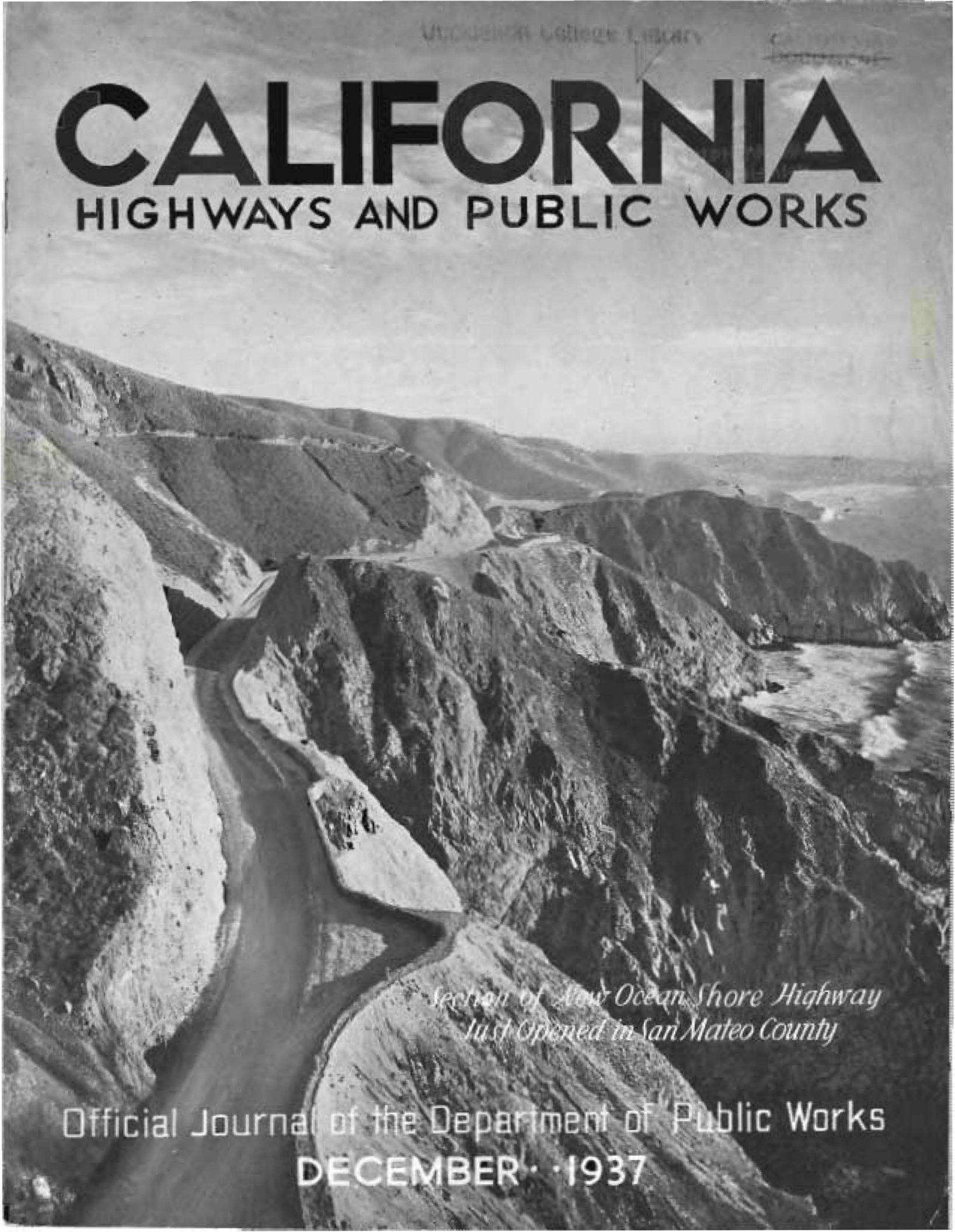
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Section of New Ocean Shore Highway Just Opened in San Mateo County

Official Journal of the Department of Public Works
DECEMBER · · 1937

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

EARL LEE KELLY, Director C. H. PURCELL, State Highway Engineer JOHN W. HOWE, Editor K. C. ADAMS, Associate Editor

Published for information of the members of the department and the citizens of California

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

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

Vol. 15 DECEMBER, 1937 No. 12

Table of Contents

Pedro Mountain Section of New Scenic Road Entailed Difficult Construction Work

Ocean Shore Highway Job Is Completed

By JNO. H. SKEGGS
District Engineer

ON ARMISTICE DAY, November 11, 1937, one of the most difficult highway construction projects, and probably the most important section of the so-called "Ocean Shore Highway" between San Francisco and Santa Cruz, was opened to public travel.

District Construction Engineer E. G. Poss, in an article appearing in the June, 1937, issue of this magazine, briefly described the nature of, and a few of the construction problems on this project. Accompanying the referred-to article was a sketch-map showing the alignment, and a photograph of the former county road with its 250 curves, involving 42.2 complete circle-turns in its 10.6 miles of length, with a total rise and fall of 2,409 feet.

The importance of this portion of the Ocean Shore Highway, commonly referred to as the "Pedro Mountain" section, was aptly portrayed by the twenty-eight curves involving only 3.8 circle-turns and 1,225 feet of total rise and fall in grade in the new length of 5.9 miles covered by this construction project.

TIME AND DISTANCE SAVED

The saving of 4.7 miles in distance does not truly reveal the convenience afforded the traveling public by this new road. The former road, for almost its entire length, gave no sight distance to the motorist, who, in averaging fifteen miles per hour throughout the entire length, was making good progress. The highway will permit speeds throughout its entire length averaging close to the legal speed limit of 45 miles per hour, and will affect a saving in travel time of more than one-half hour to all motorists destined south of Farallone City.

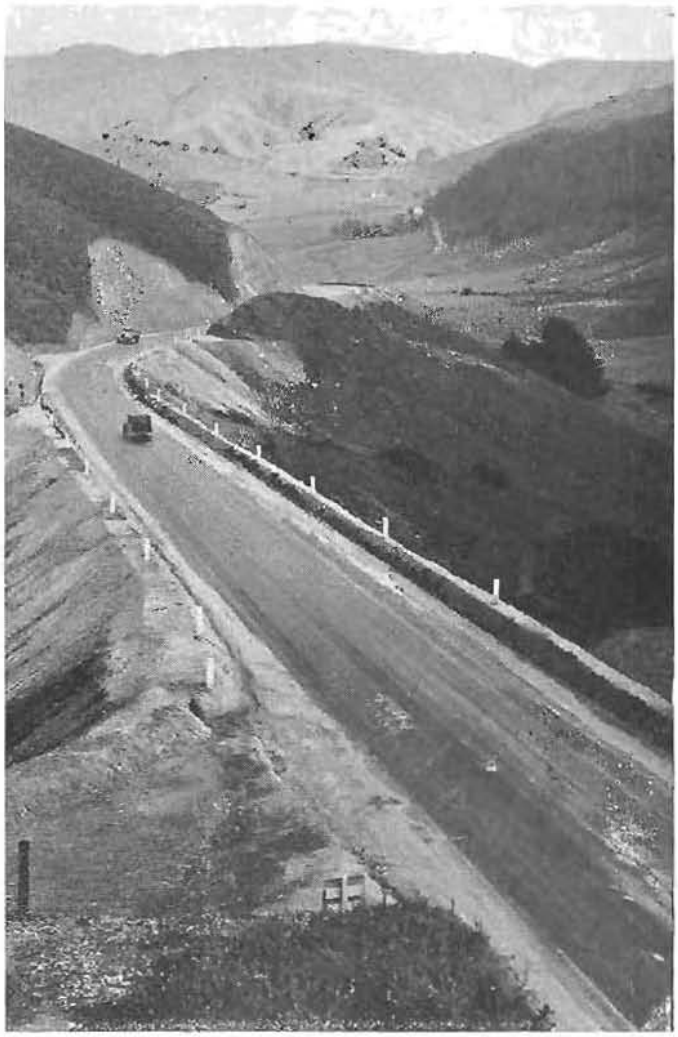
This highway will therefore assume great importance, not only as a recreational road between San Francisco and the beaches and redwood-covered mountain slopes of the Santa Cruz Peninsula, but also as a market artery in transportation of the truck garden, dairy and stock-raising products of the rich agricultural area centering about the coast towns of Half Moon Bay, Pescadero, Tunitas and San Gregorio.

SCENIC HIGHWAY

The scenic nature of the new highway is portrayed by the cover-page photograph on this magazine, which shows it to be comparable in this respect to the newly-opened Carmel-San Simeon scenic coast route.

From a construction standpoint, the project involved one and one-half million cubic yards of roadway excavation, or an average of approximately one-quarter million cubic yards per mile. These quantities include approximately 700,000 cubic yards of material removed outside the original typical roadway section, principally slides occurring at the famous "Devil's Slide" on Pedro Mountain, near the center of the project. Some daylighting of small cuts was included at vantage points, to give the motorist the full benefit of the marine view, and to increase the sight distance as a safety precaution.

Rubble masonry walls played an important part in retaining the roadbed at control points on the steep mountain slopes. These were constructed in preference to concrete walls, due



Looking down valley from Pedro Mountain Summit. This section of road is typical of new Ocean Shore Highway which will benefit tourists and agriculturists alike, saving time and distance.

View of Ocean Shore Highway 1½ miles south of Rockaway Beach. The old county road is shown on left.

to the availability of rock, from the standpoint of economy of construction, and also to keep the nature of the improvement in line with the scenic features of the rugged coast country traversed. Approximately 700 lineal feet of rubble masonry parapet walls were constructed on top of the rubble masonry retaining walls supporting the roadbed, a job itself. As is so common in the north coast section of California, where all formations have been shaken and disturbed in earthquakes of the past, providing stability of the roadbed calls for the solution of more difficult problems in the construction of large fills than it does in excavating the material from large cuts. The present project presented a problem in the construction of a fill approximately 85 feet in depth at the centerline, involving approximately 100,000 cubic yards of material in place.

Within a length of 400 feet along the roadway, it was necessary to strip approximately 4000 cubic yards of

View looking northeasterly from intersection of county road with new Ocean Shore Highway.

unstable top soil, and to excavate trenches 12 feet in width and up to 20 feet in depth, involving approximately 12,000 cubic yards additional excavation.

These trenches, consisting of one transverse, two longitudinal and one diagonal ditch, explored the natural drainage courses of a number of underground springs, and were led into one outlet trench and backfilled with large rock placed directly on the supporting rock, to insure the free drainage of the entire area beneath this important fill. Approximately 9000 cubic yards of rock was placed in these trenches prior to the starting of construction on the fill.

Another special construction problem in providing a stable roadway was presented at a location where the typical section lay almost entirely in excavation. The roadway section, for approximately 150 feet of length, was trenched into the mountain side, but the slopes below the roadway were so steep and of such unstable material that it was considered necessary to excavate to a maximum depth of some 40 feet below grade on the lower side, to trench the mountain slopes and carefully rebuild the fill to grade, entirely out of large rock anchored into a stable portion of the mountainside.

In spite of all the precautions taken from an engineering standpoint to provide a stable roadway, as free as possible from major slides both in cut and fill sections, it is anticipated that considerable trouble will be experienced by our maintenance forces during the next two or three winters, in keeping the roadway clear of minor slides and the natural sloughing of material from the steep mountain slopes.

The maximum slide occurring on this project during construction broke at a point about 600 feet (measured horizontally) and approximately 500 feet (measured vertically) from the grade of the roadbed. At this same point, the roadbed is about 330 feet above the ocean waters, with a slope below the road to the ocean.

Granfield, Farrar & Carlin were the contractors, and H. A. Simard was the resident engineer for the state on this project.

This picture vividly illustrates difficult construction on Ocean Shore Highway on Pedro Mountain.

San Francisco-Oakland Bay Bridge Is Year Old

WHEN the hands of the clock pointed to 12:30 p.m. on Friday, November 12, the San Francisco-Oakland Bay Bridge was one year old.

Within twelve months approximately 9,250,000 vehicles, carrying more than 20,000,000 persons, had crossed the great span, State Highway Engineer C. H. Purcell reported to Earl Lee Kelly, State Director of Public Works.

The Bridge had earned more than $5,000,000—placing the structure first among the toll bridges of the world in point of earnings. It ranks third in volume of traffic. A daily average of 25,200 vehicles had crossed the bridge during the year, while over its truck lanes approximately 325,000 tons of freight were transported.

Added also to its other records is that of safety. Out of 9,022,099 vehicles crossing the bridge from November 12, 1936, to November 1, 1937, there were only 34 accidents occurring on the bridge proper which involved personal injury. And out of less than 20,000,000 crossing, only 69 received injuries in accidents on the bridge. There have been 4 fatal accident on the span.

Primary Road Upkeep Costly

Maintenance of primary highways is costing the forty-eight states more than $170,000,000 annually, according to the National Highway Users Conference.

The conference has just completed a comprehensive study of state expenditures throughout the nation for highway upkeep. Primary highways, the conference report says, include both surfaced and unsurfaced roads, maintained at state expense, and are those which carry virtually all the commercial traffic.

"How about the last dance, babe?"
"Fellah, you jes' had the last dance!"

Broadway Tunnel Opened and State Assumes Maintenance

By P. O. HARDING, Assistant District Engineer

CONSUMMATING 11 years of planning and difficult construction work, Governor Frank F. Merriam on Sunday, December 5, amidst pageantry and jubilation officially opened the $4,500,000 Broadway Low Level Tunnel connecting Alameda and Contra Costa counties.

Cooperation of the Federal government and the State of California with Joint Highway District No. 13 comprising Alameda and Contra Costa made possible completion of the project. A PWA grant of $1,095,000 and a State contribution of gas tax moneys amounting to $700,000 added to funds raised by the two counties financed the undertaking. The State assumes maintenance of the tunnel as a unit of the highway system.

A community breakfast at the Claremont Hotel in Berkeley Sunday morning, which was attended by 900 Federal, State and county officials, civic leaders of the East Bay area, celebrants and invited guests, a Spanish fiesta at the tunnel's western portal and programs of speech making at both ends of the big bore featured the celebration.

T. E. CALDECOTT HONORED

The dedication ceremonies were arranged by the Oakland Junior Chamber of Commerce under the direction of the organization's president, Edwin W. Geary.

At the breakfast, Thomas E. Caldecott, president of Joint Highway District No. 13, was honored as the man who, above all others, is responsible for the success of the project. Mr. Caldecott was presented with a copper bucket, suitably engraved, containing some of the earth spaded up when the venture was launched.

