reinforcing steel on bridge deck.

Grade Crossing Peril Removed by Overpass

(Continued from page 20)

distributes to Route 4 by way of California Avenue or Brundage Lane or toward Taft and Maricopa and other points south and west. Northbound traffic distributes to the business district of Bakersfield, to the west on Route 58, to the north on Route 4, or to the oil fields easterly.

There is no other grade crossing within eleven blocks to the east as The Atchison, Topeka and Santa Fe Railroad yards make such a grade crossing impractical. It is also highly improbable that any separation would be built within the yard area as the vehicular traffic would hardly warrant it and the physical difficulties involved would make such a separation uneconomical. The area to the west is sparsely settled and outside the city limits. Therefore, a separation within a considerable distance in that direction seems unlikely.

The Oak Street Grade Crossing involved a main line, passing track and three yard tracks of The Atchison, Topeka and Santa Fe. The overhead structure recently completed provides for twelve tracks which will accommodate the ultimate development of yard facilities.

Highway traffic amounting to about 2000 vehicles per day is now accommodated by a two-lane 26-foot overpass with sidewalks for pedestrians. Since highway traffic is increasing on this route, it is anticipated that a wider roadway will be needed later. The present structure was therefore built to permit future widening. Surfaced sideroads were provided for access to abutting property where needed.

The final cost of the Oak Street Overpass is about \$190,000. It is considered an outstanding improvement, which adds very materially to the safety and convenience of highway users in the Bakersfield area. For the satisfactory planning and construction of this separation, a great deal of credit is due the city of Bakersfield and The Atchison, Topeka and Santa Fe for their cooperation.

Otto Parlier was superintendent for the contractors and Irwin T. Johnson was resident engineer for the State.

Highway Bids and Awards for the Month of October, 1939

BUTTE COUNTY—Fifteen bridges between Marysville and Chico to be strengthened. District III, Route 3, Sections B, C, A. Frederick Anderson, Oakland, \$12,376; E. E. Smith, Eureka, \$14,273; M. A. Jenkins, Sacramento, \$15,740; C. W. Caletti & Co., San Rafael, \$16,656; A. A. Tieslau, Berkeley, \$16,790; Albert H. Siemer and John Carcano, San Anselmo, \$17,605. Contract awarded to F. Kaus, Stockton, \$12,361.

FRESNO COUNTY—At Firebaugh, about 2.7 miles to be graded and surfaced with plant-mixed surfacing and bridges to be constructed. District VI, Route 41, Sections M, F, N. Louis Biasotti & Son, Stockton, \$142,229; Trewhitt-Shields & Fisher and Stewart & Nuss, Inc., Fresno, \$145,057; Union Paving Co., San Francisco, \$147,370; Claude C. Wood & L. D. Tonn, Lodi, \$160,178; Basich Bros., Torrance, \$163,184; United Concrete Pipe Corp., Los Angeles, \$175,149; A. S. Vinnell Co., Alhambra, \$199,087. Contract awarded to Al Teichert & Son, Inc., Sacramento, \$137,730.

INYO COUNTY—Between southerly boundary and Lone Pine, about 9.7 miles road-mix surfacing and seal coat. District IX, Route 23, Sections G, L. A. S. Vinnell Co., Alhambra, \$11,768. Contract awarded to Basich Bros., Torrance, \$10,877.40.

INYO COUNTY—Between Natural Soda Products Plant and Panamint Sink, about 12.1 miles to be surfaced with road-mix surfacing. District IX, Route 127, Sections D, E, F. A. S. Vinnell Co., Alhambra, \$17,372; Basich Bros., Torrance, \$18,408. Contract awarded to Ruddy & Corfield, Modesto, \$16,593.60.

INYO COUNTY—Ten miles southeast of Keeler, 1.1 miles grading and road-mix surface treatment. District IX, Route 127, Section D. Basich Bros., Torrance, \$5,266; A. S. Vinnell Co., Alhambra, \$6,145; Ruddy & Corfield, Modesto, \$6,925; Oilfields Trucking Co., Bakersfield, \$7,405; Rexroth & Rexroth, Bakersfield, \$7,498; Spaletta, Siri & Siri, Santa Rosa, \$12,657. Contract awarded to Anderson & France, Visalia, \$3,952.05.

