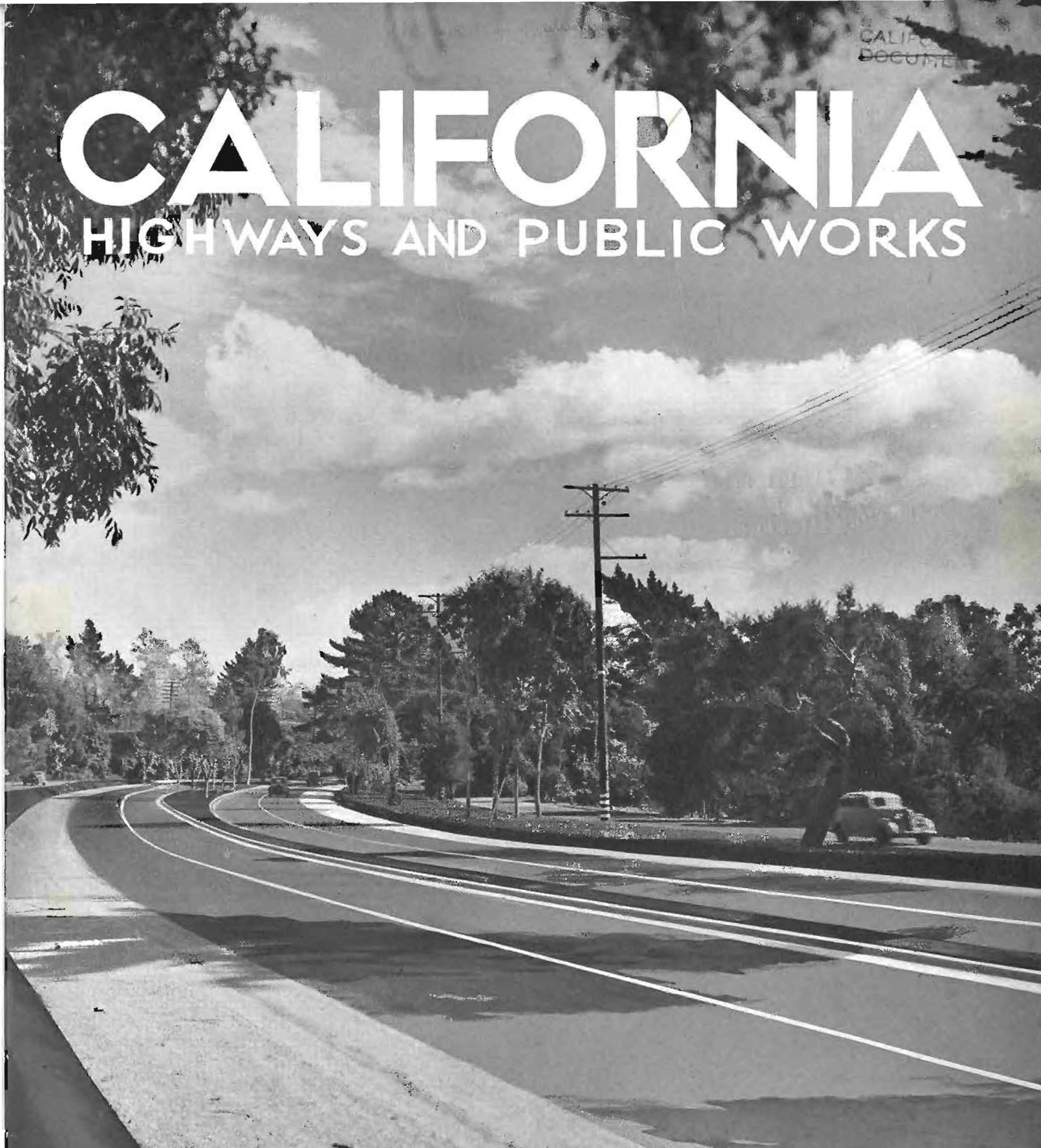
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



New Four Lane Divided Highway
Through Montecito

Official Journal of the Department of Public Works
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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

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Proposed Decrease in Federal Aid Would Eliminate $8,200,000 From Current Biennial Highway Budget

By EARL LEE KELLY, Director of Public Works

CALIFORNIA, in common with all the other States of the Union, is greatly concerned over a proposal now before Congress to curtail Federal aid highway appropriations which, if approved, means the elimination of projects totaling approximately $8,200,000 from our current State highway budget and the loss of $4,000,000 per year thereafter.

Section 12 of the Hayden-Cartwright Road Act of June 18, 1934, provides that any State that diverts gasoline taxes and other motor vehicle revenue from highway purposes in greater amount than provided by law on the date of passage of the act shall be penalized not to exceed one-third of the Federal aid funds made available to that State in any year.

This penalty has been levied in several States yet Congress is asked to reduce Federal allocations for highway purposes in spite of the fact that gasoline users pay a one cent per gallon tax to the Government in addition to excise taxes imposed on motor vehicles, tires, inner-tubes, oil, etc., all amounting to approximately $327,000,000 per year.

GOVERNOR'S VIEW

Governor Frank F. Merriam, while an exponent of balanced budgets, State and National, and a firm believer in governmental economies, is of the opinion that curtailment of highway construction is not helpful economy because such curtailment will add to unemployment and deprive the public of needed road improvements. The Governor says concerning the proposal before Congress:

"I am informed that in 1936 the Federal Government collected $186,542,000 through its own gasoline tax of 1 cent a gallon, and $140,495,000 in other excise taxes on motorists. Collection of $186,000,000 in gas taxes and the curtailment of highway appropriations to $125,000,000 would seem to me to be the same sort of gas tax diversion by the Federal Government for which it has penalized several States.

EARL LEE KELLY

"Approval of the proposal submitted to Congress not only would throw vast numbers of persons out of employment but would discourage general contracting and manufacture of heavy materials and equipment."

THE RECOMMENDATIONS

The recommendations before Congress are as follows:

(1) Cancellation of a $214,000,000 apportionment authorized for distribution among the States for the fiscal year ending June 30, 1939.

(2) Distribution of $200,000,000 of unappropriated 1938 fiscal year funds over the next two fiscal years.

(3) Limitation of annual appropriations to $125,000,000 for 1940 and thereafter for the next few succeeding years compared to $238,000,000 allocated under the Act of June 16, 1936 for 1938 and 1939.

EFFECT ON CALIFORNIA

The effects on California's highway construction this proposed legislation would have are outlined as follows:

(1) Cancellation of the fiscal year 1939 apportionments for regular Federal Aid, feeder roads, and grade crossings would mean the elimination of projects totaling approximately $8,200,000 from the current biennial budget.

This total is derived in the following manner:

In the State highway fund budget for the current biennium, July 1, 1937, to June 30, 1939, there was included anticipated regular Federal Aid revenue in an amount of $9,500,000 which was all allocated to projects. The 1938 apportionment in an amount of $4,858,220 has already been received leaving a balance of $4,641,780 anticipated 1939 regular Federal Aid.

The feeder road apportionment for the next fiscal year should be approximately the same as for the present year in an amount of $971,644 as should the grade crossing set-up for $1,874,656. Summarized, the loss of funds for 1939 through the proposed cancellation of Federal Aid is as follows:

Anticipated 1939 Federal Aid	$4,641,780
Anticipated 1939 Feeder Funds	971,644
Contribution by Counties to match Feeder Funds	703,604
Anticipated 1939 Grade Crossings	1,874,656
	$8,191,684

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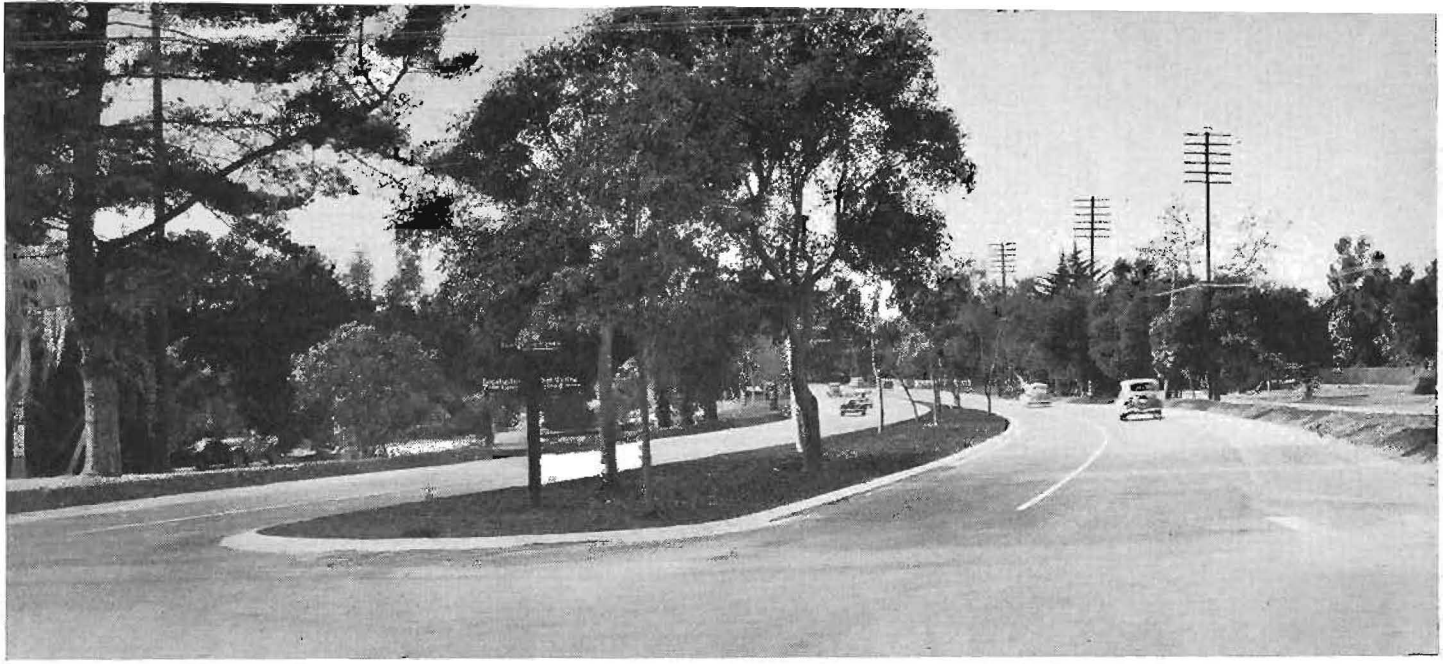

View of intersection of Eucalyptus Lane and San Ysidro Lane in Montecito showing break in curb at intersection.

MODERN SEPARATED HIGHWAY IN MONTECITO

By E. R. GREEN, District Construction Engineer

UPON the acceptance, on October 28, 1937, of the Miramar Avenue-Olive Mill Road project, which was through the Montecito area, adjacent to the city of Santa Barbara, an important, though short, link of reconstruction in the Coast Highway (U. S. 101) was completed.

Before reconstruction at this location there was an average traffic flow of 12,000 vehicles daily over a three-lane highway on which the sight distance was very limited by reason of horizontal and vertical curvature. There existed only a 60-foot width of right of way through a highly developed and exclusive residential district, that has long been noted for its beauty and abundant growth of trees and shrubbery.

These surroundings, while pleasant to drive through and beautiful to view, in no way helped the sight distance, as both shrubbery and trees encroached well within the highway right of way. Added to the above mentioned adverse conditions for through travel was a considerable amount of local travel entering the traveled way from side roads, which by reason of poor visibility, materially increased the hazard to both local and through traffic.

Northerly from this project for a distance of ¾ mile, extending through a zoned business district, a four-lane pavement had been constructed in 1934 by the Division of Highways, to the south city limits of Santa Barbara. A continuation of this improvement, on the project in question, presented the problem of adequate provision for through traffic, the preservation of all trees, shrubbery, and landscaping possible, and at the same time provide a safe access to the highway for local traffic.

Surveys were made which included the exact location, size, and character of all trees and shrubbery, together with local improvements. This information was utilized to the fullest extent in planning for their preservation on the reconstruction of the highway.

COOPERATIVE PROJECT

Working in conjunction with the District, Survey and Plans Department, and the Santa Barbara Planning Commission, L. Deming Tilton of the State Planning Commission presented a plan which he had long cherished, whereby an 180-foot width of right of way would be acquired (100 feet by the State and the additional 40 feet on each side by a cooperative arrangement between the State and county.)

A four-lane pavement with a central dividing strip was designed for the accommodation of through traffic, while local traffic would be served by parallel two-lane roads on each side. These side roads would have access to the central or four-lane through road only at fixed intervals.

The plan provided for a distinct separation between the side roads and the main thoroughfare by parkway areas of variable widths. Alignment and grades on the service roads were not planned to conform with the central four-lane pavement in that they were designed to blend more closely with the natural topography of the area and at the same time preserve to the greatest extent possible the existing trees and shrubbery.

TILTON PLAN ADOPTED

After due consideration by all parties concerned, Mr. Tilton's plan was adopted. By agreement with Santa Barbara County, the construction costs of the side or service roads was borne by the county and were constructed by county forces working under the direction of the Santa Barbara Planning Commission and Assistant County Engineer E. B. Brown.

The roadway design for the side roads consisted of an 18-foot width of natural asphalt surfacing—a local

This picture shows westerly end of Montecito project at Olive Mill Road. Local service roads shown on left and right.

product from the Carpinteria pit—4 inches thick, laid in two courses over a waterbound rock base. Three foot oil mixed shoulders were placed on each side.

The central four-lane pavement constructed by the State was of 7 inch asphaltic concrete laid on an imported borrow base 6 inches thick, in two 20-foot lanes, with 9-inch outside edges, except on portions of second story work where the minimum thickness of surfacing was 3 inches.

NEUTRAL ZONE FOR TRAFFIC

These opposing 20-foot traffic lanes were separated by a concrete curb-lined dividing strip, generally 4 feet in width, except at a provided intersection with the side roads at San Ysidro Lane where the dividing strip was gradually increased over a distance of 500 feet to a width of 25 feet just before reaching the intersection. A gap in the parting strip, symmetrically rounded, was, of course, necessary at this intersection to allow access from the side roads.

The additional width of the parting strip, on the four-lane or central roadway at the San Ysidro Lane intersection, was designed to provide a neutral zone in which cars could come to a stop after crossing one lane of traffic and before entering, or crossing, the opposing line of traffic.

The curbs bordering the parting strip were constructed to a height of 4 inches above the pavement grade and were finished with white Portland cement mortar, which makes an effective contrast with the dark pavement, thus greatly increasing their visibility, particularly for night driving. The intervening space between curbs was filled with selected top soil and it is planned to plant low type shrubbery or ice plant on this area.

Oil mixed, selected material, shoulders 8 feet by 4 inches were constructed on the outside of each 20-

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Rolled curb on parting strip is revealed by this photograph. Public utility poles are concealed by trees.

This is type of auger blower rotary snow plow, nine of which Division of Highways has added to its snow removal equipment for work in mountains this winter.

State Buys Nine More Snow Plows For Winter Work

THE Division of Highways will shortly place some nine additional auger blower type rotary snow plows at various locations where last year's storms indicated their necessity.

With these additions, the State will be equipped with twenty-five modern rotary plow units, which are used in conjunction with the push type plow in removing the windrowed snow from the highway. It is hoped that these additional units will insure a more continuous use of our snow routes and permit the programming of snow sports with more or less certainty, except in the case of very unusual and heavy snowstorms.