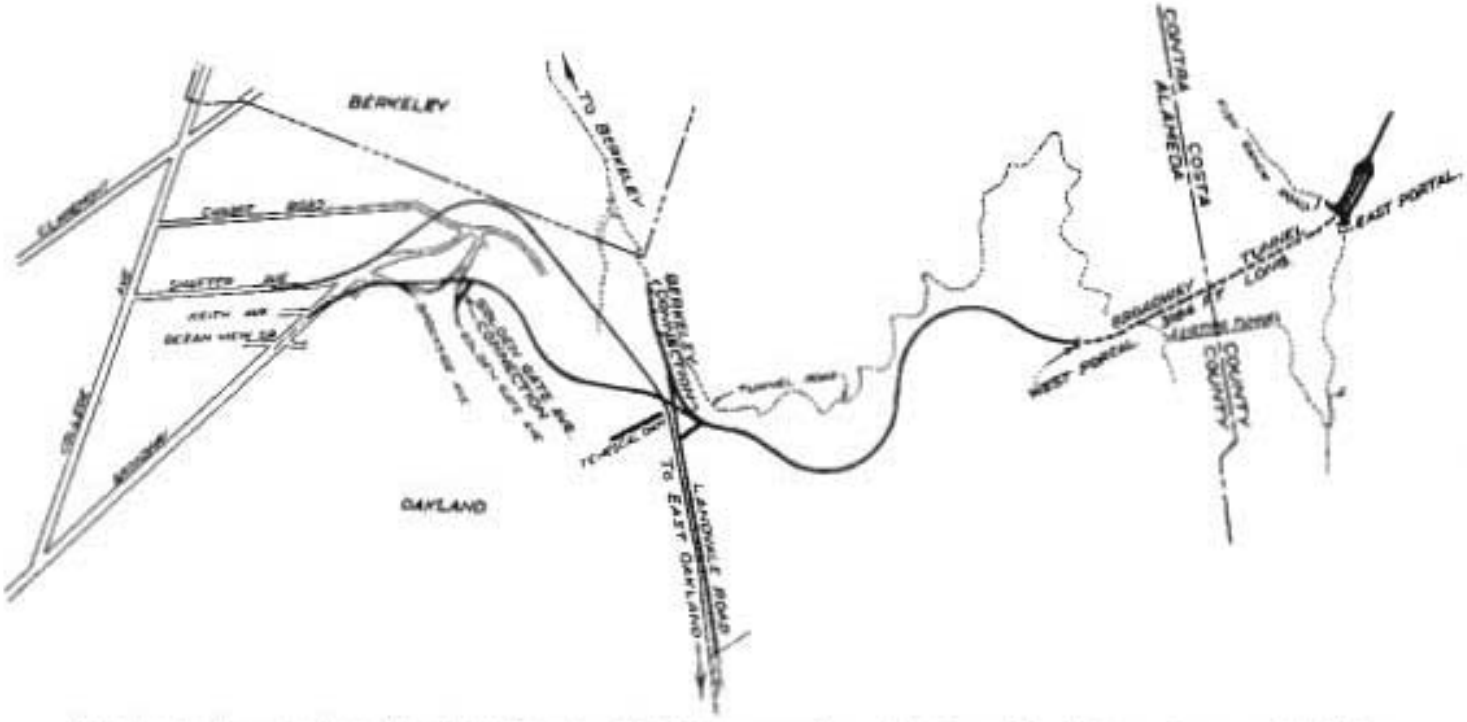
In an address at the west portal of the tunnel Governor Merriam praised the cooperative spirit exhibited by the national government, the State and the counties of Alameda and Contra Costa. He said the project had been made possible by the gas tax which the people of California gladly pay for highway construction and maintenance.

FEDERAL AID CUT DENOUNCED

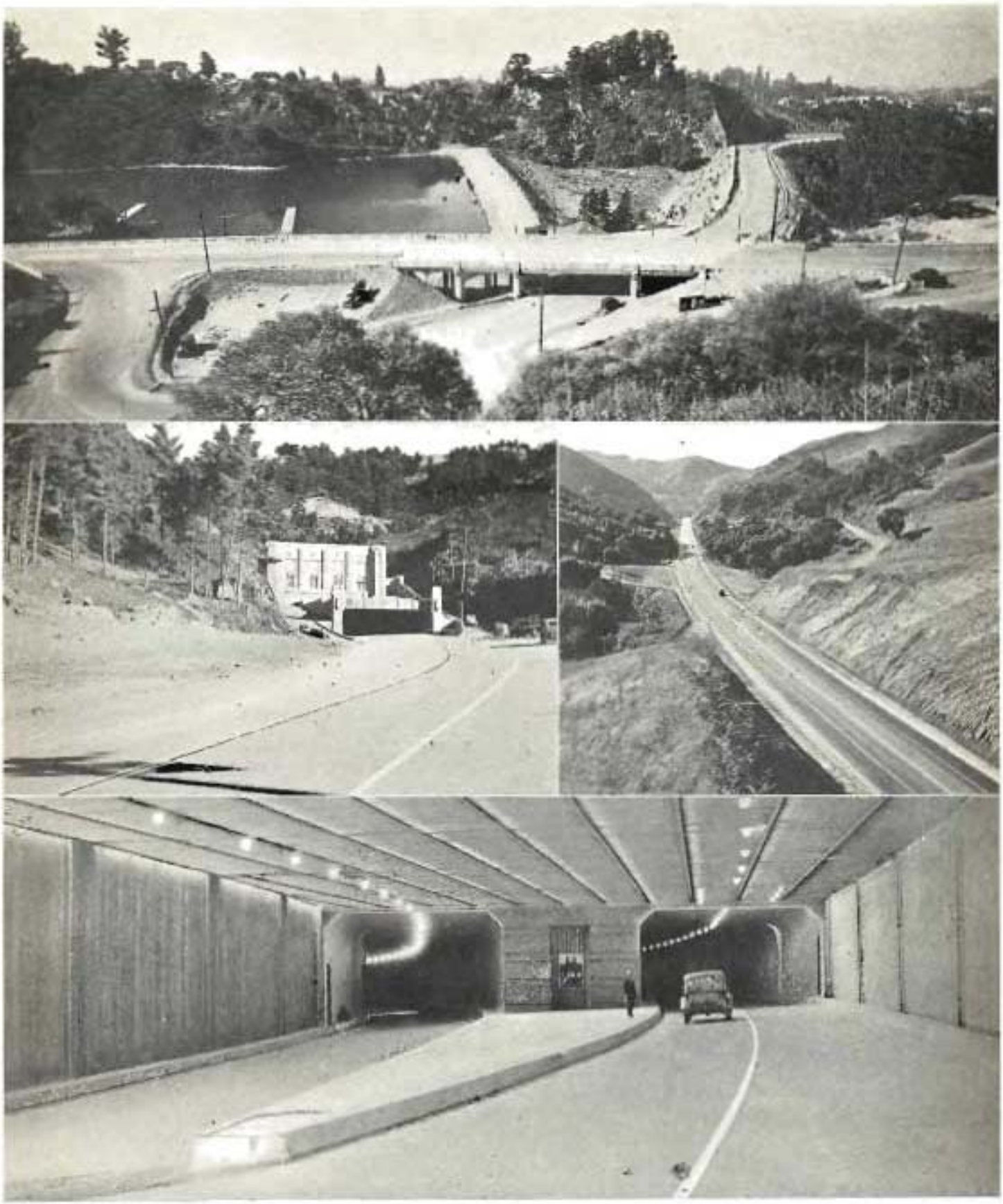
Governor Merriam deplored the proposal made in Washington under which the states would be deprived of Federal aid appropriations for roads and highways.

"We have been receiving great aid from the government in highway financing," the Governor said. "It is now proposed that Federal contributions be gravely curtailed. I urge all of you to write your Congressmen and Senators in Washington demanding that the Federal aid funds be not withdrawn."

(Continued on page 12)



Sketch map shows location of Broadway Tunnel and Berkeley connections. Old Tunnel Road shown by wavy dotted line.



Broadway Low Level Tunnel Project. Upper—Landvale overhead across west approach to tunnel. Center left—West portal of bore. Center right—State highway leading from Moraga Junction to east portal. Lower—Twin tubes of tunnel and lighting system.

Attractive view looking across Lake Mary from new Mammoth Lakes Highway in Mono County.

NEW MOUNTAIN HIGHWAY

Photograph taken from Mammoth Lakes Highway shows Twin Lakes and new highway in distance.

By F. R. PRACHT
Associate Highway Engineer

THE surfacing under contract with the State Division of Highways, of the portion of highway joining the main north and south State Route Twenty-three with the Mammoth Lakes region in Mono County, finished November 4th, opens up another section of the High Sierra scenic wonderland to the motorist over a modern highway.

The grading of this highway was completed last year at a cost of $60,000 by the U. S. Bureau of Public Roads and was recently taken over by the State Division of Highways.

Leaving Route Twenty-three near Casa Diablo Hot Springs at an elevation of about seventy-two hundred feet, one climbs in nine miles of high gear highway, the maximum grade being less than 6 per cent and the minimum radius curve 400 feet, to an elevation of nine thousand feet and to the very heart of a section of the High

Scene on Mammoth Lakes Highway where it crosses ornamental bridge structure. Sierra glaciers in background.

LEADS UP TO SIERRA LAKES

Sierras which was until recent years only accessible by pack train.

HIGHWAY BORDERS LAKES

The highway borders on four lakes in the most westerly three miles with numerous other lakes and streams within easy hiking distance for those who prefer this mode of transportation to the pack train.

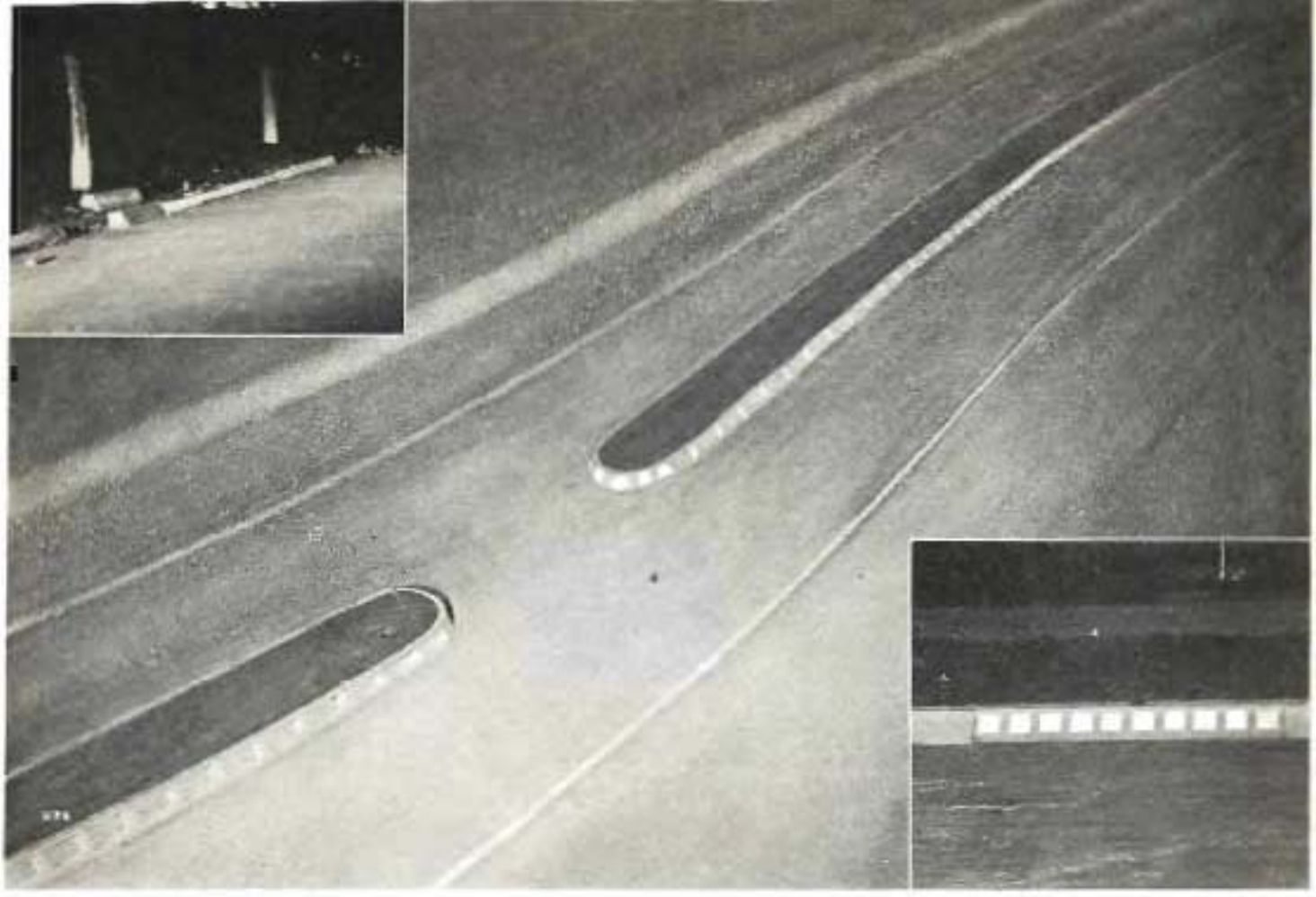
The jagged peaks rising to a height of over twelve thousand feet come down to the very shores of these tree-lined lakes and are spotted with snow even in mid-summer.

The highway consists of a thirty foot graded roadbed with the center twenty feet paved with a road-mix surfacing three inches in depth bordered with select material shoulders.

The major contract items were 15,400 cubic yards of imported surfacing material, 7600 cubic yards select material for shoulders and 975 tons of SC-3 road oil and represents an estimated expenditure of $50,000.

Tourists are expected to take full advantage of the new road.

Scenic stretch of new Mono highway showing heavy timber growth. Lake Mary in background.



Artist's conception of new type of reflecting curb for intersectional islands and division strips. Upper inset shows wedge shaped recess for separation strip curbs. Lower inset shows block type recess under direct headlight rays.

New Type of Reflecting Curb Designed

By F. J. Grumm, Engineer Surveys and Plans

TO REDUCE the hazards of night driving, the Division of Highways has designed a new type of curb. This curb will reflect the light from the headlights of a car, thus increasing its visibility and more clearly marking the marginal limits of the roadway.

In the development of highways with multiple lanes separated by a dividing strip, efficiency and safety of the facility that is designed principally as a safeguard against head-on collisions also depends upon the provisions made for facilitating and safeguarding movements on the roadways each side of the dividing strip.

In each roadway the traffic lane widths have been increased to a minimum of 11 and 12 feet, traffic stripes are placed, and, where conditions are suitable, adjacent traffic lanes are constructed of types that show contrast in surface appearance. The curbs that border the separated roadways constitute the more important feature in guiding traffic.

Under normal daylight driving conditions when visibility of the road and of the above features obtains, satisfactory results can be expected. In the case of night driving, however, the effectiveness of traffic stripes and the conventional type of curbs is reduced, especially in cases where the separation strip is limited in width, glare of opposing headlights has a blinding effect, or visibility is decreased in fogs or storms. Then the specularity of the separation curbs which define the limits of the traffic lane becomes of increasing importance, particularly inasmuch as the lane adjacent to the curb is the high speed or passing lane.

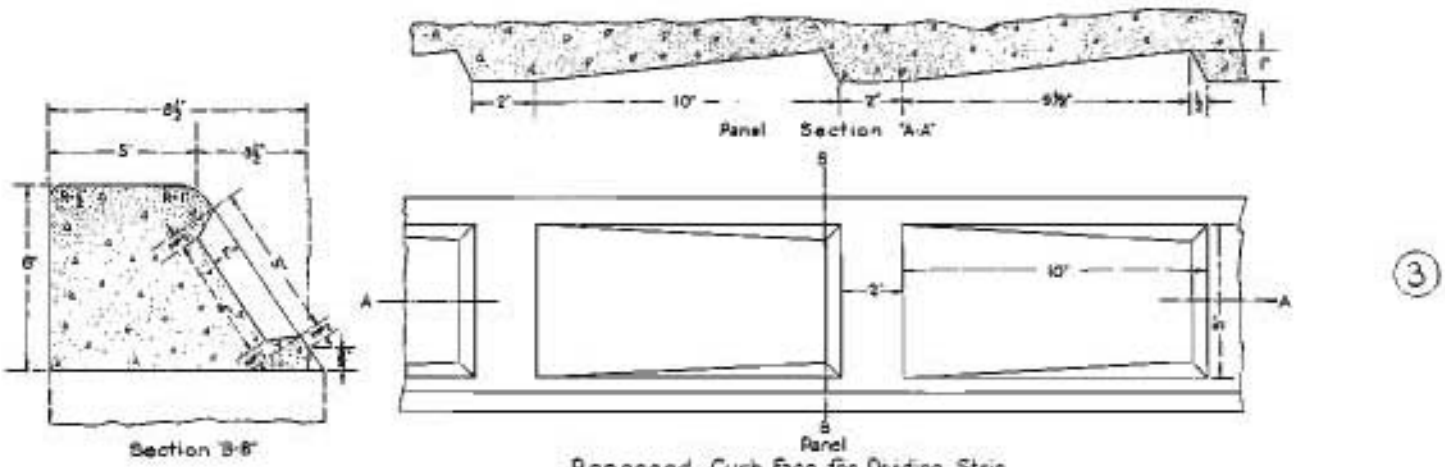
CURB DESIGN STUDIES

Studies have been made of curb design in an endeavor to improve its effectiveness and visibility at night or during adverse weather conditions. Curb sections were constructed with various dimensions, slope batters, face designs and paint combinations.