KERN COUNTY—Between Weldon and Chimney Creek, imported borrow blanket and road-mix surface treatment on 1.4 miles. District IX, Route 57. Section J. A. S. Vinnell Co., Alhambra, \$7,715; Basich Bros., Torrance, \$9,252; George E. France, Colfax, \$9,221. Contract awarded to Rexroth and Rexroth, Bakersfield, \$6,980.80.

LOS ANGELES COUNTY—Between Walnut Canyon and Solstice Canyon, about 3.7 miles to be graded and plant-mixed surfacing and portland cement concrete pavement to be placed. District VII, Route 60, Section A. Parish Bros., Los Angeles, \$258,671; Match Bros., Elsinore, \$260,711; Macco Construction Co., Clearwater, \$263,381; J. E. Haddock, Ltd., Pasadena, \$271,612; Basich Bros., Torrance, \$278,448; Claude Fisher Co., Ltd., Los Angeles, \$281,888; Radich & Brown, Burbank, \$282,230; Griffith Co., Los Angeles, \$295,053; United Concrete Pipe Corporation, Los Angeles, \$311,235; Spicer & Thompson, Los Angeles, \$328,697. Contract awarded to John Strona, Pomona, \$245,786.80.

MERCED COUNTY—Between Merced and Black Rascal Creek, about 1.7 miles to be graded, paved with portland cement concrete and plant-mixed surfacing and reinforced concrete bridges to be constructed. District X, Route 4, Section C. Louis Biasotti & Son, Stockton, \$179,190; Union

Paving Co., San Francisco, \$186,179; United Concrete Pipe Corp., Los Angeles, \$199,276. Contract awarded to Marshall Hanrahan, Redwood City, \$175,327.95.

MONTEREY COUNTY—Between the southerly boundary and Bradley, about 7.3 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District V, Route 2, Section I. J. E. Haddock, Ltd., Pasadena, \$250,399; Eaton & Smith, San Francisco, \$279,277; Basich Bros., Torrance, \$242,361; The Utah Construction Co., San Francisco, \$235,113; R. E. Hazard & Sons, San Diego, \$232,901; Harms Bros. and N. M. Ball Sons, Berkeley, \$236,585; Daley Corp., San Diego, \$256,328; A. Teichert & Son, Inc., Sacramento, \$258,127; Hefey-Moore Co., Frederickson & Watson Const. Co., Oakland, \$258,885; Claude Fisher Co., Ltd., Los Angeles, \$261,879; United Concrete Pipe Corp., Los Angeles, \$327,402; Oswald Bros., Los Angeles, \$262,677; Gibbons & Reed Co., Burbank, \$288,911. Contract awarded to Hemstreet & Bell, Marysville, \$228,912.20.

SACRAMENTO COUNTY—Fenders and draw rest for bridge at Three Mile Slough about 7.4 miles north of Contra Costa County line to be constructed. District X, Route 11, Section C. Holdener Construction Co., Sacramento, \$19,033; Healy Tibbitts Construction Co., San Francisco, \$19,882; Frank Legg, San Francisco, \$20,083; M. A. Jenkins, Sacramento, \$21,717; M. B. McGowan, Inc., San Francisco, \$22,906. Contract awarded to Bundesen & Lauritzen, Pittsburg, \$17,489.70.

SAN BERNARDINO COUNTY—Between Upland and Haven Ave. and between San Bernardino and Verdemon, about 7.1 miles plant-mix surfacing to be placed and a seal coat applied thereto. District VIII, Routes 190 and 191, Sections A, S. Bd., A. Griffith Co., Los Angeles, \$32,501; E. L. Yeager, Riverside, \$34,119; J. E. Haddock, Ltd., Pasadena, \$34,524; Geo. Herz & Co., San Bernardino, \$34,963. Contract awarded to Oswald Bros., Los Angeles, \$30,993.

SAN DIEGO COUNTY—3.9 miles road-mix surface treatment through La Jolla Indian Reservation. Daley Corp., San Diego, \$14,891; Anderson & France, Visalia, \$13,855; R. M. Price, Huntington Park, \$13,878. Contract awarded to R. E. Hazard & Sons, San Diego, \$12,769.50.

SAN DIEGO COUNTY—Between El Cajon Avenue in La Mesa and Sunshine Street in El Cajon, about 4.1 miles to be graded and portions to be paved with portland cement concrete and asphalt concrete. District XI, Route 12, Sections L, Msa., B, E, Cj. Griffith Co., Los Angeles, \$224,745; R. E. Hazard & Sons, San Diego, \$239,313; Daley Corp., San Diego, \$246,552; J. E. Haddock, Ltd., Pasadena, \$283,390. Contract awarded to V. R. Dennis Construction Co., San Diego, \$219,325.45.