Assignment of plows this year and last year is shown as follows:

	1937	1938
State Route 3—Pacific Highway, U. S. 99		
Mt. Shasta City	1	2
State Route 28—Redding-Alturas, U. S. 299		
Burney Mountain	1	1
State Route 29—Red Bluff-Susanville, State Sign Route 36		
Mineral	1	1
Lost Creek	1	1
Westwood	1	1
State Route 37—Auburn-Truckee, U. S. 40		
Emigrant Gap	1	2
Donner Summit	3	3

Widening operations to clear highway of deep snow banks.

	1937	1938
State Route 15—Nevada City-Emigrant Gap, State Sign Route 20		
Nevada City	1	1*
State Route 13—Sonora Pass road, State Sign Route 108		
Sonora	1	1
State Route 125—Wawona Road to Yosemite, State Sign Route 41		
Pinehurst	1	1
State Route 76—Huntington Lake Road, State Sign Route 168		
Shaver Lake		1
State Route 23—Bishop-Bridgeport, U. S. 395		
Crestview Summit	1	1
Conway Summit	1	1
McGee Creek		1
State Route 43—Lake Arrowhead Route, State Sign Route 18		
Burnt Mill		1
Lakeview	1	2
Fawnskin	1	2
State Route 31—Cajon Pass, U. S. 395, U. S. 66		
Cajon Pass	1	1
State Route 190—Camp Angelus Road		
Camp Angelus		1
State Route 61—Angelus Crest Road		
La Canada		1
Totals	17	26

* Rotary widener.

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HIGHWAY INVENTORY

By J. G. STANDLEY, Principal Assistant Engineer

FEW people realize that in America today no State has an adequate road system. Yet our roads are the basis of transportation —the major factor in modern life. An adequate road system may be said to be one which in mileage, character, and upkeep is equal to or greater than the economic demands of traffic.

Economic demands of traffic may be defined in this case as a road or road improvement that costs the motorists, community, or State more not to have than to buy and pay for. No State has reached this goal and California does not at this time lead the various States in approaching such a goal.

HIGHWAY TRAVEL CHEAP HERE

Today California ranks first in the number of automobiles and trucks registered. However, while California ranks first in registration, it ranks fourth in gross receipts from motor vehicle fees and gasoline taxes and forty-second in total receipts per motor vehicle. In other words, there are only six states where the average motorist pays less for using the highway than in California.

While the registration in California increased 8.2% in 1937 over 1936, highway facilities in this State have not kept pace with this increase.

Let us stop and analyze the status of our present California Highway System. This system comprises 14,000 miles and today carries approximately 75 per cent of the rural traffic in the State.

Of the 14,000 miles:

26%, or 3,640 miles, are as yet unimproved;

41%, or 5,656 miles, are provided with an intermediate type surfacing;

33%, or 4,578 miles, are high type pavement.

Of this mileage thus improved, approximately 7,500 miles are now of inadequate width and design to efficiently carry the traffic.

On the system there are approximately 30 main artery highway

J. G. STANDLEY

intersections crossing at grade where separations are justified.

There remain approximately 250 railroad grade crossings justifying separations.

There are 3,300 bridges on the State system, of which only 1,750 have been constructed by the State, the remainder being existing bridges on roads taken into the State Highway System.

Of these 3,300 bridges, only approximately 1,000 are fully adequate.

Of the remaining 2,300, approximately 1,000 are weak; 1,100 are too narrow, and 320 have inadequate or dangerous approaches.

NEW BRIDGES NEEDED

While, because of the obvious impossibility of doing all the work at once, accurate estimates are not available of the total cost of giving California an adequate road system, nevertheless we do know that of the 2,300 inadequate bridges mentioned above, there is a crying need at the present time for the removal of at least 250 of the old county bridges that at this time are an absolute hazard, representing an approximate expenditure of $7,000,000.

Of the 7,500 miles of road of inadequate width, there is absolute congestion at peak hours on about 1,000 miles where at least four lane divided roadway should be provided, representing an approximate cost of $75,000,000.

Of the 30 important road intersections where separation is justified, the justification lies largely in the removal of the hazard and saving of lives, which can not be measured in dollars and cents. Such obligations would cost in the neighborhood of $200,000 each and in many cases where right of way difficulties are encountered and where clover leaf or similar designs are desirable, the cost would be several times this amount.

Approximately the same thing applies to the railroad grade separations. These are bare necessities and it does not take a mathematician to see where we stand at the present time.

NEED FOR SAFETY

Consistently increasing traffic and continuously improved mechanical efficiency have accelerated demands for safety and comfort while revenue has followed a uniform velocity of return. Where construction lags behind traffic needs, congestion results with its attendant hazards. While accidents directly chargeable to highway defects are proportionately few, they are sufficient in number to emphasize the necessity of overlooking no opportunity to prevent them in so far as reasonably possible; all of which again emphasizes the need of widening our roads and strengthening our bridges with the greatest possible speed until an adequate system can be more nearly approached or realized.

To handle this problem and keep pace with traffic, California has the returns from a 1½ cent gasoline tax

(Continued on page 27)

Stately Campanile Erected On Highway In Honor of Old Mission

By H. DANA BOWERS, Highway Landscape Engineer

AN UNUSUAL Federal Aid roadside development project has recently been completed in San Benito County at the intersection of the Prunedale Cut-off, State Highway Route 2, U. S. 101, and the "Rocks" Road, State Highway Route 22, leading to San Juan Bautista.

San Juan Bautista lies 16 miles north of Salinas on what was formerly the old Coast Highway, El Camino Real. The elimination of the San Juan Grade by the relocation and construction of the Prunedale Cut-off, leaves the town approximately three miles east of the main traveled route and it is now reached by a connecting road called the "Rocks" Road. The name "Rocks" is derived from the Bandit Rocks a mile to the south, scene of old-time desperado activities.

OLD MISSION TOWN

The town of San Juan Bautista, which developed from a small pueblo of some fifty inhabitants in 1839, derived its name from the Mission San Juan Bautista, founded in this locality in 1797 by the superior of the missions, Friar Presidente Fermin Francisco de Lasuen.

Because of the historical and romantic background that surrounds this beautiful old mission, and in accordance with its policy of perpetuating and indicating the locations of all points of historical interest, the Division of Highways and the U. S. Bureau of Public Roads approved an appropriate roadside treatment of the intersection of the main traveled highway and the "Rocks" Road as an attractive indication to the traveler that one of California's historic old missions lay only a short distance away.

The cross and the campanerio or campanile, with its mission bells and adobe construction were selected as the motif of the development.

Additional right of way, forming a triangular area of the intersection, was acquired and this area was enclosed with adobe walls. The west wall along the main highway is seven feet in height, the northeasterly curved wall is six feet and the southeasterly curved wall is seven feet in height. The additional height of the southeasterly wall was used to screen a cut slope. All walls are two feet in thickness with the low curb walls being twenty inches in height and placed to form an enclosure and a protection for the planted areas.

Cross and campanile with its mission bells form motif for Prunedale Cut-off intersection improvement.

The campanile is located in the northeasterly area and the cross directly opposite, in the southeasterly area. Boxed olive trees were placed to produce a framing effect for both objects. The campanile was purposely placed on the northeasterly side by reason of the silhouette effect obtained against a background of rolling oak-dotted hills, and this effect is accentuated when approaching the intersection from the south over a vertical curve.

Many plants, introduced by the padres and commonly seen in the patios of the old missions, were used in the landscaping. Pepper trees were planted behind the wall on the west side for windbreak purposes and to give the effect of depth and background.

WATER WELL DUG

Water, for the maintenance of the plants, is secured from a well dug several hundred feet to the south and the installation of a gasoline pump and water lines.

Unlike ordinary adobe bricks, used in the construction of the mission, the bricks used on this project were stabilized with asphaltic emulsion. Considerable difficulty was encountered, at first, in preparing a satisfactory proportion of soil, sand, straw and asphaltic emulsion that would sun-dry without cracking. It was found that the adobe material stockpiled and designated for use in the manufacture of the adobe brick was unsatisfactory for this purpose. It was impossible to use this material on a satisfactory and economic basis for the production of the larger volume needed for the project.

As a result of experiments, the adobe material was rejected and top soil consisting of a sandy loam, combined with aproximately 50 per cent sand from the San Benito River was

Campanile and roadside beautification at intersection of U. S. 101 and State Route 22 leading to Mission San Juan Bautista.

used in the manufacture of the brick. This blend of material, when mixed with asphaltic emulsion as a stabilizing agent and finely chopped straw, produced a satisfactory brick.

ADOBE MANUFACTURE

A pugmill designed specifically for the manufacture of adobe brick, together with trucks, molds and other necessary equipment were rented. This machine was of home made construction and consisted of a half-round trough approximately six feet in length. In this trough a longitudinal shaft was placed on which were mounted a number of nine-inch blades set at fifteen degrees from right angle. The shaft rotated at a speed of approximately thirty-five revolutions per minute. Power was supplied by an automobile engine.

Soil, sand, finely chopped straw and asphaltic emulsion were fed into one end of the mill and mixed as the materials were worked toward the discharge end of the mill by the angular pitch of the blades. The mixture, having reached a plastic consistency, was forced from the discharge end of the mill by a set of flat spiral blades through a manually operated discharge valve into the assembled brick mold lying on a roller conveyor track immediately below the trough.

BRICK MOLDS

These brick molds consisted of two parts, a detachable bottom or pallet of lattice-like construction formed by nailing wood strips transversely across two supporting wooden members and a main body or rectangular wooden form constructed to the side and end dimensions of the brick allowing for a small shrinkage. This form slipped over and rested on the detachable bottom or pallet.

In the molding process the two parts of the form were assembled, placed on the conveyor track and filled with the required amount of the plastic mortar which was hand tamped, care being taken to assure that the corners were filled and all voids eliminated. The mortar was then struck off flush with the top of the form and the brick still encased in the molds moved down the track to await conveyance in groups of four to the drying field by a cart mounted on small rubber tires.

The cart was automatically tipped at the point of discharge by lowering the front end and backing. This action relieved a trigger which permitted the form encased bricks to slide to the ground in a continuous row. Side forms were immediately stripped and returned to the pugmill on the conveyor where they were assembled with new pallets.

MAKE 33,757 BRICKS

When the molded bricks were sufficiently dried to permit stripping the pallets, they were set on edge and allowed to continue drying for a minimum of twenty-one days before being removed to the stockpile at the site of construction.

Brick used on sloping buttresses and on short radius curves were made in forms designed to meet the special conditions. Otherwise, all bricks were molded 4 inches by 12 inches by 18 inches in size. A total of 33,757 bricks were manufactured using 7159 gallons of stabilizing asphaltic emulsion Grade "D" base, and 175 bales of grain straw approximating 75 pounds per bale. Asphaltic emulsion content was held at approximately 3½% by determining water emulsion ratio and checking this against yield. Bricks consisted of the following proportions:

Soil by volume	50%
Sand by volume	50%
Asphaltic emulsion by weight	1.75 pounds
Straw by weight	.40 pounds
Volume of brick in cubic feet	.50 pounds
Weight of finished brick (dry)	.50 pounds

Class "C" Portland cement concrete for the wall footings and structures, was purchased ready-mixed delivered to the site of the work.

On completion of the bricklaying, the walls were wire broomed to produce an aged or weathered effect which, with stabilized brick, presents a rather difficult problem, due to their hardness. Much of the expense of this aging can be reduced if the bricks are molded imperfectly. By the use of a soft mix this can be easily accomplished.

(Continued on next page)

Imposing cross, surrounded by adobe walls, guides motorists to San Juan Bautista and its famous mission.

The walls were whitewashed, using the Government Lighthouse formula except that a stain produced by soaking redwood sawdust in water was added to the whitewash to reduce the glare and to obtain a dull weathered finish.

Exclusive of the campanile and cross construction, there were 15,744 cubic feet of adobe walls laid at a cost of 51 cents per cubic foot. This cost does not include the curbs and footings, but does include the cost of materials and installation of the woodwork, tile and whitewashing.

The cross is constructed of 12 inches by 12 inches Oregon pine timbers. It is set in concrete and additionally braced at the base with adobe brick. The entire height of the cross is fifteen feet. All woodwork was adzed, burned, wire brushed and treated with hot linseed oil.

The campanile was designed after the one at the Pala Mission in San Diego County and is twenty-two feet in height. It was laid on a reinforced concrete base with a reinforced concrete core extending up through the sides and across the top. The padre tile used in the campanile construction was rounded and worn off unevenly to soften the lines and give an appearance of age.

The bells, hung in the campanile, are true mission type. They are constructed of laminated redwood, painted to resemble bronze.

In addition to the treatment at the intersection proper, the three-mile "Rocks" Road entering San Juan Bautista was landscaped with WPA funds. Trees and shrubs were planted in groups and masses to frame vistas to the foothills and to cover the cut and fill slopes.

Exceptionally fine results have been obtained on this project in the sterile soil conditions of the cut slopes by the use of a very hardy native shrub, Coyote Bush (*Baccharis pilularis*). This variety has proven to be one of the best native plants particularly where adverse soil and climatic conditions are encountered. Its development is extremely rapid, which is highly desirable in roadside planting. Roads may be constructed and completed in days but plants demand years before the results of expended labor are discernible. A rapidly developing and hardy plant is, therefore, a welcome addition to material used in roadside treatment.

Although this project is probably more pretentious and elaborate than the usual treatment rendered to roadsides generally, it presented a problem that was singular in its demands, and to achieve propriety it was essential that such treatment be on a large scale.

A child was having a geography lesson and came to the word "earth." He couldn't pronounce it; so the teacher said: "Gene, what do you live on?"

Gene looked embarrassed for a moment, then said, "Beans."

Mrs. Austin B. Fletcher Views Public Works Memorial to Husband

During the Christmas holidays, Mrs. Austin B. Fletcher, of Massachusetts, widow of California's first State Highway Engineer, visited with her daughter, Mrs. Lawrence Chapman of Stockton.

Mrs. Fletcher called at the Department of Public Works building in Sacramento to extend the season's greetings to former associates of her late husband, particularly to Miss Myrtle V. Murray, who was Mr. Fletcher's private secretary when he was Director of the Department of Public Works. Miss Murray is now Administrative Assistant to Public Works Director Earl Lee Kelly.

Mrs. Fletcher viewed for the first time the bronze placque which graces the board room of the California Highway Commission in the Public Works building and which bears this inscription:

"IN COMMEMORATION OF
AUSTIN B. FLETCHER
FIRST STATE HIGHWAY ENGINEER
FIRST DIRECTOR OF PUBLIC WORKS
STATE OF CALIFORNIA
1911 to 1923."

Cut in Federal Aid Would Halt Highway Work

(Continued from page 1)

(2) The second point of the recommendation which proposed spreading $200,000,000 of unobligated 1939 funds over the next two years would have no particularly serious effect on our 1938 program, as we now have agreements with the Government covering approximately 90 per cent of this fiscal year's allocation.

The only States that could operate a Federal Aid program for the next fiscal year would be those that have not obligated their funds for the current fiscal year.

We would apparently lose none of our 1938 funds but would be penalized for next year because we had placed our program under way as rapidly as possible.