The best results for visibility of the curb under all driving conditions were obtained by making small recesses in the face of the conventional curb. Curbs were constructed with different forms, widths, spacings and angles of recesses.

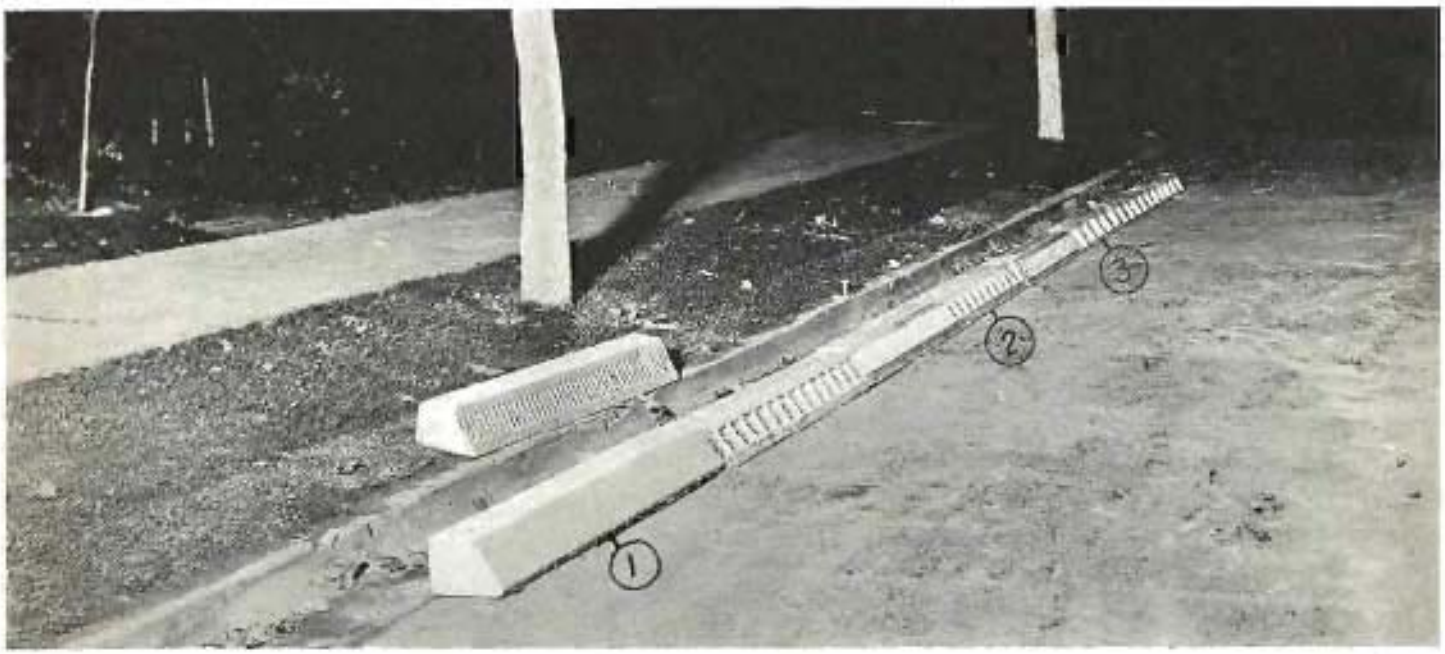
By observation of direct comparison it was clearly demonstrated that

(Continued on page 37)

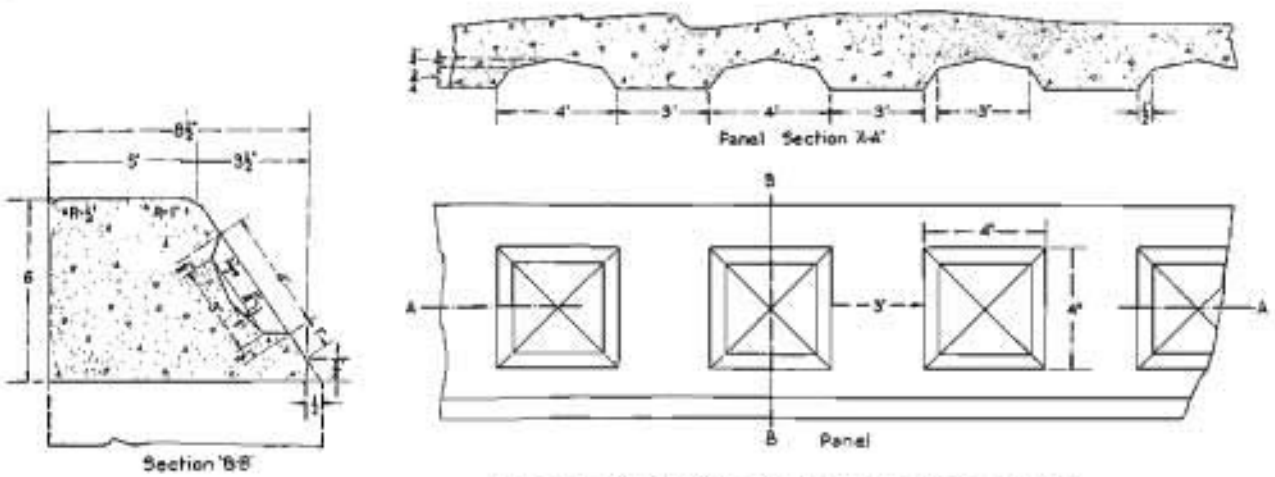


Recessed Curb Face for Dividing Strip

③



Three types of curb. 1—Section of standard conventional curb. 2—Block type recess proposed for curb returns and intersection islands. 3—Wedge shaped recess for separation strip curbs.



Recessed Curb Face for Curb Return or Island Section

②

Eighteen Bridge Structures Will Span Arroyo Seco Parkway

By C. W. JONES, Senior Bridge Engineer, Southern Office

EIGHTEEN traffic separation structures which will be built over the new Arroyo Seco Parkway will separate grades at all highway and railroad crossings on the new nine-mile highway to be constructed from the Figueroa Street Viaduct in Los Angeles to Glenarm Street in Pasadena, and will make it possible for through traffic to safely travel this nine mile course in about twelve minutes. This is less time than it ordinarily takes traffic to travel nine blocks along Broadway Street in down town Los Angeles.

This shortening of travel time will link the communities to the northeast more closely to Los Angeles and will greatly encourage the development of such communities as the Highland Park District, South Pasadena, Pasadena, Sierra Madre, Altadena and all others between Pasadena and San Bernardino having traffic tributary to Foothill Boulevard.

With these separations this road will become the fastest and most direct route leading from Los Angeles to the Rose Bowl game and to Pasadena's Tournament of Roses. It will greatly relieve traffic congestion which has occurred in the past on New Year's Day.

The eighteen separation structures will conduct cross traffic and railroad traffic over the new highway. This will eliminate boulevard stops which consume so much travel time in densely populated areas. It will eliminate all cross traffic congestion. It will eliminate delay and hazard at railroad crossings. It will eliminate street intersection accidents. It will make possible the full use of the new highway for free uninterrupted flow of through traffic.

Artist's drawing of bridge which will be typical of several planned for Arroyo Seco Parkway.

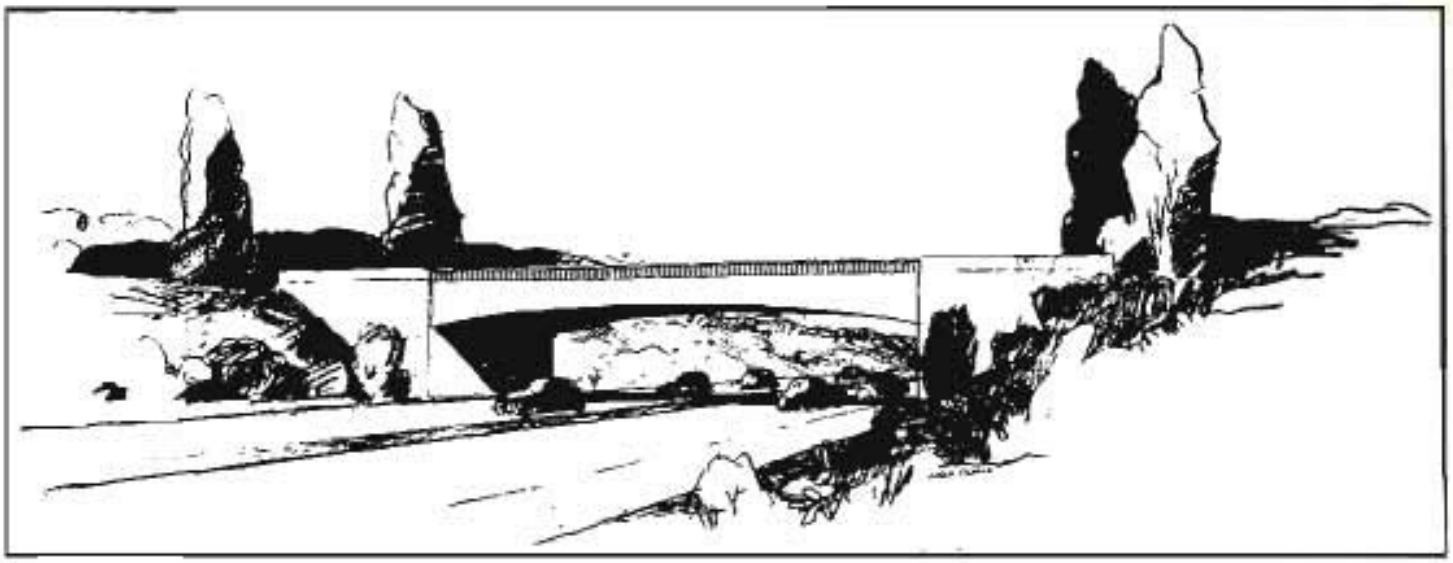
THROUGH ARROYO SECO

Starting at the Figueroa Street Viaduct, which was recently built over the Los Angeles River, the new parkway will follow along the west bank of the Arroyo Seco channel to the boundary line between Los Angeles City and South Pasadena. It will then cross the Arroyo Seco channel and proceed easterly through South Pasadena in a beautified cut and after crossing under Fair Oaks Avenue will turn north and connect with Broadway Street in Pasadena. At a few selected places along the road, one-way side ramps will be built to join the upper roads with the new boulevard.

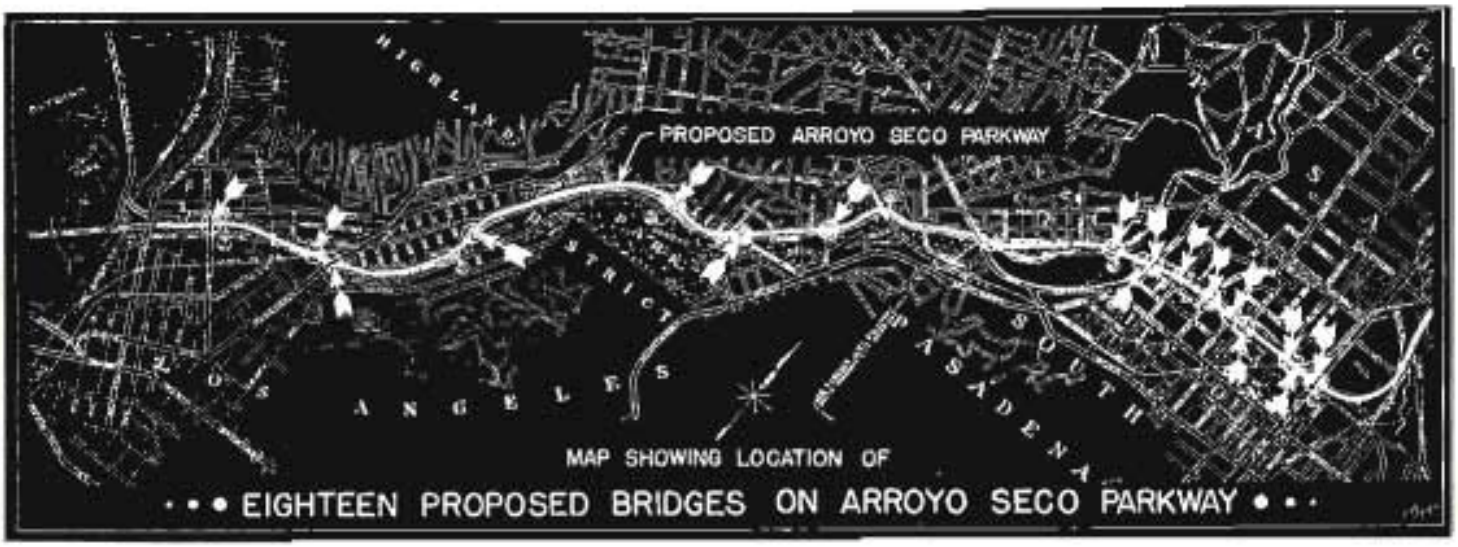
At Avenue 26, Pasadena Avenue, Avenue 43 and Avenue 60 it is proposed to remodel or extend existing bridges so that the new road, which will be a divided highway with thirty-four foot roadway on either side of a central raised curb, may pass beneath.

The Union Pacific and Santa Fe bridges immediately west of Pasadena Avenue will also be reconstructed to cross over this highway. At Avenue 52 and Hermon Avenue new bridges will be constructed to cross over the parkway.

Near the boundary line of Los Angeles and South Pasadena a new concrete girder bridge will be built



Sketch of proposed Arroyo Drive bridge over Arroyo Seco Parkway. It will be a concrete rigid span structure.



Proposed continuous concrete span structure carrying Hough Street over Arroyo Seco Parkway. Length 289 feet.

having a central span of one hundred and twenty feet and roadway thirty-four feet wide on each side of a raised central division strip. This is an unusually long span for concrete girder type of construction

Immediately to the east of this structure there will be a pedestrian and equestrian structure under the

(Continued on page 21)

Broadway Tunnel Opened to Traffic

(Continued from page 4)

In a brief talk, Director of Public Works Earl Lee Kelly pointed out that motorists now may go from the Moraga Valley in Contra Costa County to San Francisco by way of the tunnel and the San Francisco-Oakland Bay Bridge in thirty minutes without exceeding the legal speed limit.

GAS TAX PRESERVED

"Such projects as this," Director Kelly said, "are possible because California's gas tax funds are used solely for highway building and maintenance. One of the finest things Governor Merriam and his administration have done has been the carrying out of a determination to stand fast against any gas tax diversion."

Dueray L. Stewart was master of ceremonies at the West Portal dedication and State Senator T. H. Delap officiated in a similar capacity at the East Tunnel Portal celebration in Contra Costa County. Among the speakers at the West Portal were W. J. Hamilton, chairman of the Alameda Board of Supervisors; Mayor W. J. McCracken of Oakland, Mayor Edward N. Ament of Berkeley, Dr. L. I. Hewes, U. S. Bureau of Public Roads, Mr. Caldecott, Harry Bell and Edwin W. Geary of the Oakland Junior Chamber of Commerce, and John M. La Dieu, Spanish Pageant narrator.