SAN FRANCISCO CITY AND COUNTY—Between Lake St. and Golden Gate Bridge approach, consists, in general, of about 1.6 miles to be paved with portland cement concrete on crusher run base, and a lighting system to be furnished and installed. District IV, Route 56, Section S. F. Macco Construction Co., Clearwater, \$130,536; Chas. L. Harney, San Francisco, \$130,591; Eaton and Smith, San Francisco, \$141,754; The Fay Improvement Co., San Francisco, \$153,483. Contract awarded to Union Paving Co., San Francisco, \$130,373.50.

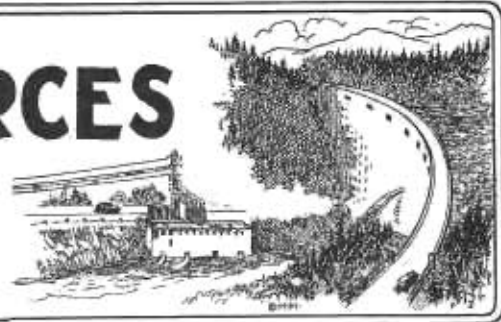
(Continued on page 27)



DIVISION OF WATER RESOURCES

OFFICIAL REPORT
FOR THE MONTH OF
OCTOBER, 1939

EDWARD HYATT, State Engineer



IRRIGATION DISTRICTS

Imperial Irrigation District called for bids October 3d, on miscellaneous equipment and materials for its power plant located at Drop No. 3 on the All-American Canal. Construction of the District's hydro power plants has been under way for several months and they are expected to be completed and in operation by April 1, 1940. The Imperial Dam and Headworks, and the All-American are now substantially completed. The canal is ready for priming preparatory to being placed in service.

Santa Ynez River Conservation District in Santa Barbara County was organized at a special election to protect and develop the water supplies of the Santa Ynez River. It embraces over 150,000 acres of land along that stream in Lompoc and Santa Ynez valleys.

The Irrigation Districts Association of California held its biannual meeting in San Francisco, October 19th and 20th for discussion of current problems, including flood control plans and equitable methods of collecting revenues by levying assessments or by charging water tolls. More than three hundred delegates from 47 counties were in attendance.

CENTRAL VALLEY PROJECT

Studies were continued with regard to the disposal and distribution of power which will be available from the Shasta Power Plant of the project including the programming of additional facilities to provide for the absorption thereof in the market of northern and central California, also for the formulation of a program of studies and investigation to be made in connection with the disposal of water made available by the project.

Some assistance was given the Bureau of Reclamation in negotiations with public utility companies in connection with the relocations of power and communication facilities for the completed Central Valley Project and the temporary relocations necessitated by construction activities.

Studies were made relative to the East-side Water Storage District in the Edson-Arvin Area in Kern County under organization for obtaining water from the Central Valley Project.

The annual collection of data on ground water levels in the upper San Joaquin Valley was continued during the month.

Assistance was rendered to Governor Olson's Committee on Central Valley Project.

SPECIAL INVESTIGATIONS

Flood Damage Repairs

Investigations and the preparation of reports on work for which applications have been made for allotments from the State Emergency Fund for the restoration of property, levees, flood control works, county roads and bridges damaged by the floods of the 1937-1938 winter season, were continued. No allocations were made by the Director of Finance for flood damage repairs during the month. The total amount of outstanding allocations at the end of the month was \$4,848,400. The Division of Water Resources has performed, or is performing, considerable of the work for which these allocations were made and the remainder is being done by the applicants under one hundred seventy-eight contracts entered into with the Department of Public Works. These contracts cover work which will cost \$3,652,200, much of which has already been completed. Work was continued on the checking of plans for work to be done under these contracts, supervision and inspection of the work, the checking and approval of claims for payments for work already performed and the auditing of the accounts of the various agencies prior to the making of final payments.

Flood Control Works on Napa State Farm

Work was started on the construction of the drainage channel, levees and incidental works on the Napa State Farm under an allotment from the Emergency Fund. Clearing work was practically completed and the construction of levees and drainage channels was about 50 per cent completed during the month.