BIG REDUCTION IN ROAD WORK

(3) The recommendation to limit annual appropriations to $125,000,000 annually beginning in 1940 would apparently reduce Federal Aid to California about one-half. This would mean a reduction in our highway construction program of about $8,000,000 per biennium or $4,000,000 per year beginning July 1, 1939.

If the annual appropriations beginning with the fiscal year 1940 apportionment are reduced to $125,000,000 compared to $238,000,000 at present, it is not brought out in the recommendations the manner in which the $125,000,000 will be distributed.

The recommendations before Congress propose revisions of the authorization and amendment act of June 16, 1936, which allocated $238,000,000 to the States for highway work for each of the fiscal years ending June 30, 1938, and June 30, 1939.

The authorizations under this act were as follows:

(a) Regular Federal Aid	$125,000,000
(b) Secondary or Feeder Roads	25,000,000
(c) Grade Crossings	50,000,000
(d) Forest Highways	14,000,000
(e) Public Land Highways	2,500,000
(f) National Parks	7,500,000
(g) Approaches to National Parks	10,000,000
(h) Indian Reservations	4,000,000
Total	$238,000,000

The administration of the allocations totaling $216,500,000 listed under the first five items in the preceding tabulation, is handled by the Department of Agriculture (Bureau of Public Roads) and the last three in an amount of $21,500,000, by the Department of the Interior.

Direct allocations to California, which are administered by the Division of Highways, include only regular Federal Aid, secondary or feeder roads, grade crossings, and an occasional allocation of Public Land Highway funds in a comparatively small amount. The 1938 allocation of Public Land Highway funds is being handled entirely by the Bureau of Public Roads.

California's apportionment then of the $238,000,000 for the fiscal year ending June 30, 1938, to be administered by the Division of Highways, amounts to $7,704,520 itemized as follows:

(a) Regular Federal Aid	$4,858,220
(b) Secondary or feeder roads	971,644
(c) Grade crossings	1,874,656
Total	$7,704,520

The table itemizing the $238,000,000 allocation for 1938 and 1939 reveals that if the $125,000,000 is distributed in the same proportion for each item it means a reduction straight down the line of about 48 per cent. If, however, the 1940 allocations for the last three items, which are handled by the Department of the Interior, were the same in 1940 as for 1938 and 1939, it would reduce the first group which directly affects our highway program an even greater amount.

LOSS TO STATE $8,000,000

Should all of the $125,000,000 fund for 1940 and thereafter be allocated to regular Federal Aid, for administration by the State highway departments, which appears highly improbable, it would cause no appreciable change in our regular budget program exclusive of emergency Federal funds.

As previously stated, the proposed distribution of this $125,000,000 is not defined so it is not known at this time what funds would be available for our highway construction beginning in 1940.

(Continued on page 24)

California Protests

WHEREAS, The California Highway Commission has been informed of the proposal made in Washington to reduce Federal aid to the States for the Nation's highways; and

WHEREAS, More particularly, the Commission is greatly alarmed at the serious plight in which such a course would place California's highway program budgeted, as it is, on a biennial basis and inextricably interwoven with already promised Federal funds; and

WHEREAS, Such a course would compel cancellation of about one-half of the projects already authorized by the Commission and the indefinite postponement of many projects amounting to millions of dollars, vital to the continued growth and prosperity of all sections of this State; and

WHEREAS, The resultant loss of work by persons directly employed in or engaged in businesses or industries contributing to the construction of needed transportation facilities for the use and enjoyment of the State and the Nation, would deal a most damaging blow to the public welfare; and

WHEREAS, In the opinion of this Commission, the use of Federal aid funds supplementing the outlays by the States for highway improvement has proven to be one of the most effective forces in restoring the economic balance of the State and the Nation; and

WHEREAS, The Commission is hopeful that the proposal has been made only for consideration by Congress and that when Congress hears from its constituency it will determine that such a course would be most inadvisable and contrary to the best public interest; now, therefore, be it

RESOLVED, By the California Highway Commission, now in session in the city of Watsonville, in the State of California, attended by a thousand residents of the Monterey Bay area, and other sections of the State, and backed by a hearty expression of approval by such representative assemblage, does hereby most earnestly appeal to the President and Congress of the United States that they determine not to press the passage of such legislation and that they seek to find other means of achieving the President's economic objectives; and be it further

RESOLVED, That the Secretary of the California Highway Commission send copies of this resolution to the President of the United States, the Senators from California, and all members of the California delegation in Congress.

Elimination of Newhall Tunnel Bottleneck Soon to Be Realized

By P. A. McDONALD, Assistant Engineer

HISTORIC interest has long been centered about Newhall Pass, or Fremont Pass as it is now known, which is soon to be the scene of intensive highway construction activities by the State Department of Public Works.

This pass divides the Santa Susana Mountains on the west from the San Gabriel Mountains on the east, and these mountain ranges in turn separate the San Fernando Valley lying to the south from the Santa Clara River Valley on the north. Through this narrow defile, the Padres and Spanish Dons of old made their way. Through it, Tiburico Vasquez and his feared outlaw bands of the lawless sixties and early seventies rode to their Soledad and Mint Canyon hideaways, and the armies of General John C. Fremont, in their journeys in the late forties, marched between Southern California and the northern sections of the State.

FREMONT PASS

The pass later became known as Fremont Pass, and it was so officially marked by the San Fernando Ebell Club on May 26, 1916, with an appropriate monument erected a short distance to the right of the present highway, and south of the Newhall Tunnel entrance. Today's traveler can easily follow the original trail from this monument through the famous Beale Cut, which was constructed by General E. F. Beale and his men in 1859.

This extremely narrow cut, through solid rock to a depth of from fifty to sixty feet, has vertical side slopes and was wide enough to allow one-way passage for the traffic of a former day. It served as the sole means of travel for early Californians between Los Angeles and northern valley points until the construction of the Newhall Tunnel, along a line some four hundred feet to the west, by the Los Angeles County Road Department in October, 1910.

The route then became a part of the State highway system in 1917, and was the only direct highway connection between Southern California and the San Joaquin Valley cities, until the construction of the Weldon Canyon Road by the State Department of Public Works in 1929.

Through Fremont Pass

Long prior to the completion of the Weldon Canyon Road, the Newhall Tunnel had become a very serious bottleneck, requiring traffic converging from several routes on the north to be confined to a narrow tunnel bore 17 feet 5 inches wide, with no sidewalks, and with narrow curbs on both sides constructed flush against the sides.

This traffic congestion was only temporarily relieved by the construction by the State of the Weldon Canyon Route, and with the steady increase in volume of traffic each succeeding year since then, the need to widen the roadway through the existing tunnel has become increasingly more urgent, and is now to be met by the Department of Public Works.

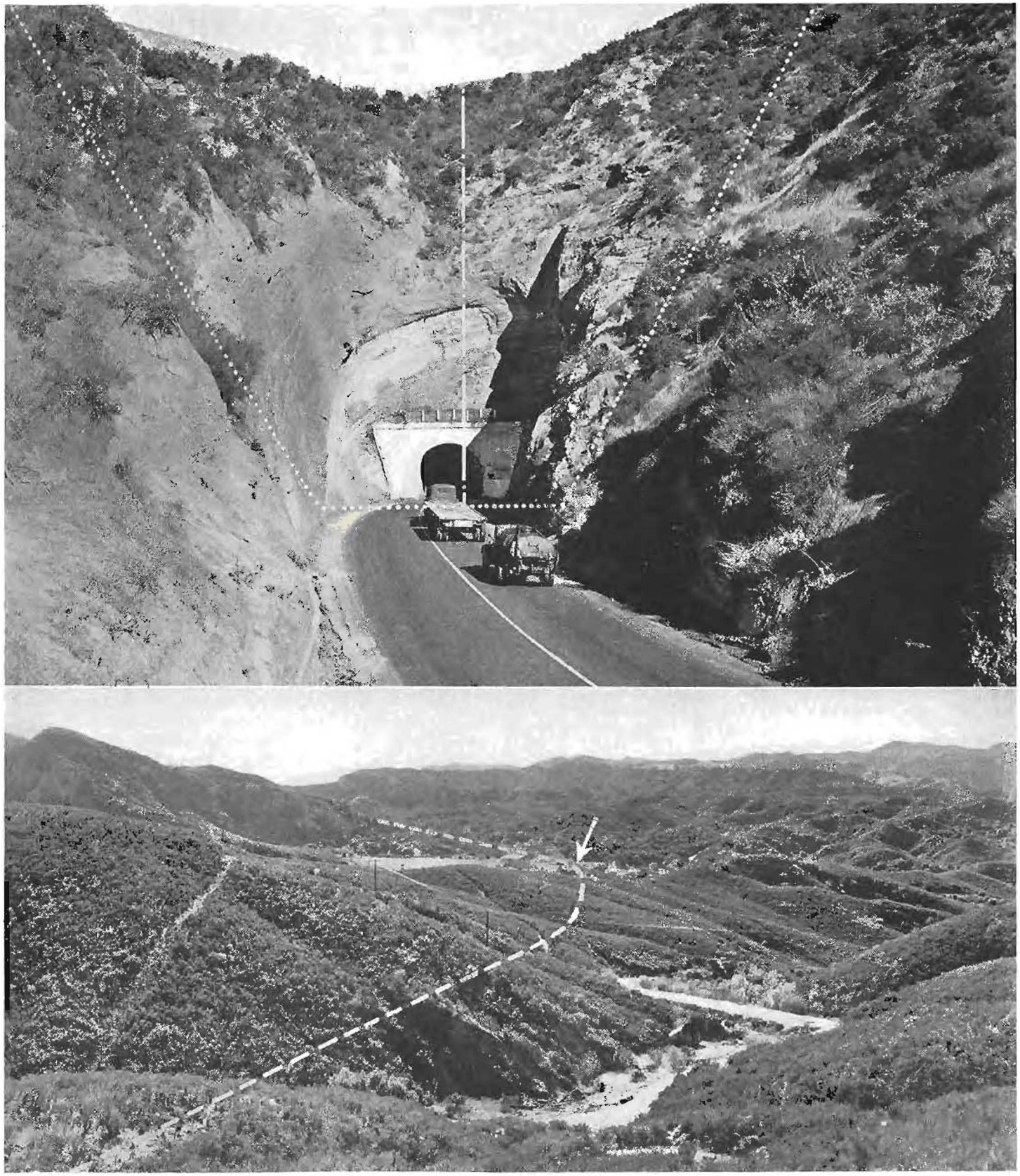
The California Highway Commission has set aside $215,000, and plans have been formulated toward eliminating this bottleneck.

TUNNEL 434 FEET LONG

The existing tunnel is 434 feet in length and, measured by present day standards, is narrow, dark, and foreboding looking. It promptly becomes a one-way road on the appearance of limit loaded vehicles. The speed of all traffic using this route is therefore necessarily reduced to that of the slowest moving vehicle, or, due to the heavy trucking on this route, to generally the speed of a truck and trailer negotiating the six plus per cent grade of either approach, causing traffic on peak days to be jammed for a mile or more from the tunnel portal.

Route 23 is important in that it delivers traffic through the Newhall Tunnel between the Los Angeles metropolitan area and the interior valleys, serving as the best access to Los Angeles from all the East Sierra region, the Owens River, and the Antelope Valleys. The same holds true for the recreational and play-

(Continued on page 21)



Upper—Newhall Tunnel, narrow bore on Route 23, long has been a serious bottleneck for traffic between the Los Angeles metropolitan area and interior valleys. In construction of the Mint Canyon Cut-off it will be eliminated. Dotted lines on photograph indicate proposed cut slopes to abolish tunnel and provide wide roadway. Lower—Looking south on Mint Canyon short cut route, broken line indicating location of proposed new highway. Arrow shows junction of projected road with present traveled portion of Route 23.

Storm Damage to Highways and Bridges Totals $2,340,875

By C. F. WOODIN, Assistant Maintenance Engineer

A storm unequaled for both severity and the extensive area affected struck at forty-three of California's fifty-eight counties during the three days of December 9, 10 and 11, 1937, and left in its wake a devastated trail of broken bridges and damaged highways. The estimated cost to the State for highway repairs and replacements will exceed $2,000,000.

A search through the records for the past forty or fifty years reveals that but one storm approached in magnitude the recent catastrophe. In January, 1909, the entire month was one of heavy precipitation and the number of rainy days exceeded previous records and have been unequaled since. However, in the higher altitudes the precipitation fell as snow whereas the recent storm was attended by high temperatures with rain falling on old snow in the upper reaches and resulting in heavy run-offs.

IMMENSE DRIFT PILES

At Soda Springs on the Donner Summit road, precipitation amounted to 10.8 inches of rain in 48 hours. The elevation at this place is 6770 feet above sea level and precipitation at that time of the year would normally be snow. At Kennett, 7.75 inches of rain was reported for a 24-hour period, and 11.42 inches in 48 hours. Oroville's 24-hour high was 4.70 inches and an unconfirmed report stated that 16.5 inches of rain fell in 40 hours in the vicinity of Madrone south of San Jose.

In many places, the rainfall attained cloudburst proportions, bringing down drift and debris which contributed largely to the damage to bridges and fills occupied by minor structures.

Mile after mile of highway was inundated at the same time. Motor vehicles were trapped and entire towns isolated by the floods. Forty-five of the 70 miles between Gridley and Red Bluff on the east side highway, U. S. 99-E, were flooded and impassable to motor traffic. Healdsburg, Geyserville, Guerneville and Monte Rio were submerged by the overflowing Russian River. Willits, Fernbridge and Loleta in the Eel River watershed were likewise isolated by the flood waters. Inundation was generally distributed over the affected area from Alturas to Visalia.

In spite of lack of intercommunication and transportation facilities between stricken areas, rehabilitation and repair were started very soon after the subsidence of the storm. Maintenance forces working under emergency pressure cleared the roads of debris, placed warning signs and barricades to aid in the safe passing of traffic and got down to the main business of backfilling washouts, making temporary repairs to structures and establishing detours where immediate replacement of the roadway was impossible.

ROADS SOON OPENED

Because of the widespread nature of the storm, construction equipment was at a premium, slowing up the work of repair. In several locations the magnitude of replacement and protection work is equal to major construction jobs and where such work may be done without excessive delay to traffic, it will be let to contract.

Too much praise can not be given to the maintenance forces, who without reservation and at times with personal danger and sacrifice pushed ahead untiringly, upholding the tradition of their organization that "the traffic must go through." The results speak for themselves. Most of the roads were rendered passable within three or four days.

On U. S. 40 over Donner Summit, one-way traffic was in force December 13, and normal traffic movement was resumed December 20. The All-

A Great Organization

People hereabouts and, probably all over the State, appreciate the State Highway Commission and the Department of Public Works headed by Earl Lee Kelly, more, these days, than they have in the past. Following the recent severe storm the roads, especially of Northern California, were terrifically damaged. On the highways above the paving water was running from four to six feet deep; slides kept coming in constantly, bridges were washed out, approaches made dangerously impassable.

Daylight came after the havoc of the first night had been accomplished and with it, seemingly automatically, there moved into action a vast number of highway workmen and a tremendous amount of equipment and, without interruption the crews, in torrential downpours, toiled in entire disregard to hours, to get the highways back in shape to permit travel. This magnificent instant response to restoration of traffic was not recorded in isolated instances—it went from end to end of California. No publicity accompanied the movement. It was just another day's job to be attended to by the big force of highway workers and it was well handled, too, and the ravages of the storm were, after great struggle, in a surprisingly short time, overcome.