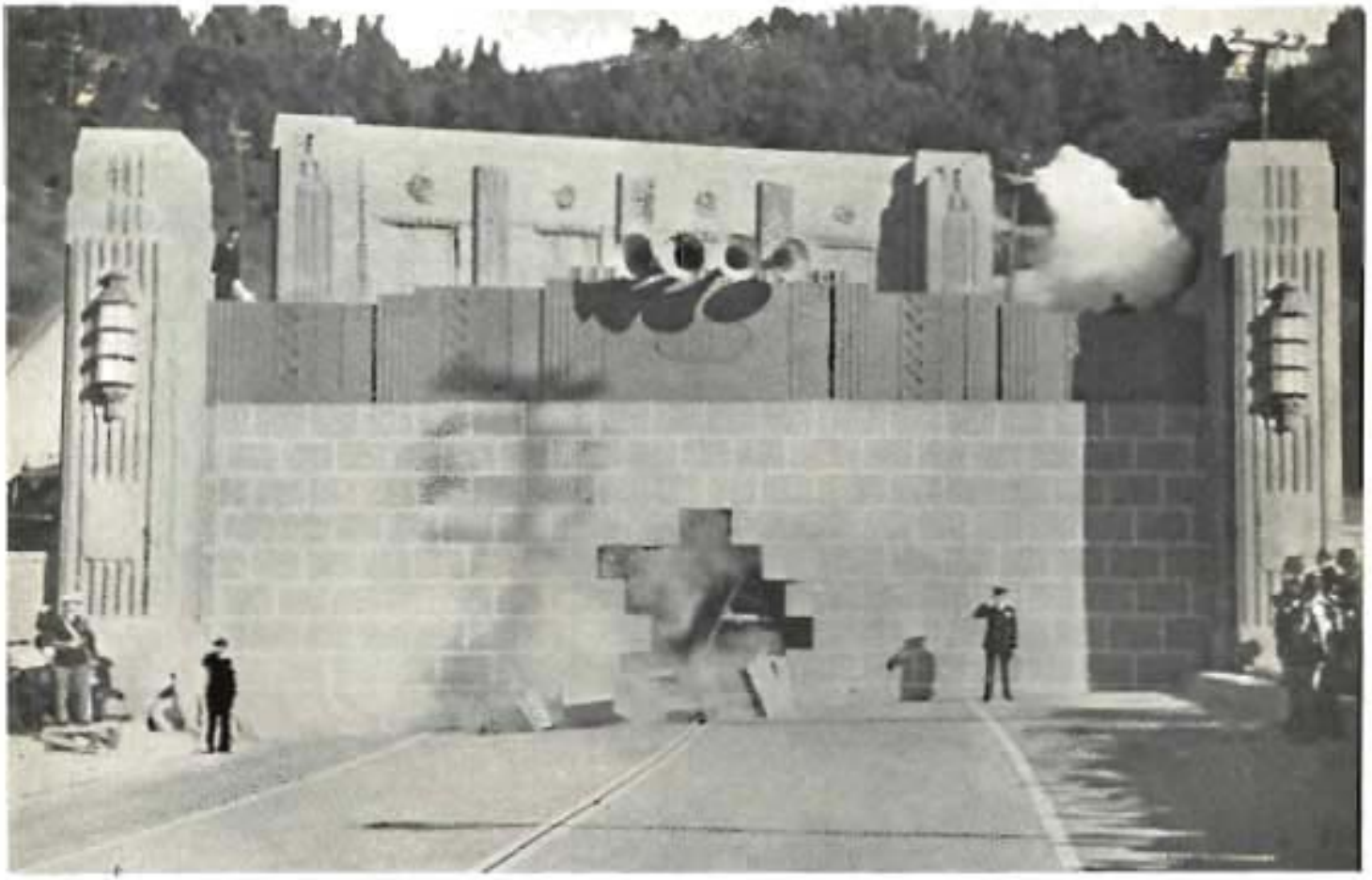
Opening of the West Portal of the bore was spectacularly achieved. From the speakers' stand, Governor Merriam threw a switch which blasted a large hole in a dummy wall blocking entrance to the tunnel and at the same time set off aerial bombs.

HISTORY OF PROJECT

From 1926 to 1928, a joint tunnel commission, composed of members from Contra Costa and Alameda counties and the city of Oakland, was engaged in making preliminary studies for this project.

In 1929 Joint Highway District No. 13, in which Contra Costa and Alameda counties were the participants, was created. George Posey, the father of the Posey Tube between Oakland and Alameda, was appointed district engineer. In 1931 this joint highway district was reorganized under a new law of that year. Upon the death of Mr. Posey in 1932, Wallace B. Boggs succeeded to the position of district engineer, with J. W. Barclay as chief assistant district engineer.

Actual construction work was started with Alameda County relief labor late in 1931, which was carried on into the latter part of the fall of 1932. This construction work was confined to construction of culverts



Photograph taken at instant Governor Merriam blasted aperture in dummy wall blocking West Portal of Broadway Tunnel.

on the Oakland approach highway and the opening up of grading operations. Some preliminary borings and investigation was also performed by this relief labor.

BIDS TAKEN IN 1934

Under the supervision of Mr. Boggs, plans and specifications were prepared and bids were taken on May 22, 1934, for the construction of the complete project. The Six Companies of California, Inc., was the low bidder, at a contract price of $3,683,-931, and received the award of the contract on May 29, 1934. Actual work under this contract was started on June 6, 1934, with a time limit of 720 calendar days, which placed the completion date on May 24, 1936.

On June 13, 1936, the original contract was rescinded by the contractor, with some 68 per cent of the total work completed. The remainder of the work was readvertised under a series of schedules involving various portions of the construction required to complete the project.

CONTRACTS COMPLETED

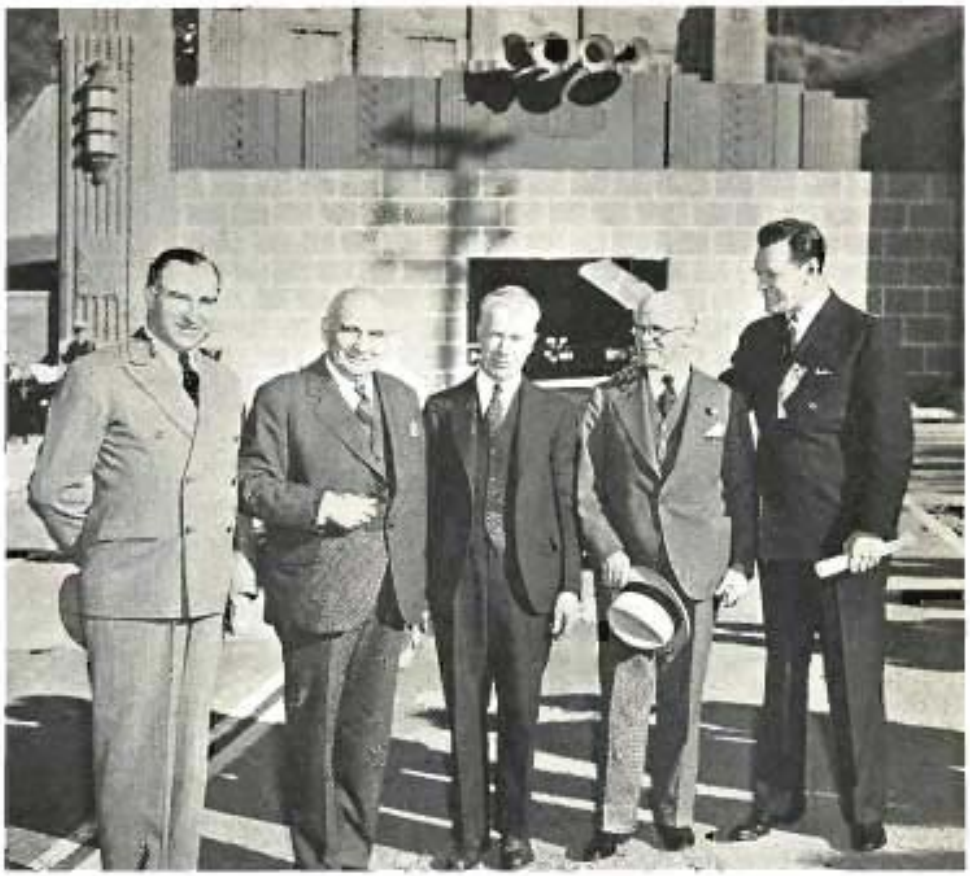
Schedule "A" called for completion of tunnel excavation and concrete arch ring lining. This work was awarded to the George Pollock Company and R. G. Clifford, at a contract price of $731,000. Work under this schedule was started by the contractor on December 9, 1936, and was completed and accepted by the joint highway district on June 22, 1937.

Schedule "B" involved the completion of grouting in the tunnels, and was awarded to R. G. Clifford at a contract price of $29,750. Work under this schedule was started December 21, 1936, and was completed and accepted by the joint highway district on June 22, 1937.

Schedule "C" required the completion of ceilings and roadway in the tunnels. This work was awarded to Fred K. DuPuy at a contract price of $434,886. The contractor started work on February 20, 1937, and completed the paving in the tunnel in time to permit proper curing before the opening date of December 5, 1937.

WORK ON SCHEDULE

Schedule "D" involved the completion of ventilating buildings, which work was awarded to E. T. Lesure at a contract price of $43,460. The contractor started work on February 15, 1937, completing the same just prior to the opening of the project to the public.



These officials express happiness over opening of Broadway Tunnel. Left to right: Earl Lee Kelly, Public Works Director; Governor Frank F. Merriam, Thomas E. Caldecott, President Joint Highway District 13; Dr. L. I. Hewes, U. S. Bureau of Roads; Edwin W. Geary, Oakland Junior Chamber of Commerce.

Schedule "E" covered the completion of ventilation, mechanical and electrical equipment. This work was awarded to the Alta Electric Co. at a contract price of $269,800. Work was started on January 18, 1937, and final tests were made just prior to the opening of the project.

Schedule "F" involved the furnishing and installing of carbon monoxide detectors and recorders, which work was also awarded to the Alta Electric Co. at a contract price of $18,893. Work was started on July 2, 1937, and was completed and accepted by the joint highway district on September 5, 1937.

Schedule "G" involving the completion of highway construction and appurtenant structures was awarded to the Healy-Moore Company at a contract price of $209,713. Work was started by the contractor on January 15, 1937, and was completed just prior to opening the project.

Schedule "H" called for the completion of steel structures and was awarded to the Berkeley Steel Company at a contract price of $17,360 on April 16, 1937. The work was completed and accepted by the joint highway district on September 18, 1937.

The total cost of the Broadway Low Level Tunnel project, exclusive of the county relief labor employed in 1932, is estimated at $4,173,-000, which amount has been financed by an issue of bonds of the joint highway district, in the amount of $2,378,-000, a 30 per cent Public Works Administration grant of $1,095,000, and a contribution by the State of California of $700,000.

The Broadway Low Level Tunnel project was adequately described in an article by District Engineer Wallace B. Boggs in the May, 1934, issue of this magazine, at which time were published typical sections of the twin bores, a panoramic sketch showing the complete project, and a plan outline of the tunnel section proper.

In brief resume, the Broadway Low Level Tunnel project, from the junc-

(Continued on page 22)

Sketch on photograph shows proposed Waldo Approach lighting system off northern end of Golden Gate Bridge.

STATE EXPERIMENTS WITH HIGHWAY LIGHTING

By T. H. DENNIS, Maintenance Engineer

HIGHWAY lighting experiments as an accident prevention measure have been undertaken by the State Division of Highways.

The Division is now installing a 3½-mile section of highway lighting on the Bayshore Highway, U. S. 101, between the south city limits of San Francisco and the north city limits of South San Francisco. The standards will be set on staggered spacing, 140 feet apart, the lighting to be sodium vapor with 10,000-lumen lamps.

A second installation, 1¼ miles in length, is being made on U. S. 101, between the north end of the Golden Gate Bridge and the crest of grade just north of Waldo Tunnel.

On this section, standards will be placed 125 and 150 feet apart at staggered locations between the bridge and the south end of the Waldo Tunnel, and on a 200-foot staggered spacing from the north end of the tunnel to the crest of the grade beyond. This lighting will also be sodium vapor, the lamps generating 10,000 lumens.

Two types of lighting standards will be used, tapered steel and centrifugally spun concrete. These poles will be thirty feet in length and carry a movable mast arm for suspending the lighting fixture some two feet inside the pavement edge.

The locations were selected not only to provide a proving ground for the efficiency and cost of such lighting, but also because of particular conditions which might justifiably warrant installation.

While these installations will mark our first strictly highway lighting experiments as an accident prevention move on the open highway, we have, during the past two years, made some 34 sodium vapor installations at underpasses and highway intersections.

POLICY AT INTERSECTIONS

The locations selected in all cases conformed to the following policy:

1. **Intersections which, from their design and location, presented an element of surprise to the approaching driver, and a hazard if he stopped.**
2. **Intersections where it was necessary to place "Stop" signs against the heavier traffic, especially at "Y" intersections.**
3. **At cross intersections, where it was found necessary to place four-way "Stop" signs.**

It has been the practice of the Division of Highways to compile and analyze accident records on the various sections of highway for the past eight years. On the entire section of the Bayshore Highway between San Jose and San Francisco, only that portion between South San Francisco and San Francisco shows a type of accident which, if such is possible, might be eliminated by highway lighting.

FOG HAZARDS INVOLVED

On the section selected for lighting north of the Golden Gate Bridge, the normal hazards of nightly fogs are complicated by the highly-lighted bridge structure, as well as that of the Waldo Tunnel. Traffic emerging from either the bridge or the tunnel is often confronted with a dense fog, which will likely tend to accidents.

There can be no doubt that the hazard of accident on the rural State highways, measured in terms of vehicle miles traveled, is much greater at night than during the daylight hours. It should be noted, however, that there are very few, if any, types of night accidents which do not also occur during daylight.

We may, and in fact do, find increased frequency of certain types of accidents during darkness, but none which would automatically disappear if daylight were continuous throughout the twenty-four hours.

(Continued on page 27)

Upper picture shows projected lighting system to protect traffic emerging from southern portal of Waldo Tunnel. Lower—Lighting system for Marin approach to Golden Gate Bridge.

Contra Costa Unit of Central Valley Project is Launched

AN IMPORTANT milestone in the march toward realization of the Central Valley Project was reached in October when the construction of the Contra Costa Conduit unit of the project got actively under way.

This highly significant event, marking as it does the actual beginning of construction work on the project itself, was the occasion for an enthusiastic celebration held on November 7, 1937, under the auspices of the Contra Costa County Development Association.

Nearly a thousand people comprising representative citizens, officials, and distinguished guests from all sections of northern California, gathered on the site of the conduit near Oakley to witness and participate in ground-breaking ceremonies.

With Thomas M. Carlson, attorney for the Contra Costa County Water District acting as master of ceremonies, eminent officials and civic leaders, long active in support and advancement of the Central Valley Project, addressed the gathering.

EMINENT SPEAKERS

These included State Senator Will R. Sharkey, president of the Contra Costa County Development Association; former Assemblyman Robert F. Easley of Antioch; Chairman W. J. Buchanan of the Contra Costa County Board of Supervisors; President C. W. Schedler, of the Salt Water Barrier Association which pioneered water plans for the County; President Ralph Bollman, of the Contra Costa County Water District; former Assemblyman Clifford C. Anglim, chairman of the State Democratic Central Committee; State Senator Bradford S. Crittenden of Stockton; Clarence Breuner and John McColl, president and manager respectively of the Central Valley Project Association; Keith Southard, representative of the Golden Gate International Exposition Committee; Fred D. Parr of the Parr-Richmond Terminal Corporation; Construction Engineer Walker R. Young, in charge of the project for the United States Bureau of Reclamation; Congressman Albert E. Carter who introduced and led the fight for adoption of legislation authorizing the project as a Federal undertaking at the last session of Congress; United States Senator Ernest Lundeen, a surprise visitor and honored guest from Minnesota; and Governor Frank F. Merriam who officiated at the ground-breaking ceremonies.