FLOOD CONTROL AND RECLAMATION

Sacramento River Project

Routine maintenance work was carried on during this period, on the levees and project works in Sutter and Colusa Counties. Lower cross bracing was placed on the new bridges, constructed with flood damage repair funds, in the Sutter By-pass. This bracing could not be placed earlier on account of the height water had to be held in the borrow pits for irrigation.

Work has continued in clearing brush, poisoning squirrels and filling cracks in the levee on the left bank of the Sacramento River in Butte Basin, in Colusa County from Butte Slough to the northerly county

line. The squirrel infestation on this levee is more serious than on any other levee in the project.

The cooperative bank protection program of the State and Federal Government on the Sacramento River is proceeding satisfactorily. This office has obtained the necessary rights of way for the levee setback work in Reclamation Districts Nos. 70, 730, 900, 1500 and Sacramento River West Side Levee District.

Relief Labor Work

The work on our W.P.A. Project No. 10983 was resumed October 15th and a total of 1,056 man-hours of relief labor were utilized to October 21. On the same project from September 25th to October 21st a total of 20,851 man-hours was employed in clearing timber and brush in the American River and the Yolo By-pass.

Sacramento-San Joaquin Water Supervision

During the past months the entire efforts of the field men have been directed towards securing data relative to the acreages irrigated from the Sacramento and San Joaquin rivers and their tributaries. Salinity is almost entirely gone from the Sacramento River channels but still holds at a rather high rate in the San Joaquin River part of the Delta.

DISTRICTS SECURITIES COMMISSION

The regular monthly meeting of the Securities Commission was held October 13th in San Francisco for consideration of the following petitions, all of which were granted approval:

El Camino Irrigation District, an assessment levy of \$4,370.62; Grenada Irrigation District, an assessment of \$2,832; Montague Water Conservation District, an assessment of \$1,295.13; Waterford Irrigation District, an assessment of \$37,242.96; Tracy Clover Irrigation District, a plan for refunding outstanding bonds in the amount of \$52,170 through an R.F.C. loan of not to exceed \$20,000.

Highway Bids and Awards

(Continued from page 26)

TULARE COUNTY—In the city of Tulare, about 1.1 miles to be surfaced with plant-mixed surfacing. District VI, Routes 4, 134, Section Tul. L. A. Brisco, Arroyo Grande, \$9,200. Contract awarded to Union Paving Co., San Francisco, \$8,422.

Turlock Overhead Project Nears Completion

(Continued from page 24)

heaviest rolled shapes made. Other shorter 36-inch interior beams placed parallel to the outside girders and framed into the beams normal to the piers make up the balance of the assembly. The composite section contains beams of continuous, restrained and simply supported designs. The bearings are rollers.

On the approach spans, the beams are parallel to center line with their continuity broken in every other span by short hanging sections simply supported on the cantilever overhangs. A clear roadway width of 50 feet is provided on the deck with sidewalks on either side. The railing will be constructed of tubular steel. Slender octagonal concrete column bents or piers resting on treated timber pile foundations support the superstructure. The approaches, amounting to one third of a mile in length, are constructed of selected imported borrow and surfaced with four lanes of Portland cement concrete pavement. The pavement is bordered on either side with concrete curbs, gutters and sidewalks. Channelized plant-mixed surfaced connections to the county roads will segregate the local and through traffic.

The cost of erecting the structural steel was far below the average. A crew of thirteen men and two truck cranes unloaded and completed the erection of the 855 tons of steel in 24 working days.

Approximately 220 tons of the steel were flame cleaned in lieu of sandblasting as an experiment. The process consisted of passing an oxy-acetylene flame over the surface of the member to be cleaned. Handscrapping and wire brushing followed the application of the flame. This process has two advantages over sandblasting, namely, the removal of occluded moisture and the absence of the usual dust clouds that are common to the sandblast operations. Results of the experiment are not yet available.

Economical and adequate form design for octagonal columns is always a problem. Wooden collars are not susceptible of ready arrangement into

In Memoriam

Andrew Wilfred McCurdy

The untimely passing on October 7, 1939, abruptly terminated the career of A. W. McCurdy with the Division of Highways after twenty-two years of service.

Mr. McCurdy was born in Dansville, New York, on August 23, 1886, and, after completing grammar and high schools in that city, entered the employ of the Westinghouse Electric Manufacturing Company at Pittsburgh, Pa., in 1903. In 1904, he left there and worked with the Connecticut Railway Signal Company at Buffalo, N. Y.