As one, comfortably seated in his automobile, looked out of his car window and watched bulldozers tearing into slides, saw steam shovels lifting debris to clear the pavement and observed men in hip-boots and sou'westers toil in the rushing waters that ran from the hillsides, they must have appreciated what the gas tax does for the traveling public—not alone that, they could not have helped but reflect that this State has a Department of Public Works under Earl Lee Kelly and a State Highway Commission of which we all can justifiably be proud.

—Ukiah Republican Press

Year-Highway into Yosemite Valley was reopened December 30; U. S. 395 in the Walker Canyon, January 3; and the Feather River Highway about January 16.

The table accompanying this article shows the estimated cost of the various classifications of rehabilitation work, segregated by Highway Districts to indicate the wide distribution of the storm damage.

EXTENSIVE BRIDGE DAMAGES

Unfortunately, the bulk of the bridge damage occurred at structures which were in good condition and whose expectant life would otherwise be continued for many years. Eighty per cent of the repair cost is for those spans with the remaining 20 per cent for the structures which would have to be replaced in the near future in any event.

Such a turn in the status of highway bridges only aggravates the conditions as set forth in the article "250 Old Bridges on State Highways Must Be Replaced Immediately" by George T. McCoy, Assistant State Highway Engineer, in the March, 1937, issue of the CALIFORNIA HIGHWAYS AND PUBLIC WORKS magazine. That bright day when all bridges on the State Highway System will be capable of carrying full legal loads must be further postponed.

FEW SLIDES CAUSED

Strange to say, with the tremendous amount of damage to road embankments and surfaces, slides in general were unusually lacking. This condition in most cases becomes a disadvantage, requiring the acquisition of other sources of material needed for the rebuilding of washed out fills. The principal damage to roads, therefore, was the scouring and melting of the embankment slopes under the powerful action of the swollen boulder and debris laden streams.

Cross culverts quickly became blocked with debris and drift and the dammed-up flood waters soon overtopped the road, carrying away huge portions of the fill. The attack coming simultaneously along many fronts was irresistible and nothing could be done at the time to ward off the disaster. Drift piling up against bridges backed up flood waters, which broke through with inconceivable velocity to undermine foundations and tear away approaches.

ESTIMATED COST OF REPLACEMENT AND PROTECTION WORK STORM OF DECEMBER 9, 10, 11, 1937.

Roads

District	Headquarters	Relocation or protection work	Replacement	Bridges	Total
I	Eureka	$25,000	$152,500	$4,000	$181,500
II	Redding	50,000	557,750	116,500	724,250
III	Marysville	72,500	180,125	126,500	379,125
IV	San Francisco		10,000	2,000	12,000
VI	Fresno		30,000	9,000	39,000
IX	Bishop	39,000	106,000	12,000	157,000
X	Stockton	500,000	307,000	41,000	848,000
	Totals	$686,500	$1,343,375	$311,000	$2,340,875

Most notable are the damages along the following highway routes:

State Sign Route 18—All-Year Highway to Yosemite.

Between Briceburg and El Portal the Merced River reached heights hitherto unknown. New channels have been formed which will definitely threaten any replacement of the highway which may be made. Channel correction and rubble masonry retaining wall protection work will be required for inclusion with the replacement project of the road.

U. S. Highway 395—South of Coleville.

The Walker River in changing its channel chose to occupy areas over which the highway had been located. As on Route 18, replacement and correction work will have to go hand in hand.

State Sign Route 108—Sonora Pass Road.

The 70-foot combination truss over the west fork of the West Walker River was entirely washed away.

State Sign Route 89—In vicinity of Woodfords and Markleville.

Seven timber bridges and portions of embankments were washed out.

U. S. 50—Strawberry to Lake Tahoe.

One bridge was undermined and heavy damage was sustained on the relatively new construction between Strawberry and Camp Sacramento.

State Sign Route 89—Meyers to Nevada State Line northeast of Truckee.

Heavy erosion occurred at Emerald Bay and McKinney Creek and a good portion of a fill near Mystic was likewise washed away by the rampaging Truckee River.

U. S. 50—Donner Highway between Auburn and Truckee.

West of Cisco raging waters of the Yuba River washed out fills closing this road to all traffic. Flood waters of a side canyon on the easterly slope of Donner Pass carved a gorge across the roadway further adding to the difficulties along this road. Before the waters began to subside, work was under way to repair the damage lest closely following snows defeat all efforts to keep the road open during the remaining winter season.

State Sign Route 49—Nevada City to Sierra City.

At the historic town of Downieville located at the confluence of two branches of the North Fork of the Yuba River severe damage was suffered by both community and highway. Houses were wrecked or moved off their foundations and logs and debris from the wreckage lodged against the new concrete highway bridge collapsing one span and washing away several hundred feet of fill.

Both above and below the town, the flood removed thousands of yards of highway fill slopes. Goodyear Creek Bridge was swept away, hampering the movement of much needed supplies to the stricken areas. At Sardine Creek, west of Bassetts, the approach fill was washed out, completely isolating Sierra City.

State Sign Route 24—Feather River Highway, Oroville to Quincy.

A large granite boulder slide at the Butte-Plumas County line will require the removal of between 60,000 to 75,000 cubic yards of material before the road will be safely cleared.

Rock Creek loaded with debris and inconceivably large boulders undermined the east abutment of the new Feather River Bridge at that point, dropping one end of the specially hinged suspended steel beam span to the gravel bed. The crossings at Chambers, Chipps, Indian and Yellow Creeks were partially or entirely swept away and will involve expensive replacement.

As along other swollen streams, fill slopes were badly eroded.

State Sign Route 36—Red Bluff to Susanville.

Overtopping waters of Paynes Creek washed out the east approach fill to the bridge and removed the bituminous surface from the sub-base for several hundred feet.

Near Childs Meadow, Mill Creek likewise left its channel. When it had finally subsided several hundred feet of highway had been washed out.

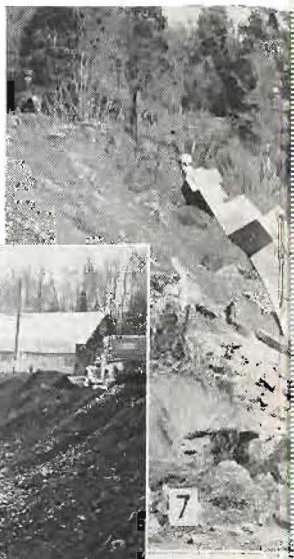
Debris jams diverted waters of the North Fork of the Feather River which flooded the streets of Chester and the highway to the west, carving miniature gorges and rendering the highway impassable.

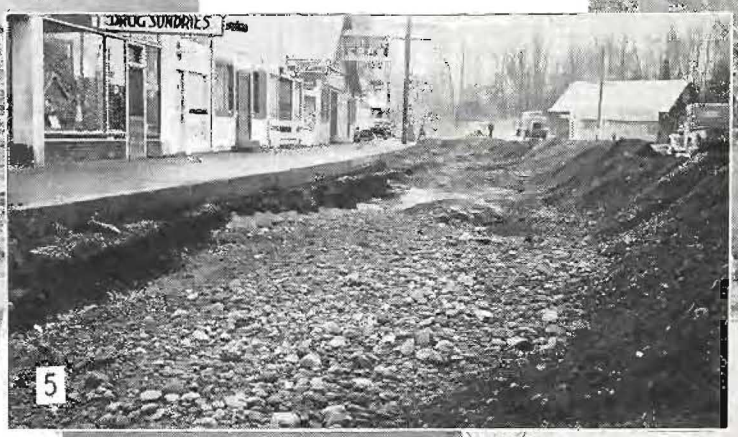
(Continued on page 25)

Highways and Bridges Damaged By Unprec

1. Wash-out of Three Flags Highway south of Coleville, U. S. 395.

2. Washed-out abutment of Joseph Creek Bridge on Alturas-Lakeview Road, U. S. 395.





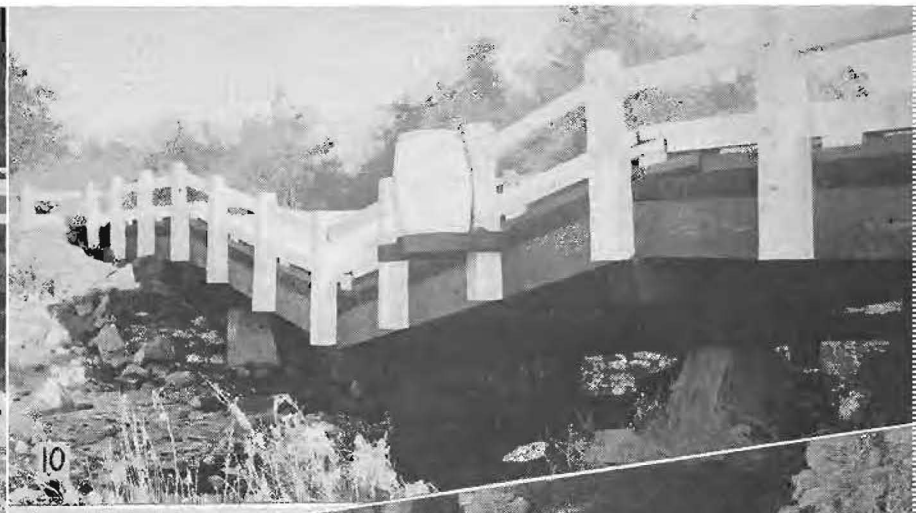
3. Route 56 south of Eel River Bridge at Fernbridge.

4. Snow covered wash-out along Yuba River west of Cisco on Donner Summit Road, U. S. 40.

5. Overflow channel formed through Main Street, Chester, State Sign Route 36.

6. Wash-out on all year Yosemite Highway along Merced River, State Sign Route 18.

cedented Torrential Rain Storms in December



7. Yellow Creek Bridge on Feather River Highway at Belden, State Sign Route 24.

8. Approach fill wash-out at Bear Creek south of Los Molinos, U. S. 99-E.

9. Fill partially washed out along Trinity River west of Junction City, U. S. 299.

10. Undermined bridge near Dales on Red Bluff-Susanville Highway, State Sign Route 36.

11. Wash-out east of Ingot, U. S. 299.

12. Pavement damaged by flood water east of Hamilton City, State Sign Route 32.

13. Feather River Highway covered by boulders at Butte-Plumas Line.

Floods Exact $14,000,000 Damage Toll in Sacramento Valley

By EDWARD HYATT, State Engineer

ON Thursday, December 9, 1937, the United States Weather Bureau charted "A disturbance of much intensity—over the Pacific about 600 miles off the California Coast—apparently—moving toward the coast." Southwest storm warnings were displayed on the California and southern Oregon coasts. By Friday morning rains were general over the entire State from the Mexican Border to Oregon, and serious storms had developed along the southern California Coast.

The rains continued throughout Friday and most of Saturday. South of the Tehachapi Mountains they were not remarkable but over northern California they were above normal in both intensity and total fall.

The most remarkable feature was the absence of snowfall at the higher elevations. Usually precipitation changes from rain to snow at elevations between three and five thousand feet above sea level and, during the winter months, very little precipitation occurs as rain above the seven thousand foot level. In this storm, however, rainfall was general at elevations up to seven thousand feet and over.

SNOW PACK MELTED

On Thursday the snow pack at Soda Springs, elevation 6752 feet above sea level, amounted to 13 inches. On Friday morning although 5 inches of rain had fallen the snow pack had only been reduced to ten inches. By Saturday morning an additional precipitation of 5.8 inches of rain had left only a trace of snow on the ground. In the afternoon the rain turned to snow and by Sunday morning there was a snow pack over 7 inches in depth. A similar regimen of snow, rain and snow undoubtedly occurred in the higher areas of the Cascades and the Sierra Nevada from Oregon to the Tehachapi Mountains and on higher Coastal peaks.

The rivers throughout northern California from the Kaweah to the Sacramento began to rise late Thursday night and by Friday evening were at, or rapidly rising to, flood stages in the mountain areas. These floods reached the foothills and debouched on to the valley floor Saturday evening and by Sunday morning the floods had started to recede on all streams except the Sacramento in its lower reaches. On the Sacramento River the flood crest which passed Red Bluff Saturday night reached Colusa Monday, Sacramento Tuesday and by Wednesday had passed into San Francisco Bay.

RECORD BREAKING FLOODS

In many parts of the State these floods were higher than any which had previously been recorded. On the Sacramento River at Red Bluff where a record has been maintained since 1902, the crest of the flood was over a foot higher than any previous record. The Feather River was higher than it has been at any time since 1907. In Sonoma County the Russian River is said by the older inhabitants to have been higher than it had been since 1862. In the San Joaquin Valley the Kings and San Joaquin rivers are said to have been higher than at any time since 1888.

In the Sacramento Valley, the levee system designed to protect the rich agricultural lands from floods was over taxed and failed at several points near the foothills. The Sacramento River broke out of bounds below Red Bluff and flooded the cities of Gerber and Tehama and large areas in Tehama and Butte counties mostly on the east side of the valley.

Further down serious breaks occurred in the levees on the west bank in Glenn and Colusa counties. The Feather broke through the levee at Hamilton Bend and sent a large flow across the rich farm lands north of the Sutter Buttes flooding the city of Biggs. Serious breaks also occurred north and south of Marysville. From Knights Landing south to the bay the levee system held. Opposite Sacramento the maximum flow was reduced considerably by storage in the upstream flooded areas.

MANY LEVEE BREACHES

In the coast mountains serious damages occurred in Sonoma, Mendocino, and Lake counties. The Russian River, rising to the highest levels known in over 70 years, made practically a clean sweep of the resort areas and flooded the rich farming lands in the vicinity of Healdsburg. In Mendocino County the damage was chiefly to roads and bridges and in Lake County to agricultural development.

In the San Joaquin Valley damages were chiefly confined to the Yosemite Valley, the All-Year Highway and the Yosemite Valley Railroad which were the only major developments close to the mountain river channels, and to the delta areas of the Kings and Kaweah rivers. In this latter area the levees were breached in many places and large areas were flooded.

In southern California precipitation was not excessive and there were no flood damages along the streams. However the severe storm created high waves, which combined with a high tide, did considerable damage to piers and other coastal developments along the Santa Barbara, Ventura and Los Angeles County coasts.

GOVERNOR GETS REPORT

Soon after the occurrence of the flood Governor Frank F. Merriam requested the Department of Public Works to submit at the earliest possible date, a report estimating in terms of money the damage which had occurred to the State of California on December 20th. Director of Public Works, Earl Lee Kelly requested the State Engineer's office to have this report prepared

(Continued on page 28)

Flood waters on rampage during unprecedented storm of last month. Upper—Break in levee along Sacramento River north of Colusa. Center—Flooded farm lands south of Princeton and west of Sacramento River. Lower—Flooded countryside north of Colusa. Overflowing streams did damage in the Sacramento Valley in excess of $14,000,000.

Tests Show Resistance To Sea Water of California Cements

By THOS. E. STANTON, Jr., Materials and Research Engineer

In this article is described some long time tests by the Testing and Research Laboratory of the Division of Highways to determine the resistance to sea water of cements of the type used in construction of the San Francisco-Oakland Bay Bridge. The specifications for the Bay Bridge called for the use of special cement designed for durability. The tests proved the wisdom of these specifications and clearly demonstrated the importance of density of a concrete mix as affecting durability.