TELL OF LONG FIGHT

Recounting the long drawn out battle to obtain additional water supplies to meet serious existing water shortages in Contra Costa County and in the Sacramento and San Joaquin valleys, which culminated in the adoption of legislation by both the State and Federal Governments authorizing the Central Valley Project and providing for its construction, speakers joined in praising all those who had a part in bringing the project to the stage of actual construction.

With cheers resounding from the entire assemblage, Governor Merriam gave the "okeh" signal to the giant dragline excavator and the first bucket load of earth was moved, officially signalizing the starting of work.

GOVERNOR SPEAKS

"This marks the official beginning of a project for which all California has been waiting," said Governor Merriam. "It is the first real throwing of dirt on the project, but it is only the beginning. We must now look forward to succeeding years, when this great project is completed, to give us a greater California.

"The Central Valley Project is one of the greatest undertakings of its kind the world has ever known, and the people of the State realize its vital need. There is sufficient water tributary to the Great Central Valley to meet every need, if conserved and properly distributed. This the Central Valley Project will do. The project has now emerged from the stage of prospecting and estimating to the reality of construction."

The Contra Costa Conduit is a minor but nevertheless important unit of the Central Valley Project. Diverting from an arm of the Delta near Knightsen, it will extend westerly a distance of forty-five miles to the vicinity of Martinez.

Present plans contemplate an open concrete-lined canal with four pumping plants to lift the water in successive stages through an aggregate lift of 130 feet. When completed, it will furnish water for industrial, municipal, domestic and irrigation purposes to an area of about 60,000 acres in Contra Costa County, bordering the lower San Joaquin River and south shore of Suisun Bay from Oakley on the east to Martinez on the west and embracing lands in the Clayton and Ignacio valleys as far south as Walnut Creek. It will serve one of the most highly developed industrial sections in the State, several important cities, such as Antioch, Pittsburg, Concord, and Martinez, extensive suburban developments, and productive agricultural lands already largely developed to orchards and vineyards.

Serious water shortages which now exist in this area will be fully met with the bringing in of ample quantities of fresh water through this conduit.

The work now under way comprises the first four miles of conduit. Although the contract was let early last summer, start of work was delayed due to difficulties in acquiring necessary rights of way. The present contract covers excavation and necessary structures for a section of unlined canal extending from the westerly end of Rock Slough to the first pumping plant site near Oakley. It is expected that bids will soon be advertised for an additional eight mile section. The entire conduit is estimated to cost, when completed, about $4,000,000.

Fortune Teller (to bride of a few months): "You wish to know about your future husband?"

Bride: "No; I wish to know about the past of my present husband for future use."

Scenes at ceremonies attending start of operations on Contra Costa Conduit, a unit of Central Valley Project. Upper picture shows group of officials present. Left to right: State Senator Bradford Crittenden, Robt. P. Easley, Thomas M. Carleon, W. R. Sharkey, Congressman A. E. Carter, Governor Frank F. Merriam, U. S. Senator Ernest Lundeen, Minnesota; Cliff Anglin, W. J. Buchanan, chairman Contra Costa Supervisors. Lower left—Steam shovel digs up first load of earth and on right dumps it, signalizing start of work on project. *Photos courtesy Oakland Tribune.*

Hazard of Curves on Highway To Placerville Being Removed

By SCOTT H. LATHROP, Assistant Engineer

MOTORISTS who are familiar with the State highway between Sacramento and Placerville will be glad to learn that construction now under way southwest of Placerville will shorten this route by 1.9 miles and eliminate many of the dangerous short radius curves so prevalent on the present road.

This highway passes through one of the most historic sections of the State, for it was near Coloma in El Dorado County that John Marshall's dramatic discovery of gold was made and such names as Hangtown, Mud Springs, Diamond Springs, Shingle Springs, and Missouri Flat soon became bywords in every part of the world where the great gold rush to California was discussed. Hangtown, which was previously known as "Old Dry Diggin's," later became Placerville and Mud Springs refined its name to El Dorado.

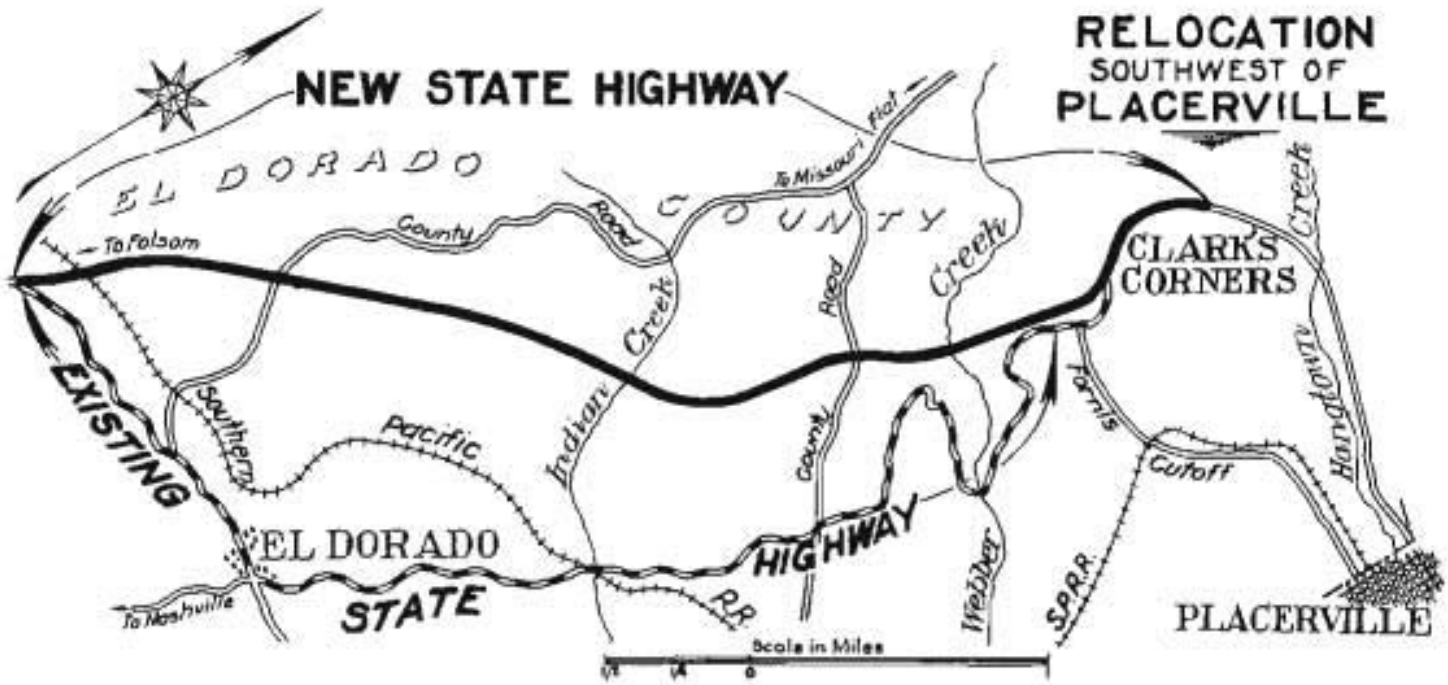
The main route, from the east, to Coloma and the gold diggings in 1849 and the early '50's was the Carson Emigrant Road which came through the Sierras by way of the Kit Carson Pass. This pass was some 9000 feet above sea level but was used by the early pioneers because they feared that other passes, while they were lower, had sharper hills and deeper gulches. As travel through the Sierras increased some of the hardier souls began to prospect around for easier routes and shortcuts which would save them time, with the result that several alternate routes were developed and more or less widely used.

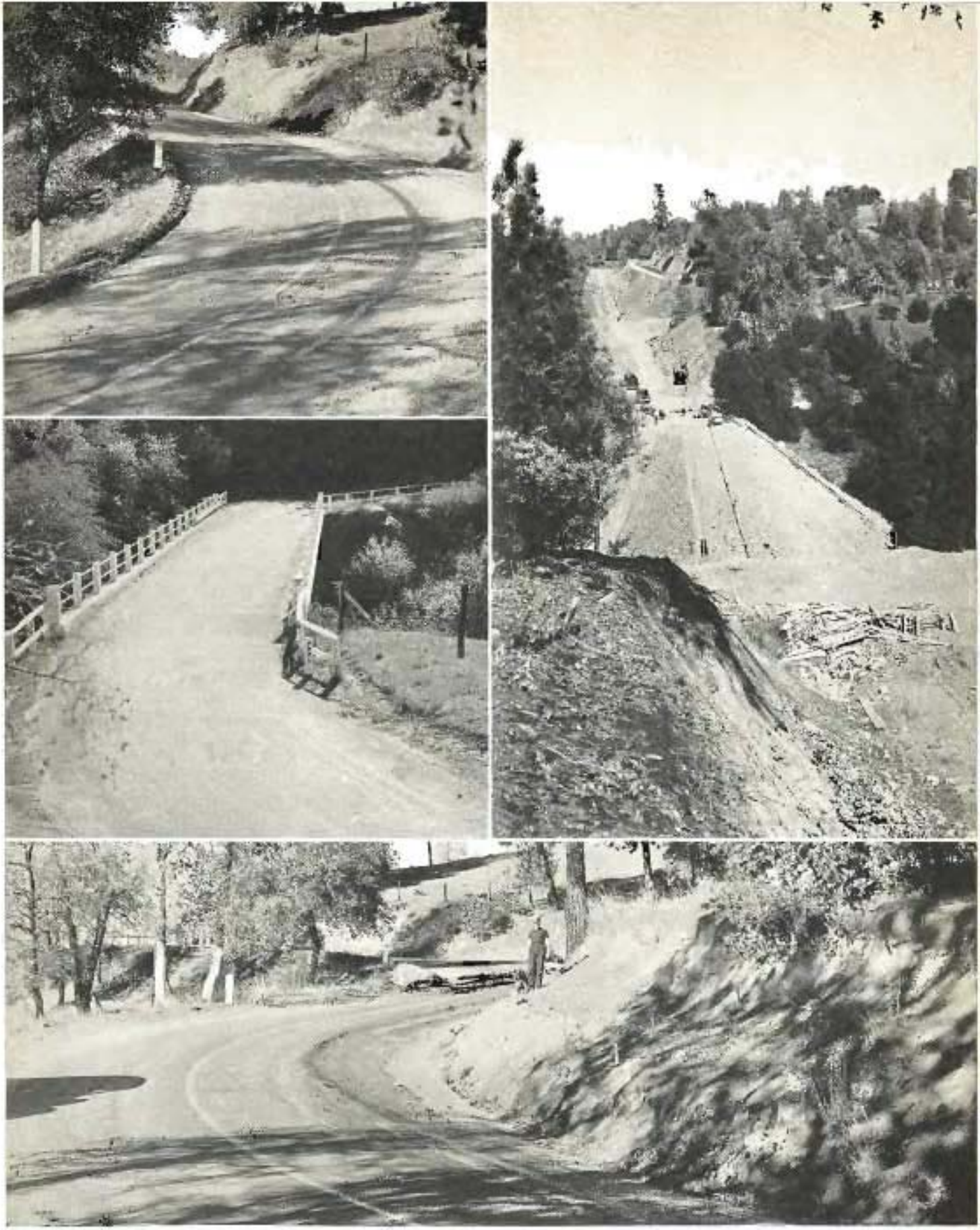
The most popular of these shorter routes was what was known as Johnson's Cut-off, which was later called the Placerville Road. This route was first made passable for wagons in 1854 and organized construction work was begun in 1858, after El Dorado, Sacramento, and Yolo counties had appropriated $50,000 for this purpose.

Stages and mail coaches began to operate over the road even before grading and leveling was started, thus proving the feasibility of this shorter, lower route. State and county governments became apathetic toward the project, however, and it is probable that it would have been abandoned and the Placerville Road through the Sierra would have became impassable had it not been for the discovery of rich silver deposits in the Comstock Lode in Nevada.

As soon as news of this discovery was confirmed private companies scrambled to obtain charters to establish toll roads and huge sums were invested by them in completing sections of this road east of Placerville. All of these companies soon cleared enough to retire their investments and many of them made large fortunes.

It has been estimated that during the years of 1864 and 1865 the daily freight traffic through Placerville averaged 320 tons. In addition to the cumbersome freight schooners this route served as a main traffic artery for mule trains, Concord coaches, and





On Placerville project. Upper left—Old alignment between Webber Creek bridge and Clark's Corner. Center left—Webber Creek bridge, to be replaced. Upper right—Realignment across site of new Webber Creek bridge. Lower—One of sharp curves between Clark's Corner and El Dorado to be eliminated. Distance will be shortened almost two miles and short radius curves abolished on this historic highway.

Pony Express riders during the early California pioneer days.

Since the road was taken over by the State, improvements have been made as needed to keep the road in shape to serve the changing types of traffic. The advent of the automobile required the provision of a hard surface and, as driving speeds increased, it became necessary to improve the alignment and grades in the interest of public safety.

The present road is a part of U. S. Route 50, which is one of the main east-west transcontinental roads. In addition to serving a large number of through tourists each year and caring for considerable volumes of local traffic, this route is serving an increasing number of persons traveling to and from recreational areas located along the American River and the south end of Lake Tahoe.

ELIMINATE CURVES

The Folsom to Placerville section of this road was constructed in 1915, the pavement width being only 12 feet, to which borders were subsequently added. The alignment was satisfactory at that time but the short radius curves used make it practically impossible to maintain what is now considered to be a reasonable speed. Reconstruction of this section will be undertaken as funds become available.

The first unit of this construction, on which work is now under way, is located southwest of Placerville between El Dorado and Clark's Corner. The new construction is principally on new alignment at some distance from the old road and is about 1.9 miles shorter than the old route, the total length of the new project being 4.3 miles.

The minimum radius of curvature on the new alignment is 3000 feet, except for one 1550-foot curve and one 1000-foot curve, which were necessitated by local controls. On the old road there are many more curves, the majority of which have very short radii, many of them 100 feet or less. In order to obtain satisfactory standards of grade and alignment, roadway excavation of some 50,000 cubic yards a mile was required. In addition to the customary drainage structures it was necessary to provide for several crossings of the old Missouri Flat ditch.

The new highway crosses Webber Creek about three-quarters of the way through the project. The adopted grade line at the crossing of this creek, at a considerable height above streambed, required a bridge 322 feet in length. This bridge, which will provide a clear roadway width of 26 feet, will be of the reinforced concrete girder type, having three 71-foot spans and two 54-foot 6-inch spans on concrete bents and abutments. This bridge is being built under a separate contract.

The contractor has already completed most of the grading work on the road contract. Work will be suspended during the winter months and surfacing operations are to be started as soon as weather conditions permit in 1938. The surfacing will consist of plant-mixed bituminous treated crushed rock 22 feet wide by 0.25 of a foot thick on a crusher run base 23 feet wide by 0.4 of a foot thick. It is estimated that the entire project will be completed and public traffic routed over it in July of next year.

The estimated cost of the grading and surfacing is $190,000, with the Webber Creek Bridge estimated to cost an additional $41,000. Hemstreet and Bell are the contractors on the highway project, with Mr. J. D. Greene acting as resident engineer for the State. On the bridge construction the contractor is the Campbell Construction Company and the resident engineer is Mr. J. H. Horn.