In 1905, he went to Los Angeles where he entered the employ of a private engineer. After two years in this work, he entered the service of the Los Angeles County Highway Commission where he rose to Chief Draftsman and then Office Engineer.

In December of 1914, he left the employ of Los Angeles County to engage in private engineering practice until July 23, 1917, when he entered State employ as a draftsman in Headquarters Office at Sacramento. There, again, his promotion was rapid and on August 1, 1920, he was appointed Office Engineer.

On July 15, 1923, he transferred to District IV in San Francisco as Assistant Division Engineer, which title was changed in 1928 to District Office Engineer, and remained in that capacity until August 1, 1939, when he assumed jurisdiction over the newly-created District Traffic and Safety Department.

In his passing, District IV has lost an employee who, through long years of association, knew the District and the State from highway to byway, and the loss of his vast fund of highway history and experience will be keenly felt.

The entire Division of Highways extends sympathy to his widow, mother, sister, and brothers.

units, are clumsy to install and remove and expensive to make. Because of the pressures on the eight faces more or stronger collars are required for these columns than for the rectangular ones. This problem was solved by converting the octagonal shape of the outside of the form into a circle by the use of filler blocks cut to the shape of circular segments. Iron bands $\frac{1}{2}$ -inch by $1\frac{1}{2}$ -inches in size with small connection angles welded to the ends were used for collars around the filler blocks. The angles were drilled and $\frac{5}{8}$ -inch bolts were utilized to cinch the collars together.

New Divided Highway Unit Completed

(Continued from page 10)

ture is being built by J. E. Haddock, Ltd., contractor, at an approximate cost of \$63,500.

The portion of the highway north of the Santa Ana River was constructed to a thirty-three foot width of traveled way and is bordered on each side with seven feet of surfaced shoulders.

After the rough grading operations were completed, twelve inches of selected material were placed on the new roadway section. Surfacing of the roadway section, including shoulders, consisted of a four-inch depth of road-mix surface treatment applied to the top portion of the selected material. This was covered with a Class "C" seal coat using screening for the traveled portion of the road and sand for the shoulders.

The recessed panel type curbs for the divisional strip were constructed with concrete from transit mixers.

Some of the major items of work on this project consisted of approximately 102,000 cubic yards of roadway excavation involving 2,500,000 station yards of overhaul; applying road-mix surface treatment to 94,000 square yards of roadway surface using 795 tons of liquid asphalt and applying a seal coat to this same area.

Many drainage structures were placed using over 2000 lineal feet of various sizes of corrugated metal pipe and 110 cubic yards of structure concrete. As most of the improvement was on new right of way, much work was performed in removing and rearranging water lines and other facilities belonging to private owners and public utilities.

This project, involving 35 contract items and an expenditure of approximately \$66,000, was completed by Matieh Bros., contractor, in the unusually short time of four months.

Mr. G. E. Malkson was the Resident Engineer.

Mrs. Newlywed—"Now, dear, what'll I get if I cook a dinner like this every day for a year?"

Mr. Newlywed—"Probably my life insurance."—*Macon Telegraph.*

State of California

CULBERT L. OLSON, Governor

Department of Public Works

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

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T. H. DENNIS, Maintenance Engineer
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R. H. STALNAKER, Equipment Engineer
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S. W. LOWDEN (Acting), District IX, Bishop
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SAN FRANCISCO-OAKLAND BAY BRIDGE

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RALPH A. TUDOR, Senior Bridge Engineer
in Charge of Maintenance and Operation

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HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer Water Rights
GORDON ZANDER, Adjudication, Water Distribution

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P. T. POAGE, Assistant State Architect

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C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical
Engineer
C. E. BERG, Supervising Estimator of Building Construction