THIS paper describes some of the results of tests started in 1933 to determine the relative resistance of California commercial cements to attack by sea water.

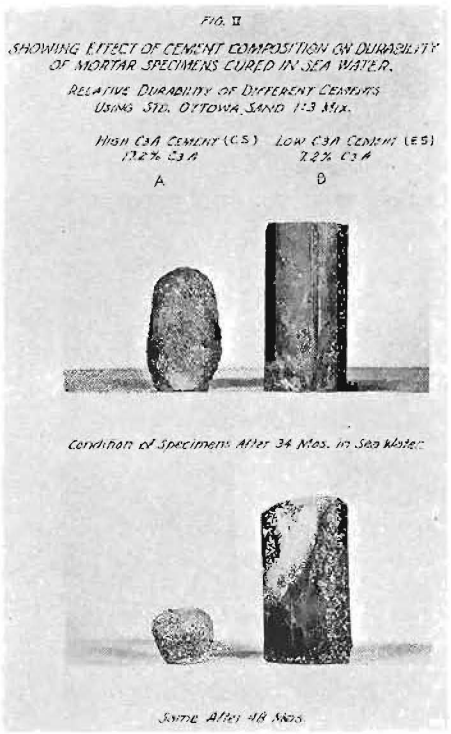
The durability of concrete exposed to sea water is governed by three factors: (a) Density; (b) Cement composition; (c) Soundness of aggregates. The aggregates used in this test were sound and highly resistant to either sodium or magnesium sulphate attack; therefore, any lack of durability is due either to low density of the mortar or composition of the cement or to a combination of low density and cement composition.

The results described herein cover a portion only of this sea water series and include cements from northern California mills only. They show rather conclusively, however, the effect of both density and cement composition.

All sea water used in these tests was secured from San Francisco Bay at the Municipal Pier, University Avenue, Berkeley. Water from the ocean opposite San Francisco has substantially the same chemical analysis as shown in Table 1. The water in which the specimens were stored was changed monthly.

TABLE 1

	Parts per million	
	Low tide	High tide
Residue at 110° C	33304	33774
Free Ammonia—as N	.06	.08
Albuminoid	.37	.34
Carbonates—CO_3	Nil	Nil
Bicarbonates—HCO_3	142	142
Chlorides—Cl	16300	16500
Sulphates—SO_3	2403	2477
Silica—SiO_3	14	7
Iron and Alumina oxides	8	7
Lime—Ca	474	509
Magnesia—Mg	1149	1138
Alkalies, calculated—Na	9063	9308
Total hardness—$CaCO_3$	5896	5937



To test for effect of density 1:3 and 1:2 mortar specimens were fabricated using a poorly graded Ottawa sand and a well graded Russian River sand. All of the Ottawa sand graded between the 20 and 30 mesh screens whereas the Russian River sand was well graded having approximately 36% passing the 30 mesh, 20% passing the 50 mesh and 32% retained on the 10 mesh.

Following is the density of the specimens shown in Figs. I and II:

1:3 Ottawa Sand	2.018
1:2 Ottawa Sand	2.218
1:3 Russian River Sand	2.328

To test for effect of cement composition, a variety of cements were used ranging from high to low C_3A content. The results for two of these brands, one normally high in C_3A (17.2%) and one fairly low (7.2%) are shown in Figures I and II.

Complete analyses of these two cements are given in Tables 2 and 3. The remaining specimens in which the other brands were used followed identically the same trend. (Fig. III)

TABLE 2

	CS	ES
SiO_2	21.49	22.94
Fe_2O_3	2.27	2.03
Al_2O_3	7.94	4.05
CaO	63.81	65.16
MgO	1.40	1.63
SO_3	1.67	1.55
Loss	1.62	2.76
Ins.	.18	.42
Free Lime	.94	.50
C_4AF	6.9	5.8
C_3A	17.2	7.2
C_2S	32.4	59.2
C_3S	36.7	20.0
Iron Modulus	3.50	1.99

TABLE 3

	CS	ES
Specific Gravity	3.13	3.10
Fineness		
—100	99.2	99.3
—200	84.9	94.6
Surface Area	1200	1570
Normal Consistency	22.8	23.2
Soundness	OK	OK
Time of Set		
Initial	2 Hr. 30 Min.	3 Hr. 00 Min.
Final	2 Hr. 15 Min.	4 Hr. 15 Min.
Tensile Strength		
7 day	320	350
28 day	420	440

Cement ES is a standard commercial cement normally low in C_3A and not a modified cement such as the Bay Bridge low C_3A cements. Even better results have been had with the Bay Bridge cements which are lower in C_3A content (Cement BSW Fig. III).

(Continued on page 20)

FIG. III

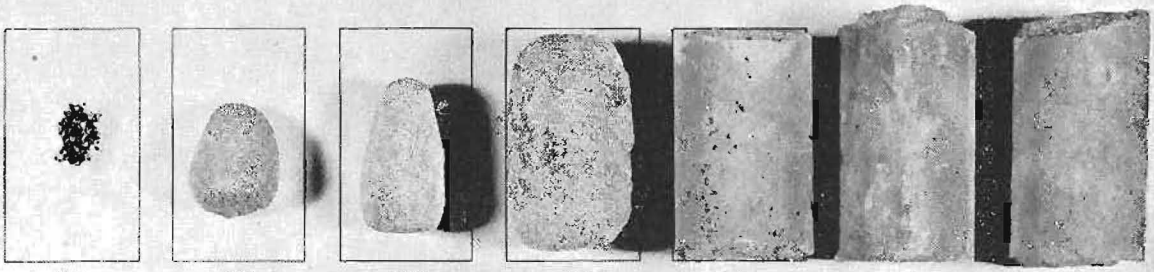
MORTAR DURABILITY TESTS

STANDARD UNGRADED OTTAWA SAND-CEMENT MORTAR SPECIMENS* STORED 48 MONTHS AT THE LABORATORY, SACRAMENTO, IN NORMAL CONCENTRATION SEA WATER FROM SAN FRANCISCO BAY. 1933–1937

MIXING WATER—FRESH

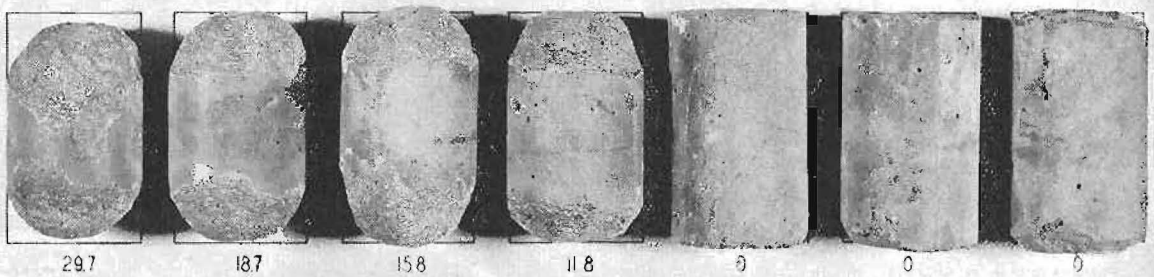
IRREGULAR EDGES RESULTING FROM REMOVAL OF CAPS ORIGINALLY PLACED WITH INTENTION OF TESTING ALL SPECIMENS FOR COMPRESSIVE STRENGTH.

1-2 MORTAR AVE. % LOSS	45.8	15.2	10.9	7.0	0	0	0

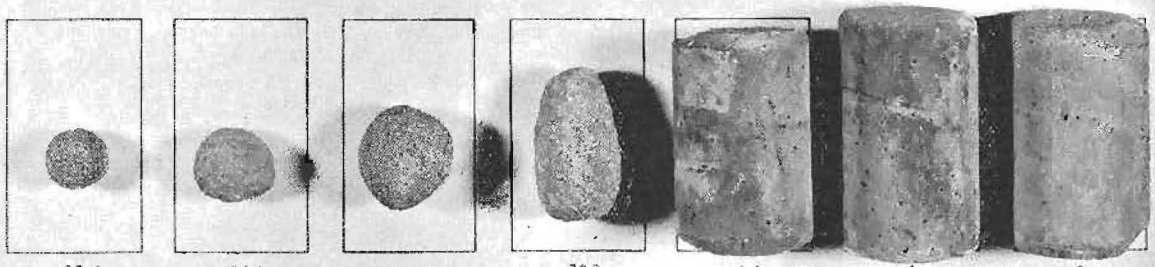


1-3 MORTAR AVE. % LOSS	100	89.0	86.0	41.2	0	0	0
CEMENT IDENT.	C S	D S	A S	B S	E S	BSW	DLI ***
% C_3A	17.2	14.2	13.1	12.1	7.2	3.7	14.2

MIXING WATER— NORMAL SEA WATER**



1-2 MORTAR AVE. % LOSS	29.7	18.7	15.8	11.8	0	0	0



1-3 MORTAR AVE. % LOSS	98.4	96.2	85.3	78.3	1.4	0	0
CEMENT IDENT.	C S	D S	A S	B S	E S	BSW	DLI ***
% C_3A	17.2	14.2	13.1	12.1	7.2	3.7	14.2

* REPRESENTATIVE SAMPLE FROM EACH SET OF SPECIMENS

** COMPANION SPECIMENS MIXED WITH SEA WATER, BUT CURED IN FRESH WATER, SHOW NO DISINTEGRATION.

*** PORTLAND-PUZZOLAN, 70% STD CLINKER & 30% SILICA COMPOUND. C_3A CONTENT OF STD. P.C. CLINKER ONLY

Effect of Sea Water on California Cements

(Continued from page 18)

The monthly inspection of the specimens showed that at about fifteen months the upper cap (placed for compression tests at time specimen was fabricated) was being distorted and loosened from some of the specimens cured in sea water. At seventeen months the first action on the specimen proper was noticed, subsequent to which the deterioration of the affected specimens progressed steadily.

The tests described herein emphasize the equal, if not greater importance of density on the durability of concrete as the cement composition. Given a dense mix in which sound aggregate, sound cement, and a practical minimum of water has been used and concrete can be expected to resist the disintegrating effect of sea water over a long period of years, regardless of C_3A content, as is evidenced not only by these test results but also by the actual service of much of the concrete in structures in the San Francisco Bay which shows little, if any, deterioration after thirty years or more, even though cement high in C_3A was used.

As opposed to this good service record, however, we have numerous instances along the Pacific Coast where marine structures have shown severe distress in a relatively short time. Lack of density of a poorly or at least inferiorly fabricated concrete undoubtedly had a great deal to do with such failures, but cement composition was likewise undoubtedly a strong contributing factor.

Figure I shows the relative durability of variable density mixes using a high C_3A cement.

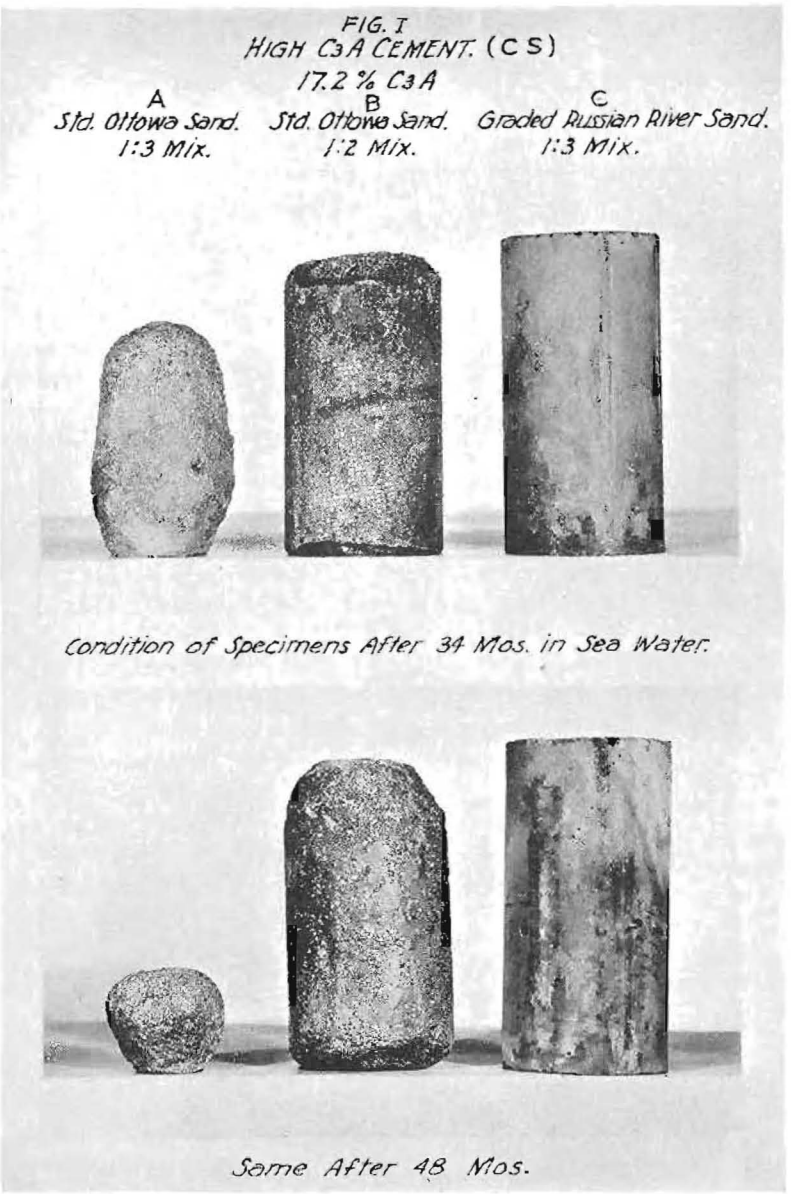


Fig. 1 Showing effect of density on durability of mortar specimens cured in sea water. Relative durability of variable density mixes using same cement High C3A Cement (CS) 17.2% C3A.

COMPARATIVE RESULT

Specimen A, a 1:3 Ottawa sand mix, had lost 98.4% of its original weight in four years, whereas Specimen C with the same amount of high C_3A cement but with a dense mortar in which a well graded sand had been used showed no appreciable loss in the same period. Specimen B in which increased density was accomplished by increasing the cement content but still using a poorly graded sand shows results intermediate between specimens A and C.

Figure II shows the effect of cement composition Specimen A (the same as specimen A in Fig. I) shows the low resistance of a 1:3 Ottawa sand, high C_3A cement mortar. Specimen B shows the greater durability of the same low density mortar in which, however, a relatively low C_3A cement was used. Specimen B lost 1.4% in 48 months as compared with 98.4% for specimen A; other 1:3 Ottawa sand mortar specimens in which lower C_3A Bay Bridge cements were used showed no loss at all at 48 months (Fig. III).

Fig. III shows the relative sea water durability of seven northern California commercial cements, six of which range from 17.2% to 3.7% C_3A; the seventh (DL_1) being a Portland Puzzolan type cement manufactured from a 14.2% C A clinker. It will be noted that the mortar from cement manufactured by the addition of 30% silica compound to a high C_3A clinker developed considerable resistance to sulphate attack. Whether this resistance developed from any puzzolanic nature of the added silica or from a denser mix is not at present known.