U. S. Begins Study of Kings River Project

John R. Iakisch, United States Bureau of Reclamation Engineer, has begun a study of the proposed Kings River Project in Fresno, Kings and Tulare counties, which is listed by the State of California as a unit of the comprehensive state-wide Water Plan, a long-range program for the ultimate development of California's water resources.

The report to be filed by Mr. Iakisch will be of interest to the California Basin Committees, recently appointed by Governor Frank F. Merriam to recommend to President Roosevelt through the National Resources committee various water, irrigation and reclamation projects in this State which urgently require Federal aid.

Before going to Fresno to undertake his survey, Mr. Iakisch together with Walker R. Young, construction engineer of the Central Valley Project, conferred in Sacramento with State Engineer Edward Hyatt.

Port of Oakland Overhead Work Now Under Way

RAPID progress is being made in the construction of the Port of Oakland overhead highway and the electric interurban overheads on the eastern approach to the San Francisco-Oakland Bay Bridge, a $450,000 project being built under authorization of the California Toll Bridge Authority, of which Governor Frank F. Merriam is chairman.

Contracts for the building of the Port of Oakland overhead highway, transbay train overhead, catenary bridges and other work on the storage yards approximate $1,222,000. The job is being done by the Department of Public Works. C. H. Purcell is Chief Engineer.

The highway overhead will cross above the Southern Pacific and Key Route interurban electric trains in the East Bay yards and will connect with the direct four-lane East Bay highway approach to the Bay Bridge.

TWO-LANE RAMPS

Two-lane "On" and "Off" ramps will permit traffic to enter and leave the main bridge approach without intersecting traffic.

The total width of the Port of Oakland approach is 42 feet, with 22-foot "On" and "Off" ramps.

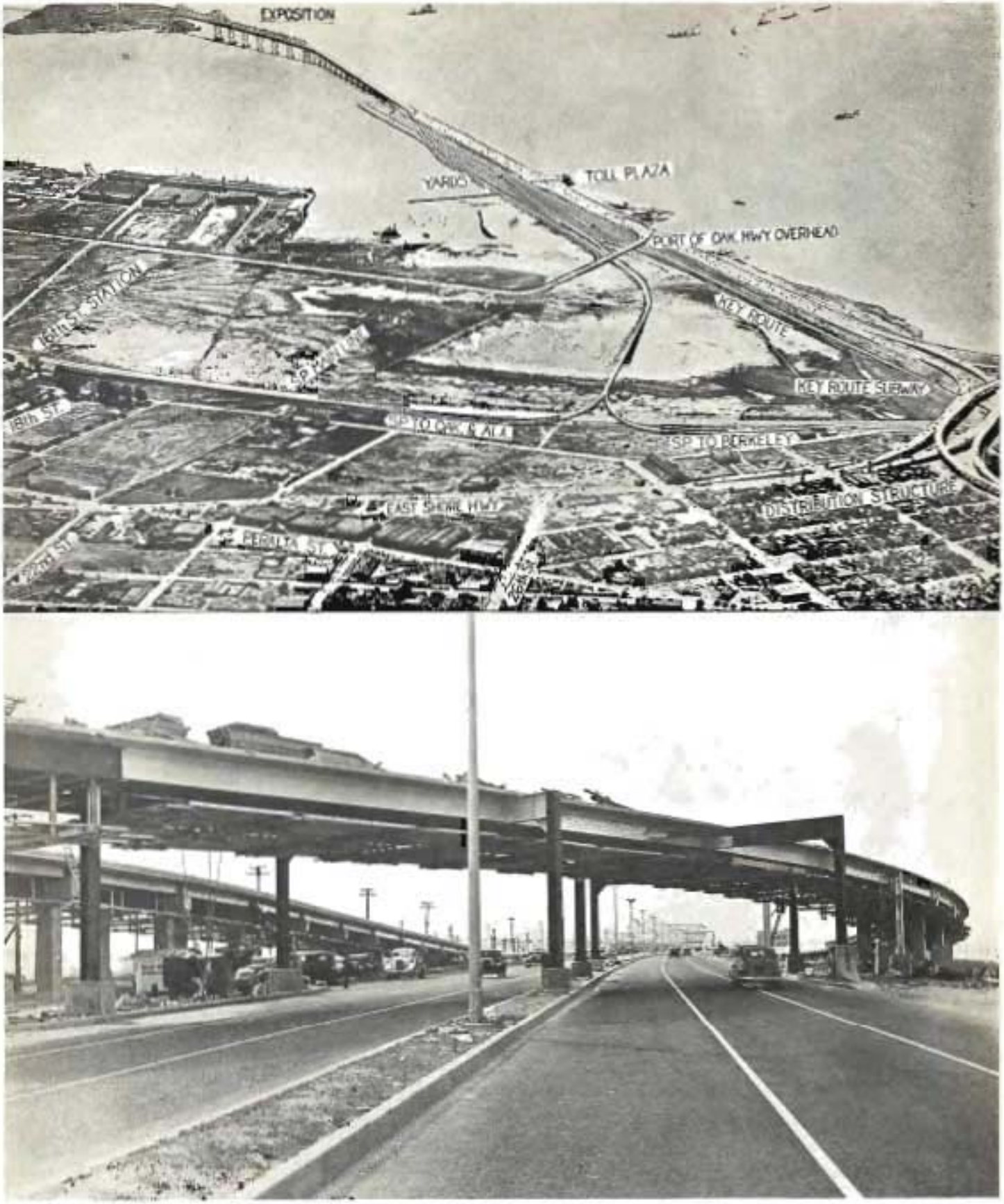
Port of Oakland is constructing the highway connecting with the overhead and the Port. The project will be lighted by sodium vapor luminaires, similar to those used on the Bay Bridge.

FOR AUTOS AND TRUCKS

The highway overhead will carry automobile and truck traffic in four lanes over the bridge railway system, separating in two "On" and "Off" ramps at the main bridge highway approach east of the Bay Bridge toll plaza.

Interurban Southern Pacific electric trains will be routed over an overhead "Y" structure at the end of 26th Street. From this structure Oakland and Alameda trains will proceed south through the 16th Street station. Berkeley trains will be routed north from the "Y."

Trains are scheduled to start operating over the Bay Bridge in November, 1938.



Upper drawing an aerial photo shows East Bay electric railway approaches to Bay Bridge. Key Route trains will proceed through subway. Southern Pacific trains will be routed overhead at end of 26th Street. Lower—Section of Port of Oakland overhead with Bay Bridge and its Toll Plaza in distance. Overhead will connect with bridge highway by ramps as shown in lower picture.

Broadway Low Level Tunnel is Open

(Continued from page 13)

tion of the Oakland approach with Broadway to the east portal junction with State Highway Route 75 in Contra Costa County, is 2.8 miles in length. This project replaces a number of circuitous routes from various sections of Oakland and Berkeley, crossing the backbone of the hills between Alameda and Contra Costa counties at a summit elevation of 1300 feet, using the "Fish Ranch Road," or a 1040 foot length timber tunnel, 17 feet clear width between sidewall timbers, at a summit elevation of 1045 feet connecting with the Skyline Boulevard.

The new tunnel will afford savings in distance of from .2 mile from Berkeley to 1.2 miles from downtown Oakland, using the Fish Ranch Road, and 1.9 miles from Oakland via the Skyline Boulevard and original tunnel.

The elevation of the new tunnel is approximately 750 feet at the west portal and about 130 feet higher at the east portal, which places it from 160 to 290 feet below the original narrow two-lane tunnel.

CURVES ELIMINATED

The minimum radius curve on the new project is 800 feet, the new alignment representing a saving of some ten complete circle-turns between Oakland and Contra Costa counties via the original tunnel.

The Oakland approach is 1.9 miles in length, with pavement constructed forty feet in width, with ten-foot shoulders on either side. Three highway grade separations have been constructed on this approach, with a clear roadway width of 44 feet between curbs. One of these three structures is combined with an overhead crossing over the Sacramento-Northern electric railroad.

The tunnel project also includes a highway connection to Berkeley (State Highway Route 206) leading to Ashby Avenue. This connection, by means of the Landvale overhead, also extends approximately one-half mile southeasterly of Route 75 to a connection with Oakland's Mountain Boulevard. This one-half mile connection is not a portion of the State Highway System, but was included in the joint highway district project.

Commendation

SAN FRANCISCO PUBLIC SCHOOLS

Office of the Superintendent
Civic Auditorium
San Francisco

November 26, 1937.

Editor,

California Highway and Public Works,
Sacramento, California.

Dear Sir:

For the past several months I have been reading and admiring successive editions of California Highways and Public Works. After reading the November issue, I succumb to the temptation to tell you that your magazine is without doubt the most inviting, the best edited, and gives a more complete view of activities throughout the state than any other publication which comes to my desk. The magazine has a high educational value and gives a true reflection of the great strides which are being made almost daily in the improvement and maintenance of California's highway system. Will you please continue my name on the mailing list?

Very truly yours,
(Signed) George F. Mullany,
Director of Publications.

TWIN BORES

At the east portal building of the tunnel in Contra Costa County, separation of grades in a connection with the Fish Ranch Road is accomplished as a portion of the building and portal structure.

The twin bores of the tunnel proper consists each of a 22-foot clear roadway between curbs, with a three-foot sidewalk on one side, 26-foot 8-inch clearance wall to wall, with a 15-foot 8-inch ceiling height. The inner walls of the two bores are separated approximately 15 feet at the two portals, but diverge to a maximum of about 100 feet under the crest of the mountain. The total covered length of the east-bound bore is 3203, and that of the west-bound bore, 3135 feet.

Easy light transition is provided by the construction of an overhead louver section, supported upon the portal approach walls, about 300 feet in length at either end.

These overhead louvers prevent direct rays of sunlight from falling upon the roadway area, and provide a lighting of intermediate intensity between the direct sunlight outside and the artificial illumination inside the tunnel bores.

The illumination within the tunnel proper is by means of incandescent lights, the reflectors of which are opaque for the rear half of the globe and clear glass in front, which projects the light ahead of the driver and provides an indirect lighting effect which is very efficient and eliminates all glare.

T. E. Ferneau was asigned as the State's Resident Engineer on this project in June, 1934, remaining on same until the original contract was rescinded in June of 1936, at which time he was assigned to another important construction project. R. J. Ivy was the State's Resident Engineer on the remainder of this construction project to the date of completion.

F. I. Doane has been assigned as engineer in charge of maintenance and operation of this project.

Auto Has Second Place On Western Family's Budget

Automobiles give precedence only to food in the budgets of many families in the extreme western part of the United States, according to statistics of the United States Department of Agriculture.

A survey conducted in 24 Pacific Coast towns revealed that in the very lowest income groups, families spend more for food and housing, and sometimes more for clothing than for automobiles, but as soon as a family attains an income of $1000 to $1500 the automobile takes second place on the budget after food.

This picture shows the laying of ties for the San Francisco-Oakland Bay Bridge railway system at easterly edge of span.

FIRST RAILWAY TIE IS LAID ON BAY BRIDGE

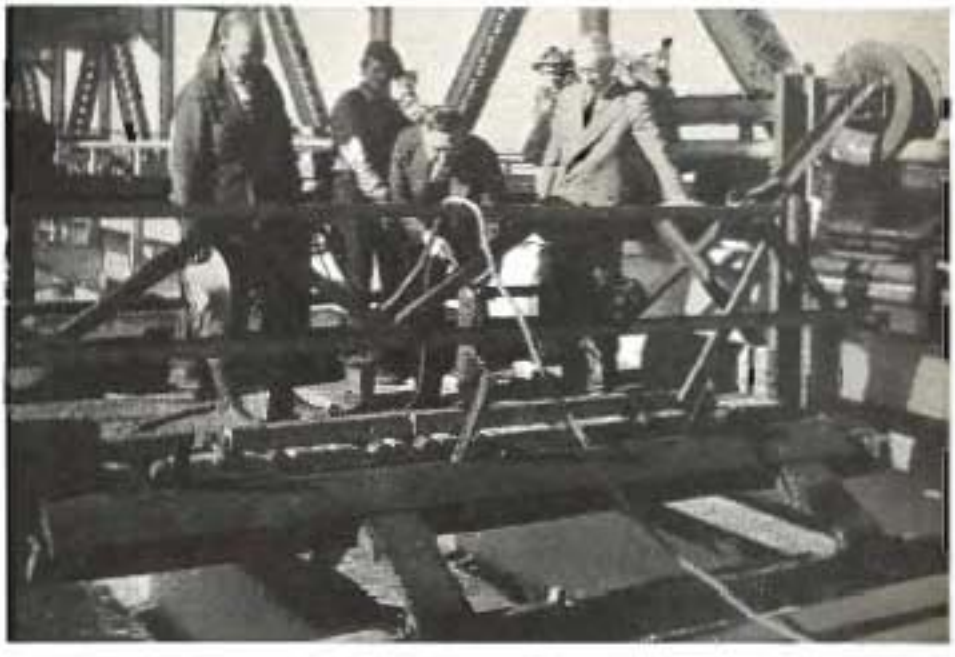
THE first of 105,000 ties for the $17,000,000 railway system of the San Francisco-Oakland Bay Bridge was laid on the morning of November 29 on the bridge proper.

Operating from a specially designed machine, the tie was neatly slipped into place by Bridge Engineer Charles E. Andrew at a point in Span E-22 on the easterly end of the structure.

The bridge proper will have 50,000 redwood ties, 8 inches by 9 inches thick and varying in length from 9 to 15 feet. Each tie is marked for its own position on the rail deck.

The ties will be placed directly on the steel stringers, which have been prepared with two coats of a coal tar paint. Before placing, the ties will have been "dapped" or notched at each end, with the cuts 6 feet, 6 inches apart, and at depths varying from a quarter-inch to an inch and a quarter and averaging a width of 11 inches. The tie will thus be slipped into its specified place on the stringer. The depth of the dap or notch depends on the location of the ties, which are placed in consecutive order according to number. This schedule assures a smooth running roadbed.

Selection of redwood for ties, Mr. Andrew pointed out, was due to its minimum conductivity of electricity, an essential requisite in the case of the Bay Bridge railway system, which cannot afford waste of current in connection with its elaborate signal system.



Bridge Engineer C. E. Andrew places first railway tie in position on Bay Bridge.

Maintenance Men Discuss Their Highway Problems

ON NOVEMBER 22 and 23, ninety-seven members of the Maintenance Department of the State Division of Highways met at Sacramento for a discussion of problems connected with the highway maintenance work.

The Maintenance Engineer and his staff, the District Maintenance Engineers with their assistants, and the Maintenance Superintendents—with one exception—were in attendance.

Earl Lee Kelly, Director of Public Works, talked to the meeting on Monday and stayed for part of the program. G. T. McCoy, Assistant State Highway Engineer; J. G. Standley, Principal Assistant Engineer; and several of the heads of departments, as well as representatives from the Bridge and Legal Departments, also attended and entered into the discussions.

Ray Duffy, District Maintenance Engineer, District IV, San Francisco, acted as chairman of the day for the Monday meeting, and Joe Stanton, District Maintenance Engineer, District VIII, San Bernardino, for the Tuesday meeting. The program was prepared from subjects submitted by these two men after contacting the other districts. It was planned primarily for discussion of problems from the field man's point of view. No formal papers had been prepared.

There is no question but that everyone in attendance secured benefit, not only from the discussion throughout the two days, but also from contact with men from other Districts, as well as the opportunity to see the type of work in other Districts which the trip to and from Sacramento afforded.

D. D. Breuning, Maintenance Superintendent of Woodland was unable to attend on account of illness.

Those in attendance at the sessions were:

CENTRAL OFFICE, SACRAMENTO.