DIVISION OF CONTRACTS AND RIGHTS OF WAY

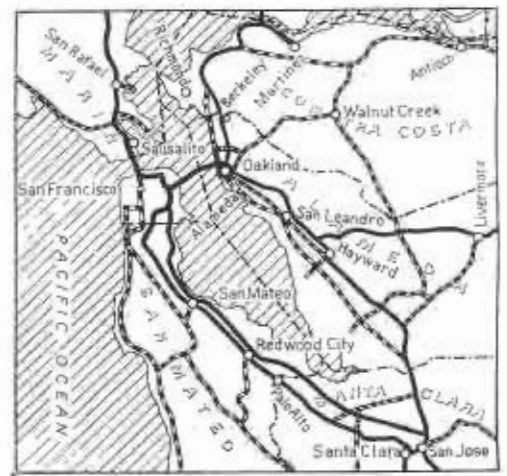
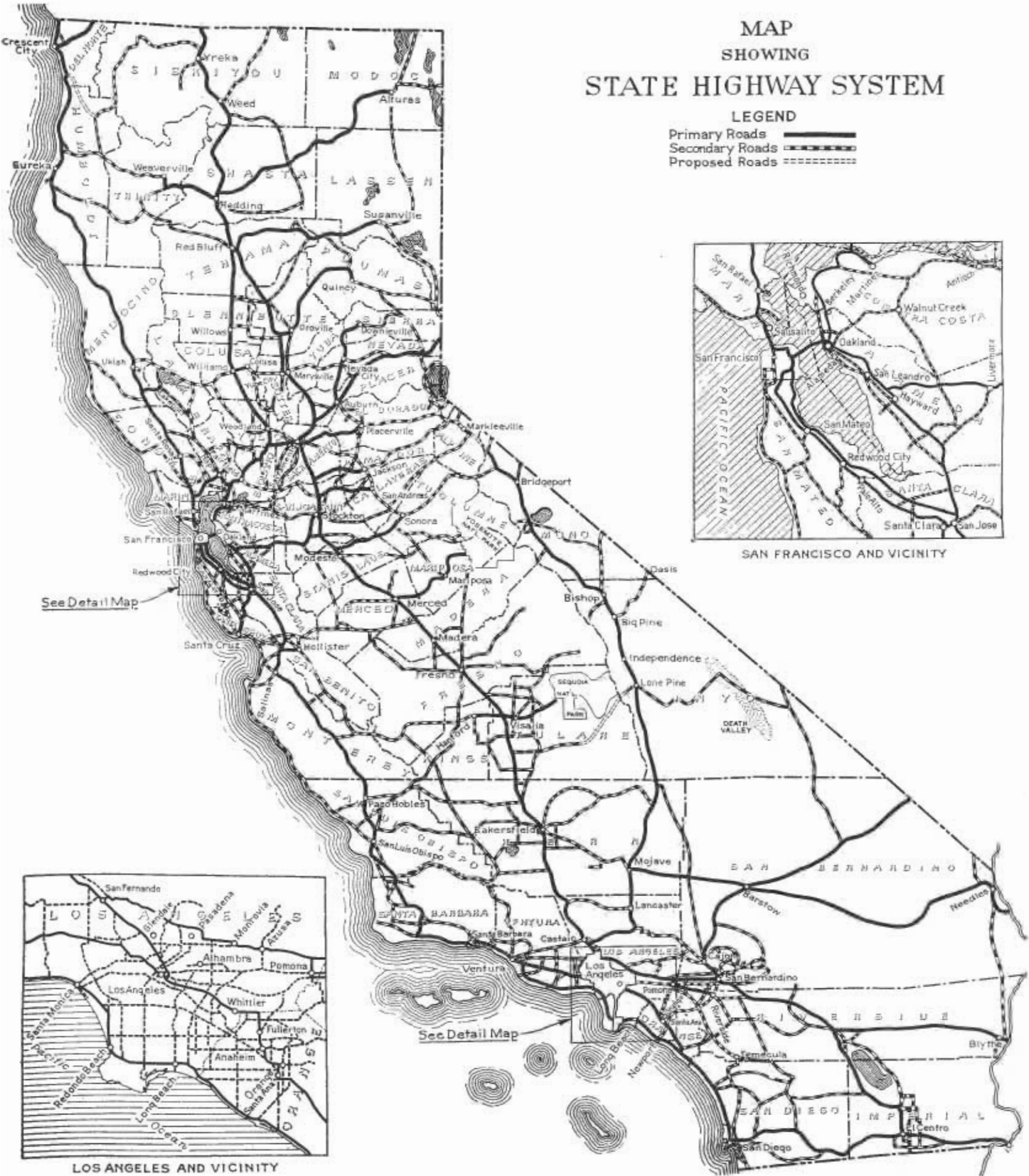
C. C. CARLETON, Chief
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney
ROBERT E. REED, Attorney

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MAP
 SHOWING
STATE HIGHWAY SYSTEM

LEGEND
 Primary Roads —————
 Secondary Roads - - - - -
 Proposed Roads = = = = =



See Detail Map

See Detail Map