While theoretically all proportioning was by volume the amount required for each batch was measured by weighing. Therefore, with weight proportions fixed on the assumption

(Continued on page 27)

Elimination of Newhall Tunnel Bottleneck Soon to Be Realized

(Continued from page 10)

ground areas high up in the San Gabriel Mountains, access to which may be had at present only from the valley side.

BORE MUST GO

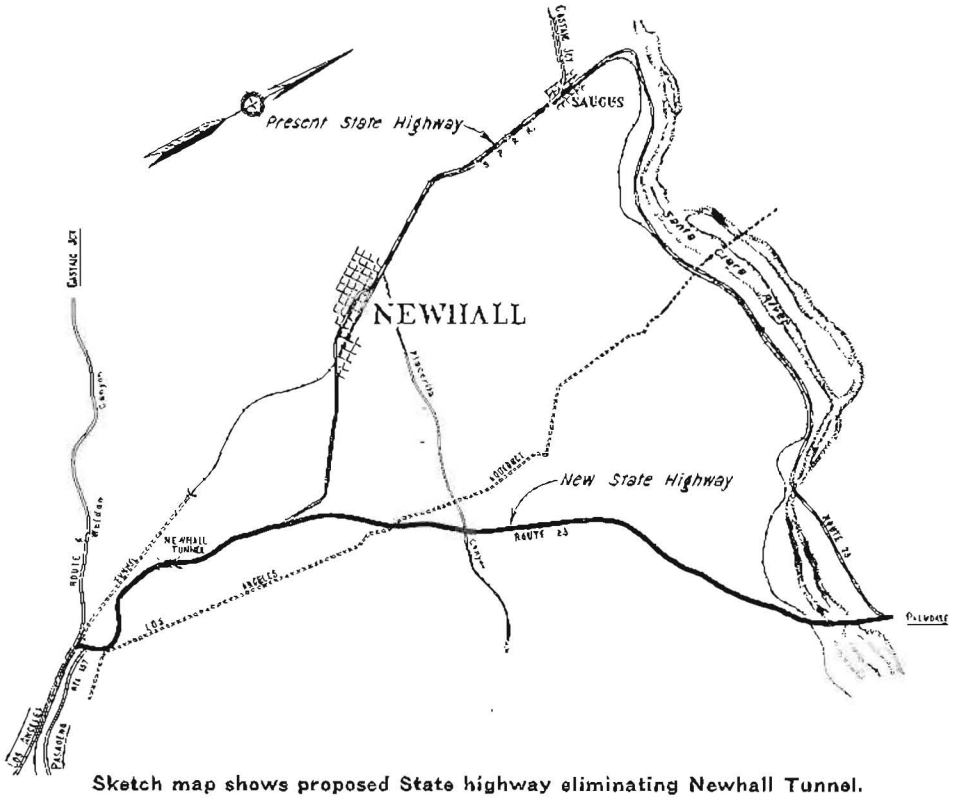
Recognizing the necessity for some sort of relief at the tunnel bottleneck, studies have been under way for some time, looking into the most logical solution from an economic standpoint of this troublesome problem. The engineering studies conclusively proved that the elimination of the tunnel completely by the construction of an open cut in place of it on approximately the same line was the cheapest and best method of carrying out roadway widening through the Fremont Pass Ridge. This, of course, will involve considerable excavation material, about 300,000 cubic yards in all, which material in turn must be disposed of in some economical manner.

Reconnaissance surveys were run in 1934 over the contemplated Mint Canyon Short Cut Route, starting from Route 23, at a point one mile north of Newhall Tunnel, to Solamint on the Mint Canyon Road, making a total saving of 4.6 miles for Mint Canyon traffic, as against using existing Route 23. As there was no nearby disposal available for the material to be removed in the Newhall Tunnel Cut, it was proposed to utilize this excess material in the best and cheapest manner by hauling it and disposing of it in roadway embankments upon the Mint Canyon Short Cut Route.

SAVING IN GRADING

Handling the excess waste material from the tunnel cut by this procedure will be of considerable advantage to the State, resulting in an economical disposal, and in a large saving of excavation grading quantities on the New Mint Canyon Short Cut Route.

It is proposed to advertise for bids shortly, calling for the reconstruction of Route 23 from the Weldon Canyon Road, through the Newhall Tunnel Cut, and for the construction of the first section of the Mint Canyon Short Cut Route as far as Placerita Canyon, all in one contract. This



Sketch map shows proposed State highway eliminating Newhall Tunnel.

work is to be financed from the budget for the 89th-90th fiscal years, the Major Project Allocation for Construction from the State Highway Fund, Preliminary South, is as follows:

LA-23-H Newhall Tunnel 0.4 Mi. Gr. & Pav.	$215,000
LA-23-H Newhall Tunnel to Mint Canyon Cut-Off 1.0 Mi. Gr. & Pav.	65,000
LA-23-I 1 Mile North of Newhall Tunnel to Solamint 5.6 Mi. Gr. & Pav., Bridges & Grade Separation	550,000
LA-23-H Tunnel Sta. to Newhall Tunnel 0.9 Mi. Gr. & Pav.	70,000
Total	$900,000

WIDE ROADBED

The design of the new roadway calls for the grading of a roadbed to a width varying from 48 feet to 64 feet. Over existing portions of Route 23 the latter graded width will prevail, upon which will be placed a combined Portland cement concrete pavement and plant-mixed surfacing 50 feet wide. This portion of the new highway also will be constructed with a central longitudinal dividing strip to separate the opposing lanes of traffic, in accordance with latest highway design standards. The contemplated pavement for the new Mint Canyon Short Cut Route is plant-mixed surfacing 33 feet in width.

The California Division of Highways has recently adopted a new standard of construction for State highways, providing for an increased width of traffic lane. In conformity with this new standard, the basic eleven foot minimum width lane will be included in the new construction.

On the present alignment of Route 23, there are many curves of sharp radii, the minimum radius being 366 feet. The alignment of the rerouting to Solamint Junction will contain two curves of a minimum radius of 800 feet, and one curve of a minimum radius of 1000 feet, with all the remaining curves being 2000 feet radius or over.

OLD AND NEW ROUTING

From the following tabulation, a direct comparison can be made between the old and new routing of Route 23, between Tunnel Station and Solamint Junction.

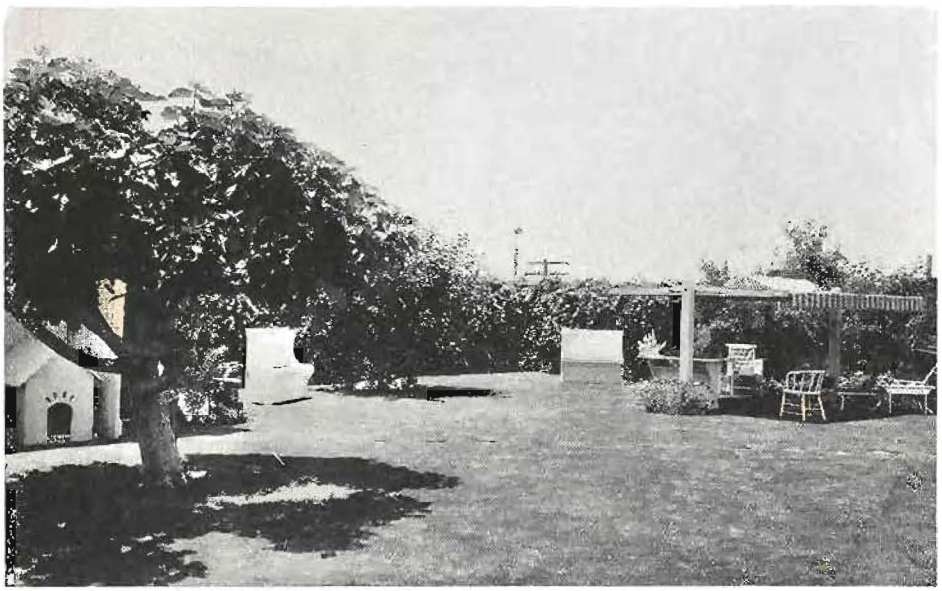
The new location will eliminate two grade crossings of the Southern

(Continued on page 28)

HIGHWAY STATIONS LANDSCAPED

By E. S. WHITAKER, Assistant Landscape Engineer

IN THE last several years an important feature of the establishment of new Maintenance Stations and of District Headquarters has been the landscaping of their surrounding grounds. Particularly at district headquarters, because of their urban location, where the building design has been influenced by the locale every effort has been made to complement that design with an appropriate planting.



Delightful garden of Highway Maintenance Station at Oceanside, landscaped by Mrs. E. G. Brassington

In Eureka, where the district headquarters simulates the appearance of old Fort Humboldt, the features of the landscaping are beautiful beds of rhododendrons and azaleas, both of which are native to the northern redwood belt.

IN DISTRICT V

In San Luis Obispo, District V beadquarters is styled in the early California type of architecture. The whole countryside is alive with legends and steeped in the lore of that early phase of California's development and the selection of this type of design was most fitting.

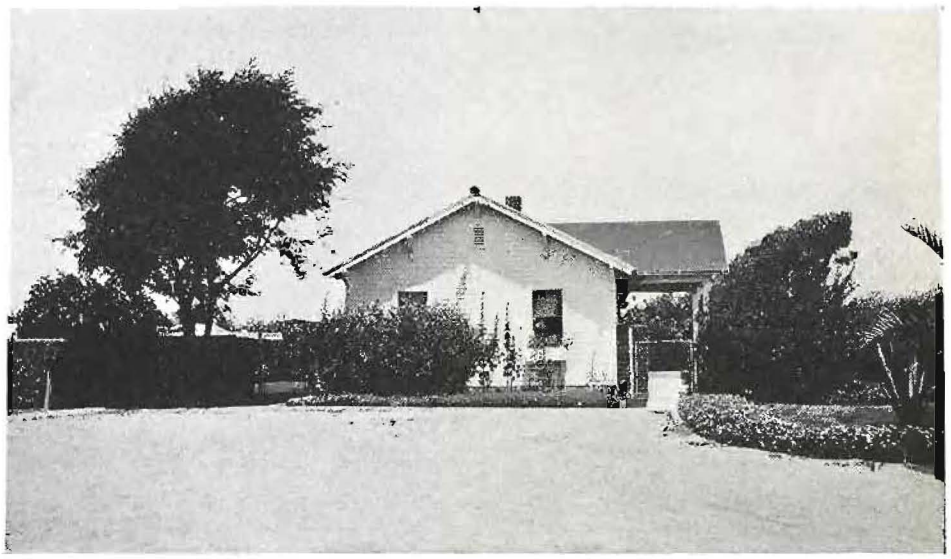
The building has been nestled in a mass of trees and shrubs, in which the palms, toyons, and California sycamores are used to enhance the effect of the building design. Thus California's Christmas berry; the ragged, wind-swept crown of the palm; and the beautiful, sprawling tree which so picturesquely adds to the appeal of southern and central California's arroyos and creek bottoms, are blended into the background, placed to soften the glare of sun on white walls and to highlight the charm of low tiled roofs.

IN DISTRICT XI

District XI has appropriately fashioned its headquarters, in San Diego, after the Spanish, and the severe lines of the building's exterior are accentuated by a formal planting of shrubs and by rows of palm trees. Inside the patio, however, flowers and shrubs bloom in a year-round wild mass of riotous color. Hibiscus, poinsettia, Mesembryanthemum croceum, tuberous begonias, roses—all add profusely to the picture, so that the exotic effect of the true Spanish patio is obtained.

At a great many maintenance stations this type of work has also been carried out, especially where location, climate, and surrounding conditions tend to make landscaping desirable. The landscaping of these stations is accomplished, as at the district headquarters grounds, under an approved plan and with maintenance of the planting performed by highway groundsmen and flower gardeners.

In maintenance stations that are



Another view of Oceanside Maintenance Station in District XI.

landscaped and maintained in this manner, appearance is nearly always a matter of the District's responsibility and the individual does not enter the picture other than as a resident of the dwelling. However, there are a great many maintenance stations which were established years ago and which, either because of their location at points removed from the main highway or because existing conditions did not warrant the planting of the grounds, were never improved by landscaping. Many of these stations are used only for the storage of equipment and material. At others, residences are used by Maintenance Foremen or Superintendents, and any development has been due to the innate desire of the occupant to have a home.

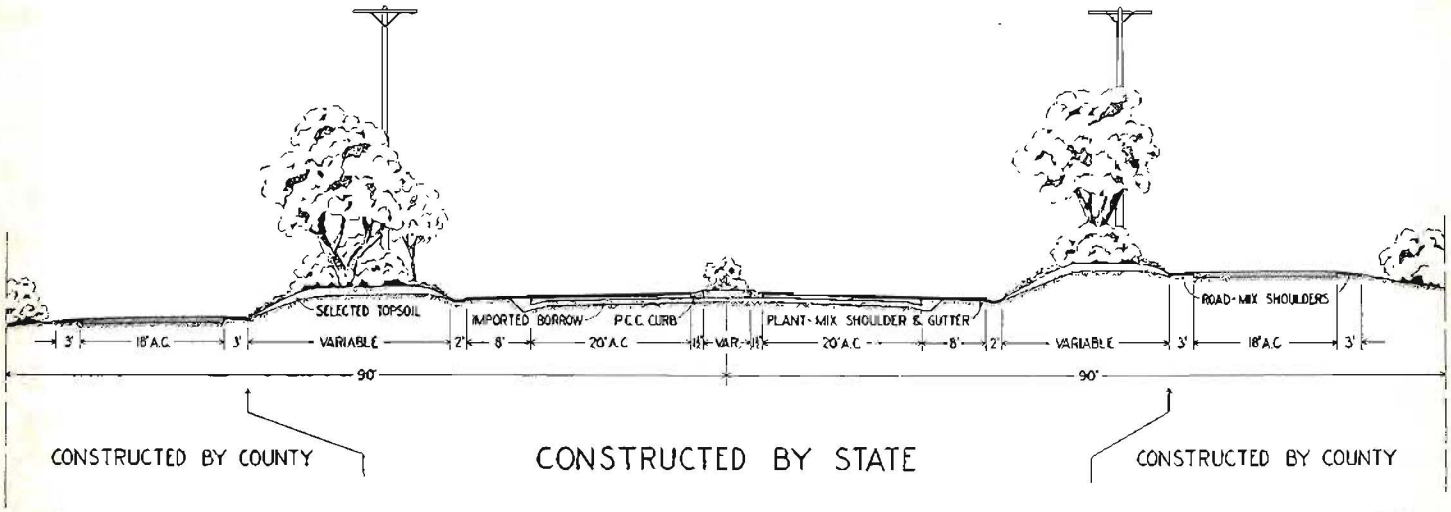
One of the most beautiful of this type has been created by Mrs. E. G. Brassington, wife of Ed Brassington, Maintenance Foreman at Oceanside, in District XI. The station is located off the highway, backed up against the railroad tracks, and in former years, while kept in a neat and clean condition, looked exactly like what it was, a store yard for maintenance materials. However, when Mr. Brassington took unto himself a wife, a remarkable change occurred on the old homestead. Now the visitor (and a visit is well worth while) will appreciate the work that Mrs. Brassington has accomplished in turning the small corner surrounding her home into a garden, which this last summer won first prize at a contest for beautiful gardens.