T. H. Dennis, Maintenance Engineer. Assistant Maintenance Engineers W. A. Smith, C. F. Woodin, N. R. Bangert, P. L. Pite, R. B. Millard, F. M. Carter (Signing), K. A. MacLachlan (Planning Survey), H. L. Kile (Accident Studies). J. M. Call, Outdoor Advertising. E. S. Whitaker, Assistant Landscape Engineer. C. S. T. Marckhoff. Maintenance Superintendent (Bridge Painting Crew).

District I, Eureka. E. M. Cameron, District Maintenance Engineer. F. L. Meyer, Assistant to District Maintenance Engineer. C. H. Amesbury, Assistant District Maintenance Engineer. Maintenance Superintendents J. A. Brown, C. H. Sackett, C. A. Miller, G. W. Lane, W. H. Miller, Guy McMurtry.

District II, Redding. H. B. LaForge, District Maintenance Engineer. L. C. Evans, Assistant to District Maintenance Engineer. Maintenance Superintendents R. L. Hollis, L. D. Craig, J. H. Rust, F. C. Macauley, G. H. Nutting, E. L. Stump, F. J. Gribble.

District III, Marysville. J. L. Piper, District Maintenance Engineer. C. E. Thompson, Assistant to District Maintenance Engineer. Maintenance Superintendents H. T. Bigelow, F. R. Garrison, O. F. Georges, C. W. Rust, C. H. Weeks, E. D. Willis.

District IV, San Francisco. R. P. Duffy, District Maintenance Engineer. R. A. Wilson, Assistant District Maintenance Engineer. Maintenance Superintendents J. W. Adams, R. K. Forrest, W. F. Holbrook, A. S. Moore, L. T. Robinson.

District V, San Luis Obispo. H. L. Cooper, District Maintenance Engineer. W. S. Dolliver, Assistant District Maintenance Engineer. Maintenance Superintendents T. M. Joyce, R. S. Peck, K. Mendenhall, C. F. Toole.

District VI, Fresno. E. M. Evers, District Maintenance Engineer. Assistant District Maintenance Engineers Tom Eastman and Earle W. Taylor. Maintenance Superintendents R. W. Latour, Carl Nelson, L. W. Seymour, J. F. Clarke, S. T. Myers, C. F. Johnson.

District VII, Los Angeles. E. T. Scott, District Maintenance Engineer. Assistant District Maintenance Engineers Wm. L. Pahey and D. H. Greeley. Maintenance Superintendents G. H. Cheeseman, B. M. Gallagher, T. W. Martin, C. T. Warren.

District VIII, San Bernardino. J. E. Stanton, District Maintenance Engineer. L. Norlen, Assistant District Maintenance Engineer. Maintenance Superintendents Ben R. Bond, M. J. Small, C. L. Calne, J. B. Davidson, E. M. Maurer, B. A. Switzer.

District IX, Bishop. C. Cleman, District Maintenance Engineer. W. M. Reith, Assistant District Maintenance Engineer. Maintenance Superintendents Grant Merrill, Dwight Wonacott, Joseph Lemos.

District X, Stockton. C. E. Bovey, District Maintenance Engineer. Assistant District Maintenance Engineers A. I. Rivett and W. D. Sedgwick. Maintenance Superintendents H. S. Clark, J. H. Gates, L. H. Haigh, S. E. Harris, L. H. Kahl, W. H. Martin, B. M. Mehl, S. Sawyer.

District XI, San Diego. H. S. Comly, District Maintenance Engineer. R. B. Luckenbach, Assistant District Maintenance Engineer. Maintenance Superintendents Chas. Herbey, E. A. Wolfe, I. A. Thomas, Morris Mitchell.

Highway Bids and Awards for November, 1937

HUMBOLDT COUNTY—Between Stegemeyer Bluffs and Myers, about 2.9 miles to be graded and surfaced with plant-mixed surfacing and Class "B" seal coat to be applied to the full width of roadbed. District I, Route 1. Sections B, C. Marco Construction Co., Clearwater, $288,955; Parker-Schram Co., Portland, Oregon, $275,240; Union Paving Co., San Francisco, $261,210; Pioneto Bros. and Co., San Francisco, $230,677; Poulos and McEwen, Sacramento, $232,685; N. M. Ball Sons and D. McDonald, Berkeley, $232,540; Fredericksen and Westbrook, Lower Lake, $233,155. Contract awarded to Hemstreet and Bell, Marysville, $226,636.

INYO COUNTY—Grading and penetration oil treatment, 17 miles southeast of Keeler, 0.7 mile in length. District IX, Route 127, Section E. Reiroth and Reiroth, Bakersfield, $7,086; T. G. Smith, Huntington Park, $6,136; Basich Bros., Torrance, $4,704. Contract awarded to A. S. Vinnell Co., Alhambra, $4,435.90.

LOS ANGELES COUNTY—Between Valley Blvd., and Los Tunas Drive, about 1.3 miles to be graded and paved with Portland cement concrete and plant-mixed surfacing. District VII, Route 168, Section C. Dinnitt and Taylor, Los Angeles, $80,506; Southern California Roads Co., Los Angeles, $78,852; Daley Corp., San Diego, $79,285; W. E. Hall Co., Alhambra, $73,755; Claude Fisher Co., Ltd., Los Angeles, $73,622; E. Paul Ford, San Diego, $71,681; Oswald Bros., Los Angeles, $71,204; C. O. Sparks and Mundo Engineering Co., Los Angeles, $74,624; George R. Curtis Paving Co., Los Angeles, $69,908; Griffith Company, Los Angeles, $69,967; United Concrete Pipe Corp., Los Angeles, $81,487. Contract awarded to J. E. Haddock, Ltd., Pasadena, $67,918.80.

LOS ANGELES COUNTY—Bridges across Zuma Creek and Trancas Creek at points about 17 and 18 miles north of Santa Monica, to be widened. District VII, Route 60, Section A. Dinnitt and Taylor, Los Angeles, $52,065; Oscar Oberg, Los Angeles, $46,764; Andy Sordal, Long Beach, $43,087; Carlo Bongiovanni, Los Angeles, $44,990; Byerts and Dunn, Los Angeles, $43,424; C. O. Sparks and Mundo Engineering Co., Los Angeles $47,870; Contracting Engineers Co., Los Angeles, $50,850; J. E. Haddock, Ltd., Pasadena, $41,631; Case Construction Co., Inc., Alhambra, $41,745; J. S. Metzger and Son, Los Angeles, $39,188. Contract awarded to John Struna, Pomona, $34,745.80.

LOS ANGELES COUNTY—On Puente Avenue at Walnut Creek, a reinforced concrete girder bridge to be constructed and about 0.3 mile of approach roadway to be graded and surfaced with plant-mixed surfacing. District VII, Route 170, Section B. Dinnitt and Taylor, Los Angeles, $17,562; Griffith Company, Los Angeles, $19,764; Oswald Bros., Los Angeles, $17,962; Vido Kovacevich, South Gate, $18,696. Contract awarded to Claude Fisher Co., Ltd., Los Angeles, $15,698.

MENDOCINO COUNTY—Between Albion and Newport, about 1.6 miles to be graded. District I, Route 58, Sections D, F. N. M. Ball Sons, Berkeley, $32,082; Parish Bros., Los Angeles, $38,824; John Rocca, San Rafael, $40,722; Guerin Bros., San Francisco, $29,317; Claude C. Wood, Stockton, $41,054; Chas. L. Harney, San Francisco, $29,530; John Burman and Sons, Eureka, $33,764; Young and Son Company, Ltd., Berkeley, $27,906; Helwig Construction Co., Sebastopol, $43,256. Contract awarded to A. R. Monstretti, Stockton, $27,245.

MENDOCINO COUNTY—A reinforced concrete bridge across Jughandle Creek about 5 miles south of Fort Bragg, consisting of 14 slab spans having a total length of 388 feet supported by an open spandrel arch and concrete bents, and about 0.3 mile of roadway to be graded and treated with asphalt. District I, Route 56, Section E. F. J. Maurer and Son, Inc., Eureka, $65,419; C. W. Caletti and Co., San Rafael, $71,185; S. D. Becktel, San Francisco, $70,925; Mercer, Fraser Company, Eureka, $84,730; A. Soda and Son, Oakland, $80,476. Contract awarded to John Rocca, San Rafael, $55,646.90.

MENDOCINO COUNTY—About 15 miles north of Point Arena across Elk Creek, a reinforced concrete girder bridge to be constructed, consisting of one 50-foot span and two 35-foot spans on concrete piers and abutments with pile foundations, about 0.30 miles of roadway to be graded and a penetration oil treatment applied. District I, Route 56, Section C. Peter J. McHugh, San Francisco, $33,161; John Rocca, San Rafael, $36,100; C. W. Caletti and Co., San Rafael, $38,174; Valley Construction Co., San Jose, $38,365; A. Soda and Son, Oakland, $42,113; Mercer, Fraser Co., Eureka, $42,502. Contract awarded to F. J. Maurer and Son, Inc., Eureka, $33,046.50.

ORANGE COUNTY—Tustin Avenue at 17th Street, about 0.5 mile to be graded and paved with asphalt concrete and plant-mixed surfacing. District VII, Route 43, Section A. Sully-Miller Contracting Co., Long Beach, $19,118; O. O. Garts, Los Angeles, $27,021; Griffith Co., Los Angeles, $23,192; Oswald Bros., Los Angeles, $21,453. Contract awarded to C. O. Sparks and Mundo Engineering Co., Los Angeles, $18,852.75.

RIVERSIDE COUNTY—Between two miles south of San Bernardino County line and Beaumont, about 2.4 miles to be graded and paved with plant-mixed surfacing. District VIII, Route 26, Section A. Dinnitt and Taylor, Los Angeles, $77,188; George Herst & Co., San Bernardino, $75,654; Claude Fisher Co., Ltd., Los Angeles, $78,176; C. O. Sparks and Mundo Engineering Co., Los Angeles, $73,904; Crow Brothers Construction Co., Los Angeles, $74,829; Griffith Co., Los Angeles, $72,545; A. S. Vinnell Co., Alhambra, $90,379. Contract awarded to Oswald Brothers, Los Angeles, $65,899.60.

SAN DIEGO COUNTY—Timber bridge and approaches to be constructed at San Felipe Creek, 11.8 miles east of Julian, District XI, Route 108, Sections E, F. R. E. Hazard and Sons, San Diego, $16,296; Valley Construction Co., San Jose, $19,287; W. R. Shriver, Los Angeles, $20,039; B. G. Carroll, San Diego, $16,724. Contract awarded to V. R. Dennis Construction Co., San Diego, $14,205.20.

SACRAMENTO COUNTY—Across Cosumnes River near Live Oak, existing bridge to be relocated with Portland cement concrete and plant-mixed surfacing. District III, Route 54, Section C. John C. O'Leary Construction Co., San Francisco, $12,457; Holdener Construction Co., Sacramento, $10,913; Theden Bros., Berkeley, $12,280; M. A. Jenkins, Sacramento, $7,390. Contract awarded to Lord and Bishop, Sacramento, $7,196.

SAN JOAQUIN-SACRAMENTO COUNTIES—Between Johnst Corner and one mile north of Galt, about 5.0 miles to be graded and paved with Portland cement concrete. District X, Route 4, Sections D, A. Basich Brothers, Torrance, $222,466; Metropolitan Construction Co., Los Angeles, $235,480; David H. Ryan, San Diego, $209,428; N. M. Ball Sons and D. McDonald, Berkeley, $232,313; Louis Biasotti & Son, Stockton, $212,625; Union Paving Co., San Francisco, $219,860; Healey-Moore Co., Oakland, $224,199; A. Teichert and Son, Inc., Sacramento, $249,379; Larsen Bros. and Harms Bros., Sacramento, $254,933; A. J. Raisch and Earl W. Heple, San Jose, $261,346. Contract awarded to Fredericksen and Westbrook, Lower Lake, $205,803.

SAN LUIS OBISPO COUNTY—A reinforced concrete girder overhead crossing over the tracks of the Southern Pacific Railroad about 6 miles north of San Luis Obispo, consisting of two 50-foot spans, two 50-foot 3½-inch spans, four 45-foot 4-inch spans, and two 32-foot 6-inch spans. District V, Route 2, Section D. Dinnitt and Taylor, Los Angeles, $89,940; J. S. Metzger and Son, Los Angeles, $91,570; C. O. Sparks and Mundo Engineering Co., Los Angeles, $94,015; Byerts and Dunn, Los Angeles, $94,893; A. Soda and Son, Oakland, $93,340; J. E. Haddock, Ltd., Pasadena, $98,200; Case Construction Co., Inc., Alhambra, $99,140; Werner and Webb, Los Angeles, $102,090; Lindgren and Swinerton, Inc., San Francisco, $103,467; C. W. Caletti & Co., San Rafael, $104,035; Earl Heple, San Jose, $88,535; Metropolitan Construction Co., Los Angeles, $92,750; J. F. Knapp, Oakland, $95,705. Contract awarded to R. R. Bishop, Long Beach, $84,390.

SISKIYOU COUNTY—On East Side Road in Scott Valley, between Callahan and Fort Jones, about two miles to be surfaced with screened gravel. District II. Feeder Road Section. A. Soda and Son, Oakland, $6,262; Clifford A. Dunn, Klamath Falls, Oregon, $6,415. Contract awarded to Garcia Construction Co., Irvington, $4,820.

SUTTER COUNTY—A reinforced concrete slab bridge across Sutter By-Pass, 12 miles west of Yuba City, consisting of one 54-foot span, one 72-foot span, twenty-two 16-foot spans and one hundred seventy-three 22-foot spans on concrete pile bents. District III, Route 15, Section A. J. F. Knapp, Oakland, $227,708; Campbell Construction Co., Sacramento, $237,407; Andy Sordal and R. R. Bishop, Long Beach, $239,462; Lindgren and Swinerton, Inc., San Francisco, $250,354; John Rocca, San Rafael, $250,864; N. M. Ball Sons and D. McDonald, Berkeley, $258,120; C. W. Caletti and Co., San Rafael, $256,545; A. W. Kitchen, San Francisco, $252,067; Clinton Construction Co. of California, San Francisco, $276,129; George Pollock Company, Sacramento, $278,275; Bates and Rogers Construction Corp., Oakland, $292,305. Contract awarded to Healey-Moore Co. and Fredrickson Watson Construction Co, Fredrickson Bros., Oakland, $227,207.

SUTTER COUNTY—Between Tarke and one mile south of Sutter City, about 4.7 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 15, Sections A, B. A. G. Raisch, San Francisco, $152,099; Hyman-Ihan Co., San Francisco, $148,494; Union Paving Co., San Francisco, $144,283; Basich Brothers, Torrance, $140,282; Louis Biasotti and Son, Stockton, $165,747; Larsen Bros. and Harms Bros., Sacramento, $135,571; Healey-Moore Co., Oakland, $149,500; A. Teichert and Son, Inc., Sacramento,

(Continued on page 27)

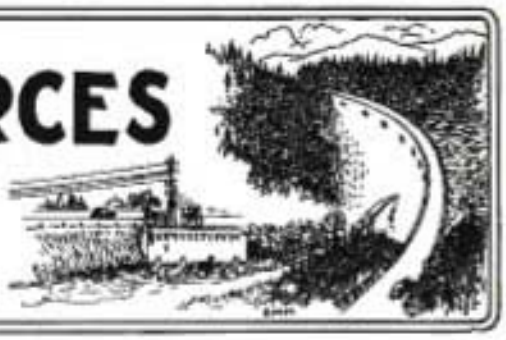
DIVISION OF WATER RESOURCES

OFFICIAL REPORT

FOR THE MONTH OF

November, 1937

EDWARD HYATT, State Engineer



WORKING under an agreement with the U. S. Bureau of Reclamation, the Division of Water Resources has continued the making of surveys and the collection and compilation of data in the San Joaquin Valley in connection with the acquisition of lands and water rights and the exchange of water for lands not acquired. Negotiations were continued with the owners of these lands and water rights in connection with their acquisition for the project. Negotiations were also continued with public utility companies for the relocations of their facilities which would interfere with the construction of certain units of the project. Studies were continued and conferences held in connection with the disposal of water and power to be made available by the project.

Announcement was made during the month that a capacity of 4,500,000 acre-feet has been selected for the Shasta Reservoir, formerly Kennett Reservoir. The dam for this reservoir will be approximately 500 feet high, above the present stream level, and will be the second largest concrete dam in the world.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The small regular crew has been engaged on routine maintenance during this period. The rainfall occurring during the latter half of the month has made it necessary to operate the drainage pumping plants at intervals, but the total local drainage runoff has been moderate.

Due to excessive and unusual rainfall in the watershed of the upper Sacramento River, the Sacramento River rose to medium flood stage and crested at Colusa on November 22, 10 p.m., at 24.9 feet on the gauge. The Moulton, Colusa and Tisdale weirs have been discharging water into the by-pass since November 21, and Butte Basin is overflowed. Water commenced discharging over Fremont weir late in the afternoon of November 24 and it will continue for several days, at a depth of from one to one and one-half feet.

Relief Labor Work.

All WPA projects have been inactive during this period owing to lack of men on relief. On November 8, work was started on clearing in the Tisdale By-pass with a crew averaging 25 men from SRA Transient Camp No. 7 in Butter Basin, this office furnishing tools, supervision and transportation. Work has been suspended since November 21 on account of the overflow of the by-pass from the Tisdale weir.

Bank Protection Program.

Work has been continued on the construction of bank protection at various points in the Sacramento River by the California Debris Commission, under the current program being done under the 1932 agreement. However, the unseasonable rise in water stage has necessitated the discontinuance of practically all of this work. Some damage has resulted in the erosion of new earth-fill material.

IRRIGATION DISTRICTS

An annual report on irrigation districts was completed and published during the month as Bulletin No. 21-H of the Division. This is the ninth of a series of these publications dealing with the history and activity of districts formed under the California Irrigation District Act. The present report contains information and statistical data collected for the year 1936, and contains a discussion of the refinancing programs being carried out by many of the districts through loans from Reconstruction Finance Corporation.

A publication containing a revision of the Irrigation District Laws is now in preparation. It will include amendments and new provisions passed by the Legislature in 1937, and when completed will be printed as Bulletin No. 18-E.

WATER RIGHTS

Supervision of Appropriations of Water.

Thirty-four applications to appropriate water were received during October, six were denied and twelve were approved. Seven permits were revoked and seven passed to license. On October 1, forms were forwarded to 1294 permittees requesting a report of progress for the past year and on October 15, forms were forwarded to 522 licensees requesting reports of use and changes during the past three years. On November 1, 851 of these reports had been received and these are in process of study with a view to such action as may be appropriate in the various cases.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

During the past month the field work of this office has been virtually completed and the field data gathered is being assembled preparatory to making the office computations of diversions, acreage irrigated, stream and return flows in the Sacramento and San Joaquin valleys. These data will all be assembled and published in a mimeographed report of the Division of Water Resources.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the past month work has been directed toward concluding arrangements with the personnel of the various cooperating agencies throughout the State for the conduct of the coming winter's snow surveys. In this connection, instruction has been given to the personnel of various cooperating agencies in the methods of making the surveys.

Work was completed on the construction of a shelter cabin in the Kern River watershed and this and several other cabins were stocked with food and supplies for winter use by snow surveyors.

Considerable work was done in placing markers along trails leading to snow survey courses so that they may be more readily followed during periods of deep snow.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

During October progress was made with field work in connection with the San Bernardino No. 3 and San Bernardino No. 4 quadrangles and office work was performed on the Downieville No. 1 quadrangle.

Final maps of the San Francisquito quadrangle in Los Angeles County are now available. This sheet is published on a scale of 1:24,000 with a contour interval of 25 feet.

Boss: "Now be careful with that money I gave you, son. Remember the saying, 'a fool and his money are soon parted'."

Boss' son: "Yes, Dad, but I want to thank you for parting with it, just the same."

State Experiments With Highway Safety Lighting

(Continued from page 15)

For instance, in single-car accidents on State highways—for both daylight and darkness—where only a single motor vehicle was involved, 54 per cent of all the causes reported was made up of "Speed excessive for conditions," "Pedestrian involved," and "Driver had been drinking."

In two-car accidents, where two or more motor vehicles were involved, we find that "Driver had been drinking," "Speed excessive for conditions," and "Improper passing" again contribute to more than 50 per cent of the total.

On the basis of their occurrence, we discover that accidents involving drivers who had been drinking were over seven times more frequent at night, excessive speed 2.6 times, and improper passing 1.8 times than under daylight conditions.

ONLY A MINOR FACTOR

Taking the three major causes—drinking drivers, excessive speed, and improper passing—which together account for more than half of all causes reported for night accidents, it is clearly apparent that the absence of daylight is only a minor factor in their increase at night. It is difficult to see how the artificial restoration of a portion of daylight can of itself, without the aid of other remedies, be expected to bring about any radical change in these causes.

However, since the real proof of the value of highway lighting can come only from the record of well-conducted experiments it is hoped that much may be learned from the two installations which will shortly be made.

The plans of the above projects were developed by Colonel J. H. Skeggs, State District Engineer of San Francisco, and the installation is under his direct supervision.

Clerk (in private office): "As I am getting married, sir, is there any chance of an increase in salary?"

Boss: "If you don't get out of here quick, we'll make you a partner and you won't get anything."

New Type of Reflecting Curb Has Been Designed

(Continued from page 8)

reflecting facets designed to proper depth and angle produced an effect markedly superior to other curbs when viewed under rays of automobile headlights. Additional benefit was derived by painting the reflecting plane with white paint and this was improved by impregnating the paint with glass beads.

Two types of recess forms which appeared to be the most effective have been adopted for construction:

First, a simple type of wedge shaped indentation is most suitable for central dividing strips where traffic movement approximately parallels the curbs.

Second, a block type with all faces of the recess sloped to reflect light, is more effective for intersection islands and curb returns, where headlights are directed against them at more abrupt angles.

In the plan and specification for the curbs regard has been given to practical and economical construction and to their durability and maintenance.

Although some change in design may increase the effective visibility of the recessed curb face, the types indicated are being constructed.

This reflecting type curb is a development of a design observed in the State of New Jersey.

HIGHWAY BIDS AND AWARDS

(Continued from page 25)

$153,878; Poulos and McEwen, Sacramento, $144,897; Fredericksen and Westbrook, Lower Lake, $133,751. Contract awarded to Hemstreet and Bell, Marysville, $133,596.55

TULARE COUNTY—Between 1.8 miles west of Merryman and Yokohl, about 3.1 miles, to be graded and surfaced with plant-mixed surfacing on crusher run base. District VI, Route 10, Sections C, D. Piazza and Huntley, San Jose, $82,162; Griffith Company, Los Angeles, $88,919; Oswald Bros., Los Angeles, $97,928; Hanrahan Company, San Francisco, $103,702; J. A. Casson, Hayward, $98,103; Union Paving Co., San Francisco, $86,499. Contract awarded to N. M. Ball Sons, Berkeley, $81,444.

Tramp: "Lady, I'm dying from exposure."

Woman: "Are you a tramp, politician or financier?"

New Arroyo Seco Parkway Will Benefit Many Southern Cities

(Continued from page 11)

new highway, which will pass beneath Arroyo Drive, Grand Avenue, Orange Grove Avenue, Prospect Avenue, Meridian Avenue, Fremont Avenue, Union Pacific and Santa Fe tracks and Fair Oaks Avenue in South Pasadena. At each of these locations it will be necessary to build separation structures.

In the case of the bridge at Arroyo Drive a single span structure about eighty feet long will be used. Encased in the structure, immediately below the deck and entirely concealed from view, will be the large Pasadena sewer.

CONTINUOUS BRIDGES

In the case of the other structures through South Pasadena it has been found economical to make use of continuous bridges with extremely shallow deck construction. This type of construction will be used so that roadway excavation cost may be kept to a minimum.

The design of the structures to fit conditions entails the usual problems which are encountered in highly developed areas. The work will be planned in such manner that construction work will not unduly inconvenience traffic over the many cross streets affected. Rail traffic must be kept going while the Union Pacific, Santa Fe and Pacific Electric grade separations are being constructed. Through the cities, utilities and tracks must be shifted as necessary to facilitate construction.

Due to the high development of the territory careful consideration is given to the engineering and architectural treatment of the structures to the end that utility, beauty and economy may be the result.

The building of the bridge over the Arroyo Seco channel and the eighteen grade separation structures will make it possible for the new Arroyo Seco Parkway to serve well the growing communities to the northeast of Los Angeles and as a result of the construction, these communities will enjoy a transportation convenience which will pay big dividends for many years to come.

Right of Way Men Hold Meet in Sacramento

A SEMINAR for right of way attorneys, right of way agents and right of way engineering assistants engaged in the acquisition of lands and easements required for the development of the State highway system and the completion of the rail transportation facilities for the San Francisco-Oakland Bay Bridge was held at Sacramento November 18 and 19, 1937. C. C. Carleton, Chief of the Division of Contracts and Rights of Way, presided over the sessions.

APPRAISAL PROBLEMS

Among the many topics discussed were appraisal problems; condemnation practice and procedure; procedure on claims before the State Board of Control; relinquishments and abandonments of existing ways; 1937 legislation in so far as it concerns right of way activities; civil service problems affecting the hiring of appraisers and court witnesses; practice in the removal or demolition of buildings; right of way fences; encroachments on right of way; conveyancing forms; acquisition of rights of way for subway and overhead railroad grade separations, etc.

The high light of the meeting was the intensive study of acquisition problems arising out of the increased use of new and advanced types of highway construction by the State.

Those in attendance included Clarence W. Morris, San Francisco, Frank B. Durkee, C. R. Montgomery and Robert E. Reed, Sacramento, Attorneys for the Division; Holloway Jones, Clifford D. Good, Lincoln V. Johnson and George Hadley, Condemnation Investigators, San Francisco; C. A. Marsh, Supervising Right of Way Agent, San Francisco-Oakland Bay Bridge, San Francisco; L. P. Bolander, Jr., Assistant Right of Way Agent, San Francisco-Oakland Bay Bridge, San Francisco; S. W. Elliott, Right of Way Agent, District I, Eureka; Leland L. Rose, Right of Way Agent; John W. White and John R. West, Assistant Right of Way Agents, District II, Redding; Herman D. Jarrett, Right of Way Agent, Richard H. Ramsey, Assistant Right of Way Agent, and J. F. O'Hara, Assistant Highway Engineer, District III, Marysville; James B. Woodson, Right of Way Agent, Roy C. Teel and E. Kenneth Rogers, Assistant Right of Way Agents, and Fred G. Beckner, Assistant Highway Engineer, District IV, San Francisco; G. J. Grohman and Orr Stephens, Junior Highway Engineers, Sacramento; E. W. Carson, Right of Way Agent, C. L. Slusher and J. M. Sorensen, Assistant Right of Way Agents, District V, San Luis Obispo; Henry Sellers, Right of Way Agent, Wiley D. Ambrose, Assistant Right of Way Agent, and F. M. Roush, Assistant Highway Engineer, District VI, Fresno; Frank C. Balfour, Supervising Right of Way Agent, E. N. Whittemore and Leo J. McCarthy, Right of Way Agents, William L. Mills, Neil C. Brown, Earle R. Bunker, Joseph F. Walsh and E. F. Wagner, Assistant Right of Way Agents, and Harold W. Leonard, Assistant Highway Engineer, District VII, Los Angeles; Edward P. Jones, Right of Way Agent, and Charles L. Flack, Assistant Right of Way Agent, District VIII, San Bernardino; F. R. Baker and M. Harris, Associate Highway Engineers, and Serge Ray, Junior Highway Engineer, District IX, Bishop; B. J. Perry, Right of Way Agent and Louis J. Malatesta, Assistant Right of Way Agent, District X, Stockton; George S. Pingry, Right of Way Agent, and A. J. Razeto, Assistant Right of Way Agent, District XI, San Diego.

Feather River Route a Credit to the State

Returning vacationists who traveled the new Feather River Highway seem to be about evenly divided into two factions, one of which contends that the highway is outstanding because of its engineering accomplishments, the other praising its beauty; they unite in proclaiming it the greatest stretch of automobile roadway in the state.

Designed to provide another eastern entrance to the state, it is predicted that the attractiveness of this highway will be an inducement that will make it one of the most heavily used routes.—*Pacific Motorist.*

November Sees Traffic Drop On Bay Bridge

VEHICLES totaling 9,721,328 have crossed the San Francisco-Oakland Bay Bridge during the first twelve and one-half months of operation, State Director of Public Works Earl Lee Kelly announced following a report of the span's November traffic by State Highway Engineer C. H. Purcell.

A drop in number of over 500 vehicles in the structure's daily average was reported for last month's traffic, with an average of 23,308 vehicles for November, compared with 23,834 for October.

There was a general drop in all classifications of vehicles, Mr. Kelly said. Total vehicles for November numbered 699,229 as against 738,868 for October. The lowest day was November 16, a rainy day, when 17,506 vehicles crossed the span. High day was November 6, with 32,195 vehicles. A 30-day, four-Sunday month, together with stormy weather conditions, was among the factors attributed to the traffic drop by Mr. Kelly.

Total earnings for the month were $369,869.90—compared with $393,465.25 for October.

Comparative figures for October and November, with total vehicles to cross the bridge to date, follow:

	Passenger Autos	Auto Trailers
Total Oct.	695,079	1,327
Total Nov.	657,901	954
Total since opening	9,247,521	16,860

	Motorcycles	Trucks	Trucks
Total Oct.	2,729	836	27,145
Total Nov.	2,220	913	25,918
Total since opening	34,240	8,125	300,869

	Truck Trailers	Buses
Total Oct.	1,299	10,453
Total Nov.	1,233	10,090
Total since opening	21,503	92,410

	Total Vehicles	Extra Passengers	Freight Pounds
Total Oct.	738,868	184,416	69,243,169
Total Nov.	699,229	179,178	62,451,501
Total since opening	9,721,328	2,036,598	688,524,183

"Was that an explosion at your house last night?"

"Yes, there was powder on my coat."

STATE OF CALIFORNIA

Department of Public Works

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

FRANK F. MERRIAM.....Governor

HARRY A. HOPKINS.....Assistant Director

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

CALIFORNIA HIGHWAY COMMISSION

H. R. JUDAH, Chairman, Santa Cruz
PHILIP A. STANTON, Anaheim
PAUL G. JASPER, Fortuna
WILLIAM T. HART, Carlsbad
ROBERT S. REDINGTON, Los Angeles
JULIEN D. ROUSSEL, Secretary

DIVISION OF HIGHWAYS

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

DISTRICT ENGINEERS

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

SAN FRANCISCO-OAKLAND BAY BRIDGE

C. E. ANDREW, Bridge Engineer

DIVISION OF WATER RESOURCES

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

DIVISION OF ARCHITECTURE

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

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
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
CLARENCE W. MORRIS, Attorney, San Francisco
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney
ROBERT E. REED, Attorney

DIVISION OF PORTS

Port of Eureka—WILLIAM CLARK, SR., Surveyor

51496 12-37 15,700

CALIFORNIA STATE PRINTING OFFICE
GEORGE H. MOORE, STATE PRINTER
SACRAMENTO, 1937

MAP
SHOWING
STATE HIGHWAY SYSTEM