There are passion vine and honeysuckle on the fences; columbine, snapdragons, roses, ferns, gardenias, and begonias in the gardens; strange fruits such as Adriatic figs and Sapotes; garden furniture under a gay striped awning; stepping stones to an outdoor fireplace in one corner, and to the neat domicile of Ruby, the somewhat ancient, fat, lovable dog. And the lawn is one of the finest specimens of creeping bent lawn to be seen off, or on, any golf course.

With little help, and less official encouragement, Mrs. Brassington has created a beautiful and liveable outdoor recreation room. She has turned a maintenance station from a place of mere existence into a beauty spot and is to be congratulated on her efforts and achievements.

HIGHWAY ADDS TO MONTECITO CHARM

(Continued from page 3)



Typical section of recently completed triple roadway through Montecito showing types of highway built by State and county.

foot pavement lane. Shallow plant mixed gutters were provided for side drainage. The area between the gutters and the county-constructed side roads was filled in with selected top soil, and generally to a higher elevation than the surface of either road. This area will, at the proper season, be planted with shrubbery to supplement the existing shrubbery and trees which were carefully preserved during construction operations.

One creek crossing necessitated the construction of three bridges, one by the State and two by the county for each of their separated side roads. Specially designed massive wooden railing was used on all three bridges to conform with the general landscaping effect.

Thanks to much study on the preliminary plans, no special difficulties were encountered during construction, this phase of the work being under the supervision of J. C. Adams, State Resident Engineer.

Owing to the fact that all of the reconstruction was carried on during the dry season and further to the cooperation of the Contractor, J. E. Haddock & Co., of Los Angeles, traffic suffered very little inconvenience during construction.

Due to this same cooperation on the part of the contractor an excellent job resulted which, because of its unique character, will be closely observed by highway builders, and it is predicted will prove to be a highly satisfactory type of construction where like conditions prevail.

When a pedestrian crosses the street nowadays, he hopes to get the brakes.

A man with a big wart on his chin dropped into a doctor's office to have it removed. When he failed to return for additional treatments, the doctor phoned him to ask how the wart was getting along. "Just fine" replied the patient. "My face is gone, but the wart is still there."

Highway Bids and Awards for the Month of December, 1937

INYO COUNTY—Between 1.5 miles west of Bishop and Bishop, about 2.0 miles to be graded and surfaced with road mix surfacing. District IX, Route 76, Sections B,Bis. Triangle Rock and Gravel Co., San Bernardino, $22,548; Young and Son Company, Ltd., Berkeley, $20.801. Contract awarded to Basich Bros., Torrance, $15,433.70.

INYO COUNTY—Between 4.75 miles east of Panamint Sink and Death Valley National Monument, about 2.9 miles to be graded and penetration oil treatment applied thereto. District IX, Route 127, Sections G,H. Triangle Rock and Gravel Co., San Bernardino, $32,152; Minnis and Moody, Los Angeles, $32,846; Young and Son Company, Ltd., Berkeley, $35,044; A. S. Vinnell Co., Alhambra, $38,282; Isbell Construction Co., Reno, Nev., $43,532; John Rocca, San Rafael, $44,836. Contract awarded to Silva and Hill Construction Co., Glendale, $31,855.

KERN COUNTY—Between one mile north of Grapevine Station and 10 miles south of Bakersfield, about 19.1 miles to be graded and paved with asphalt concrete. District VI. Route 4, Sections A,B,C. Daley Corporation, San Diego, $594,302; Heafey-Moore Co. & Fredrickson and Watson Construction Co., Oakland, $595,693; Union Paving Co., San Francisco, $483,625; Fredericksen & Westbrook, Lower Lake, $486,-055; David H. Ryan, San Diego, $493,871; Hanrahan Co., San Francisco, $526.453; Metropolitan Construction Co., Los Angeles, $535,790; D. W. Thurston, Los Angeles, $537,035; Gibbons and Reed Co., Burbank, $541,186; Basich Bros., Torrance, $555,446; United Concrete Pipe Corporation, Los Angeles, $519,216; Oswald Bros., Los Angeles, $482,346; Olaf Nelson, Logan, Utah, $549,236. Contract awarded to Griffith Co., Los Angeles, $461,075.09.

LOS ANGELES COUNTY—At the intersection of Firestone Boulevard and Santa Fe Avenue to be paved with asphalt concrete and drainage structure to be constructed. District VII, Route 174. Sections B,S.Gt. Dimmitt and Taylor, Los Angeles, $21,419; G. O. Gartz, Los Angeles, $18,172; L. A. Paving Co., Los Angeles, $20,178; C. O. Sparks and Mundo Engineering Co., Los Angeles, $20,955; George R. Curtis Paving Co., Los Angeles, $17,908; The Contracting Engineers Co., Los Angeles, $19,325; Vido Kovacevich, Long Beach, $19,408; Tomei Construction Co., Van Nuys, $19,767. Contract awarded to Griffith Co., Los Angeles, $17,676.50.

MERCED COUNTY—An undergrade crossing under the tracks of the Southern Pacific Company at Livingston consisting of a steel girder track span on concrete abutments and pier to be constructed and approximately 1.9 miles of roadway to be graded and paved with Portland cement concrete. District X, Route 4, Section Lvtn,D. John Rocca and Claude C. Wood, Stockton, $237,014; Eaton and Smith, San Francisco, $274,489; Metropolitan Construction Co., Los Angeles, $245,922; Heafey-Moore Co. & Fredrickson & Watson Construction Co., Oakland, $254,586; N. M. Ball Sons, Berkeley, $249,321; C. W. Caletti & Co., San Rafael, $267,903; J. F. Knapp, Oakland, $233,820; J. E. Haddock, Ltd., Pasadena, $258,715; Griffith Company, Los Angeles, $251,699; Fredericksen & Westbrook, Lower Lake, $238,602; Earl W. Heple, San Jose, $234,083; Union Paving Co., San Francisco, $251,250; Gibbons & Reed Company, Burbank, $270,130; John Strona, Pomona, $256,006; A. Teichert & Son, Inc., Sacramento, $245,782; United Concrete Pipe Corporation, Los Angeles, $271,162. Contract awarded to Louis Biasotti & Son, Stockton, $215,872.75.

ORANGE COUNTY—Between Bitter Point and North Arm of Newport Bay, about 2.4 miles in length, drainage structures to be constructed, ditches to be excavated and road approach to be graded and penetration oil treatment applied thereto. District VII, Route 60, Sections A,B,NptB. Sully-Miller Contracting Co., Long Beach, $35,487; C. R. Butterfield-Kennedy Co., San Pedro, $32,771; Oscar Oberg, Los Angeles, $35,136; G. O. Gartz, Los Angeles, $28,799; Claude Fisher Co., Ltd., Los Angeles, $37,-331; J. E. Haddock, Ltd., Pasadena, $37,-404; George R. Curtis Paving Co., Los Angeles, $28,978; The Contracting Engineers Company, Los Angeles, $29,487; Vido Kovacevich, Los Angeles, $29,879. Contract awarded to Dimmit and Taylor, Los Angeles, $26,480.

SAN LUIS OBISPO COUNTY—At Harmony Creek and Pennington Creek, about 0.2 mile to be graded and surfaced with plant-mixed surfacing on crushed rock base and reinforced concrete culverts to be extended. District V. Route 56, Sections C,D. R. R. Bishop, Long Beach, $13,930. Contract awarded to L. A. Brisco, Arroyo Grande, $8,483.

SANTA CRUZ and SANTA CLARA COUNTIES—Between Inspiration Point and Los Gatos, about 6.3 miles to be graded and surfaced with roadmix surfacing on crusher run base. District IV, Route 5, Sections B & C. Ralph A. Bell, San Marino, $1,298,671; Harold Blake, Portland, Oregon, $962,192; Hanrahan Co., San Francisco, $986,288; Union Paving Co., San Francisco, $1,047,280; Granfield, Farrar and Carlin, San Francisco, $916,136; Mittry Bros. Construction Co., Los Angeles, $1,091,245; A. Teichert and Son, Inc., Sacramento, $1,096,893; Metropolitan Construction Co., Los Angeles, $1,097,264; D. W. Thurston, Los Angeles, $1,127,294; The Utah Construction Co., San Francisco, $1,274,761; Macco Construction Co., Clearwater, $895,686; United Concrete Pipe Corp. and D. McDonald, Los Angeles, $943,754; Fredericksen and Westbrook, Lower Lake, $947,188; J. E. Haddock Ltd. and Crowe Bros. Construction Co., Pasadena, $1,288,-250; Guy F. Atkinson Co., San Francisco, $1,142,771. Contract awarded to Heafey-Moore Co. and Fredrickson & Watson Construction Co., Oakland, $895,045.14.

SHASTA COUNTY—An undergrade crossing under the tracks of the Southern Pacific Railroad about one mile south of Redding and about 0.79 mile of roadway to be graded and paved with Portland cement concrete, crusher run base and road-mix surfacing. District II. Route 3, Section A. John Rocca and Claude C. Wood, Stockton, $164,069; Earl W. Heple, San Jose, $164,-330; C. W. Calletti & Co., San Rafael, $174,-249; Poulos and McEwen, Sacramento, $177,314; A. Soda and Son, Oakland, $191,-099. Contract awarded to N. M. Ball Sons, Berkeley, $163,551.55.

"Do you know what I think of married life?"

"Are you married?"

"Yes."

"Yes."

Vandals Punished For Attempts To Kill Highway Trees

Vandalistic efforts of a group of property owners along the recently completed El Cajon Boulevard in San Diego to destroy eucalyptus trees bordering that beautiful thoroughfare met with prompt legal retribution.

Three men, residents in a block on the north side of the boulevard, were arrested by the district attorney at the instigation of the San Diego grand jury, convicted and given suspended sentences. Two of the offenders, R. J. Warner and K. F. Bennett, confessed that they had bored holes in a number of trees and poured acid into the tree trunks. They also admitted to driving copper nails into the trees, encircling the trunks. They implicated S. D. Archer as the ringleader of the plot.

The attempt to destroy the trees was discovered in time to repair the damage. The city superintendent of parks had the holes cleaned and filled with asphalt and the nails withdrawn.

The investigation was conducted by Thomas Frost of the district attorney's office and convictions obtained by him.

FEDERAL AID NEEDED

(Continued from page 9)

Summarized briefly, however, the proposed legislation would apparently mean a loss to California of $8,000,000 in the current biennium and $4,000,000 per year thereafter. The cancellation of the $8,000,000 for this biennium would mean taking out of our current budget projects in this amount.

Even under the present Federal allocation, while the motorists of California pay approximately $15,000,000 per year in Federal gasoline taxes alone, we receive slightly more than one-half of this amount in return for highway purposes. If the return to the States for road building is further reduced then as a matter of fair dealing the one cent Federal gasoline tax should be reduced or repealed.

The California Highway Commission at its December meeting adopted a resolution appealing to Congress to abandon the proposal to curtail Federal aid funds for highways and to seek other means to achieving the economic objectives sought.

Storm Damage to Highways Is $2,340,875

(Continued from page 13)

U. S. 395—Standish to Secret Valley.
The new construction between Standish and Litchfield suffered severely. Besides badly scoured shoulders, some 800 feet of fill was washed away and a new structure was seriously undermined.

Across Secret Valley where heavy damage was expected, somewhat less than 1000 cubic yards of shoulder scour occurred.

U. S. 99-E—Chico to Red Bluff.
Convergence of swollen Sierra streams was responsible for the flooding of tremendous valley areas. The high velocity of the flood waters washed out fills at Deer Creek and Mill Creek, and undermined concrete pavement.

U. S. 299—Redding to Alturas.
Damage to highway fills was excessive in the vicinity of Ingot. Cow Creek swollen by cloudburst rains tore out banks until passage over the road became impossible. Three detours were quickly made passable soon after the storm subsided. At other locations, the flood waters had eaten away at the roadway embankments until only a one-way width remained. A schoolhouse and six dwellings were swept away between the highway and the creek in the town of Ingot.

State Route 28—In Cedar Creek Canyon west of Cedarville.
With previous records broken, Cedar Creek laid waste the recently constructed highway in the lower two miles of the canyon. Carrying a tremendous amount of debris, culverts were rendered ineffective and the stream picked out new channels with disastrous results for the highway.

U. S. 299—Junction City to Big Bar.
As in so many other cases during the same storm, the Trinity River topped all records for high water. And here again highway fills suffered and will need extra protection when replaced.

State Sign Route 20—Between Ukiah and Colusa County.
Floodwaters of Cold Creek and East Branch of the Russian River scoured fills. Tributary streams washed out the entire roadway and flood waters in the vicinity of Upper Lake undermined drainage structures and damaged embankments. Near the Abbott Mine a very large fill was entirely washed out, which will cost nearly $10,000 to replace.

State Sign Route 28—Navarro River Road to the Coast.
Dry Creek Bridge was washed away and required a temporary structure to carry traffic until the new highway and bridge now under contract will be completed. Mud slides and scoured embankments were prevalent on that portion of the route in Sonoma County.

U. S. 101—Redwood Highway.
Heavy erosion from the Eel River occurred south of Scotia. The Russian River between Cloverdale and Hopland eroded the toes of slopes causing roadway settlements. Pieta Creek washed out the approach fill south of the bridge.

State Route 108—Between Mission San Jose and Livermore.
The Arroyo del Valle Bridge was seriously undermined.

State Sign Route 152—West of Gilroy.
The center pier of the Uvas River concrete bridge was badly undermined, damaging the structure beyond repair.

State Highway 129 and 132.
The Kaweah River overflowed its banks and undermined the bridge near Lemon Cove. About 1000 feet of shoulder was badly scoured and the concrete pavement undermined.

State Sign Route 180—Near Minkler.
Nearly 500 feet of approach fill at the Kings River Bridge was washed away for a depth of from 4 to 5 feet.

Where Credit Is Due

Within a period of three days, the unprecedented storm of last month left in its wake wrecked highways and bridges, a toll of damage that represents a loss to the State of more than two million dollars. The monumental task of clearing flood debris from highways, repairing bridge structures and restoring traffic became overnight the responsibility of the Maintenance Department of the Division of Highways.

To the men of the highway maintenance crews in the storm-stricken areas belongs the credit for the promptness with which closed roads and bridges were opened to travel. These men labored in rain and sleet for two days and nights on emergency work, without sleep or rest that traffic might go through. They have carried on without complaint since then.

Truly, the maintenance crews have performed a task of herculean proportions and I extend to each and every one of them the appreciation and gratitude of the Department of Public Works.

EARL LEE KELLY
State Director of Public Works

ENGINEER'S SON WINS BIG JOB

Mr. T. A. Bedford, Senior Highway Engineer, Bureau of Surveys and Plans at Sacramento headquarters, recently received the cheerful news that his engineer son, Clay Bedford, 34 years old, has been appointed general superintendent for the Interior Construction Company, low bidder for raising the Grand Coulee Dam in Washington to its ultimate height, a job that will require four years and result in the largest dam in the world.

Holidays Raise Traffic on Bay Bridge Slightly

THE Christmas holidays brought an increase in daily and total traffic for December on the San Francisco-Oakland Bay Bridge, according to a monthly traffic report filed by State Highway Engineer C. H. Purcell.

Total December vehicular traffic was 723,281 with a daily average of 23,332, bringing the number of vehicles crossing the span since it opened to 10,444,609. Total earnings last month were $380,919.60. November's total vehicular traffic was 699,229 with a daily average of 23,308 vehicles.

Low point last month was 17,905 vehicles on December 9, a severely stormy day. High point was Christmas Day, when 37,883 vehicles used the bridge. The three-day Christmas holiday alone produced 100,519 vehicles for the span, the largest comparative holiday period the bridge has experienced.

"Traffic for December," Mr. Purcell said, "showed an increase over the anticipated quota of as many as one thousand cars a day. A succession of foggy weather during the month, which caused many motorists to take the bridge rather than the ferries, was another factor in the increase of traffic."

Comparative figures are as follows:

	December	November	Total since opening
Total passenger autos	681,506	657,901	9,929,027
Total auto trailers	856	954	17,516
Total motorcycles	2,077	2,220	36,317
Total tricars	977	913	9,102
Total trucks	26,236	25,918	327,105
Total truck trailers	954	1,233	22,457
Total buses	10,675	10,090	103,085
Total vehicles	723,281	699,229	10,444,609
Total extra passengers	189,480	179,178	2,226,078
Total freight lbs.	59,671,837	62,451,501	748,196,020

Teacher: "What is a myth?"
Pupil: "A little moth."

DIVISION OF WATER RESOURCES

OFFICIAL REPORT

FOR THE MONTH OF

December, 1937

EDWARD HYATT, State Engineer

THE Division of Water Resources, representing the Water Project Authority of the State of California, has continued cooperative work in connection with the Central Valley Project under an agreement with the U. S. Bureau of Reclamation.

Announcement was made by the Bureau of Reclamation during the month that a tentative agreement had been reached with the Southern Pacific Company whereby that company will perform the physical work of relocating its line around Shasta Reservoir with funds provided by the Federal Government. Work on this portion of the project is expected to start soon. The government camp at Friant Dam was practically completed during the month and work was continued on the construction of the government camp for the Shasta Dam. Work was also continued on surveys and the preparation of plans for various units of the project and announcement was made that calls would be issued soon for bids for the construction of another section of the Contra Costa Canal and for a railroad tunnel at the Shasta Dam site to by-pass the present Southern Pacific line during early construction work on Shasta Dam.

IRRIGATION DISTRICTS

Inspection was made during the month of work in progress in the West Side, Naglee-Burk and Banta-Carbona Irrigation districts, where improvements on canal systems are being made.

West Side District has resumed construction on a concrete conduit to replace an open irrigation canal running through the city of Tracy.

Naglee-Burk District has under way the preparation of plans for trimming and lining with concrete approximately two miles of irrigation canal to prevent seepage losses. Work will be in progress by the first of the year.

Oroville-Wyandotte District received W. P. A. approval of a $65,000 project for improvement which will include construction of an office building and reconstruction of flumes on the Palermo Ditch. In the last six years the district has replaced 8000 feet of old wooden flume with steel and concrete structures.

Anderson-Cottonwood District has received approval of an additional loan from the R. F. C. for the purpose of refunding outstanding bonds of the district. The previous offer of $282,000 has been increased to $339,000. equivalent to 30 cents on the dollar of bonded debt.

SUPERVISION OF DAMS

Application for approval of the Reese Dam owned by Winona V. Simmons, Redding, California, situated on a tributary of Tadpole Creek in Shasta County was received on December 8, 1937.

Application for approval of the Round Mountain Dam of the Camarillo State Hospital, Camarillo, on Long Canyon Creek in Ventura County was received on December 16, 1937.

Application for approval of plans for repair of the Lake Wohlford Dam of the Escondido Mutual Water Company, Escondido, situated on Escondido Creek in San Diego County was approved on November 30, 1937.

WATER RIGHTS

Twenty-seven applications to appropriate water were received during November: 2 were denied and 32 were approved. The rights were confirmed under 4 permits during the month and 11 were revoked.

Inspection reports are in the course of preparation covering projects which were investigated during the recent field season and during November 426 reports were received from permittees and licensees, which reports are under study for the purpose of determining appropriate action.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Field data gathered during the summer months is being assembled to show the diversions, acreage irrigated, stream and return flows in the Sacramento and San Joaquin valleys.

The sampling of water in the delta for salinity is being carried on at all regular stations to record the retreat of the salinity.

During the past month abnormally heavy rains caused a rapid rise in the Sacramento River and consequent flooding of the by-pass areas and low lands and in some instances, by breaks in the levees, reclaimed land.

CALIFORNIA COOPERATIVE SNOW SURVEYS

With all arrangements completed in the field for the 1937-38 snow surveys, the past month has been devoted entirely to work in the office.

Monthly precipitation records for the period since last May are being checked. All tabulations and curves necessary to our forecasting procedure are being brought up to date.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

At the commencement of this period, the stages in the flood channels were at medium height, due to the storm which commenced on November 19th. Patrols were maintained on the new levee from Butte Slough to the Colusa County line on the east side of the Sacramento River, and minor repairs were made. The pumping plants east of the Sutter By-pass were in operation practically during the entire period covered by this report.

A new storm occurred from December 9 to December 12, inclusive. This resulted in high stages in all flood channels, which made it necessary to patrol the levees day and night for about five days. During the period our crew was increased to about 140 men and, in addition, about 60 relief laborers were employed.

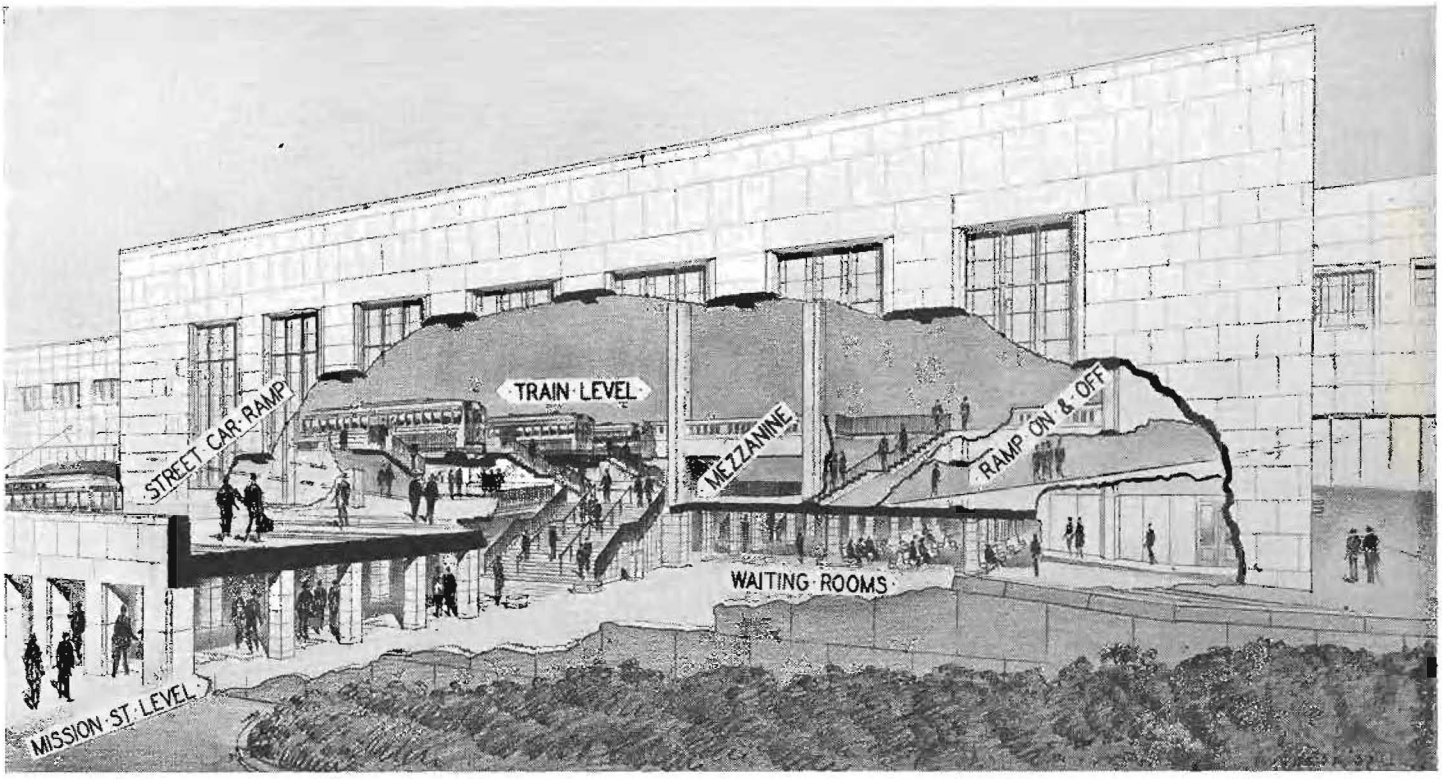
Relief Labor Work

During the recent storm, relief labor was employed under an emergency project for patrol and emergency protective work. This project is sponsored by the Department of Public Works and crews were used on the American River Flood Control District, Levee District No. 1, by-pass levees, and the Colusa levees. About 100 men were so employed. This includes a crew of 25 men from the S. R. A. Transient Camp No. 7 in Sutter By-pass, which was employed continuously at various places.

Damage to Levees

The unusual high stage reached at many points during this flood resulted in a number of levee breaks on the Sacramento River above Colusa and on the Feather and Bear rivers. A complete survey of the damages caused by the flood has not yet been completed.

Bay Bridge Terminal To Be Ultra Modern



THIS "cut away" drawing of the San Francisco Terminal of the San Francisco-Oakland Bay Bridge railway facilities shows how passengers traveling to and from the East Bay points will reach their destinations in the structure, now under construction. Electric trains will come in on the upper level over six tracks entirely enclosed within the building. To reach street cars from the trains, passengers can either take short ramps or brief flights of stairs loading directly from the train platforms to the mezzanine. Street cars loop over a viaduct in front of the terminal building at the mezzanine level. To reach the street level, passengers leave the mezzanine by means of a flight of stairs. Waiting rooms and concessions are on the street level. Information and ticket offices are on the mezzanine.

At no time will passengers cross the tracks to reach, or depart from, their trains; but will utilize the stairs or ramps leading from the train platforms to the concourse below.

Highway Inventory

(Continued from page 5)

plus approximately one-third of the motor vehicle fees and a federal aid apportionment for expenditure on our rural highways. This 1½ cent tax at the present time yields approximately $22,000,000 annually.

The State's share of the Motor Vehicle Fund is approximately $3,000,000 and federal aid is approximately $4,500,000, making a total of $29,500,000. Of this amount, a minimum of $12,500,000 is needed for maintenance, administration, engineering, and rights of way, leaving only $17,000,000 available for construction and reconstruction projects with which to overtake the procession of increasing rural traffic demands.

The above represents only the essential highlights in the survey of our present day status. There are certain other items not mentioned wherein California could improve its service to the modern motoring public. Notably among these services is the question of making our highways more pleasing in appearance.

Although roadside beautification may not be deemed a traffic service necessity, nevertheless it does contribute a vital part in developing traffic and is an important factor in helping to relieve the high nervous tension of our present day life.

STATE BUYS MORE SNOW PLOWS

(Continued from page 4)

Arrangements have also been made for a daily broadcast of road, weather and snow conditions on all State highways in the Sacramento territory, which will be released at 9.50 a.m. over Radio Station KFBK. This service began on November 27, and is expected to continue throughout the balance of the snow season.

EFFECT OF SEA WATER ON CALIFORNIA CEMENTS

(Continued from page 20)

that all cement was of uniform specific gravity, approximately 25% more by volume of the low specific gravity high specific surface Portland Puzzolan cement was used in each specimen than of the normal specific gravity cements.

The results illustrated in Fig. III indicate that the durability is affected to a much greater extent by the storage water than by mixing water when both mixing and storage waters are similar to San Francisco Bay water.

Assistant Bridge Engineer Murray Becomes Colonel

THE Bridge Department of the Division of Highways now has a full-fledged Colonel in its personnel.

Assistant Bridge Engineer Edward Jackson Murray of the Sacramento headquarters staff on October 1 was promoted from lieutenant colonel, California National Guard, to the rank of colonel, succeeding Col. Charles R. Blood, who retired in order that his subordinate officers in the 184th Infantry might obtain well earned promotions to higher grades.

Col. Murray enlisted in Co. G, 2d Infantry, California National Guard, on April 25, 1914, in Sacramento. He served with that unit as a private, corporal, sergeant and 1st sergeant until June, 1916. He was commissioned second lieutenant in his regiment June 19, 1916.

SERVED OVERSEAS

Service on the Mexican border at Nogales, Arizona, from June 26 to November 16, 1916, followed. While on the border, Colonel, then Lieutenant, Murray was attached to the 12th U. S. Infantry.

On March 25, 1917, Murray was called into Federal service again, promoted to 1st lieutenant and served with the 2d Infantry of the National Guard at Richmond, California, and for a time was assistant recruiting officer in San Francisco. In September, 1917, Murray was assigned to Co. G, 160th Infantry, at Camp Kearny and went overseas as 1st lieutenant with that outfit.

While in France he attended Air Corps Observation Schools at St. Maixent and Tours and the Artillery School of Fire at Camp Coetquidan. He served as first lieutenant and captain, Infantry Reserve, until March, 1924, when he was commissioned captain of infantry in the National Guard and was assigned to the 184th Infantry as plans and training officer. He was promoted to major in May, 1926, and to lieutenant colonel in April, 1930. He has commanded the regiment since October 1.

Col. Murray entered into state service with the Division of Highways on April 1, 1924.

COL. E. J. MURRAY

Elimination of Newhall Tunnel Bottleneck

(Continued from page 21)

Pacific Railroad at Newhall and Saugus, respectively. A grade separation structure will be constructed at the crossing of the Southern Pacific Railroad on the new line, near Solamint Junction. Future plans also include the construction of a reinforced concrete bridge at Placerita Canyon.

	Existing	*Proposed*
Length in miles	12.67	7.25
Minimum radius in feet	366	800
Number curves less than 1000' radius	13	2
Total number curves	35	15
Total degree curvature	1,119	452
Total length curves feet	21,323	18,467
Width roadbed feet	36	48

Economically, the construction of the Mint Canyon Short Cut is sound, paying the public, in the form of savings in operation costs, large returns each year. These savings in cost of operation of present day average traffic by the shorter distance will amount to approximately $240,000 per year, which savings will be sufficient to pay the total estimated cost of construction of the new line in less than two and one-half years.

Floods Cause Huge Damage

(Continued from page 16)

by the Division of Water Resources and submitted immediately after the first of January 1938.

The following table giving a preliminary estimate of the damages caused by the storm and flood of December 10-13, 1937, was prepared by the Division of Water Resources in response to this request.

The State Division of Highways, Parks, and Fish and Game; county officials, supervisors, clerks, engineers, farm advisors and agricultural agents; the Reclamation Board; the United States Engineering Corps; U. S. Weather Bureau; the National Forest and Park services; and the various public utilities gave willing and active cooperation in furnishing the data on which this report is based. It was only by this splendid cooperation possible to assemble the data for this estimate in the time allotted.

January 1, 1938.

Preliminary estimate of damages resulting from storm and floods of December 10-13, 1937, based on a survey of the entire State during the period December 20-31, 1937. Estimates are tentative and subject to considerable revision as more accurate data are received.

Railway systems	$620,000
Highways, roads and streets	4,510,000
Telephone and telegraph systems[1]	no report
Gas and electric systems	360,000
Irrigation and domestic water supplies	370,000
Improvements, homes, and industries in cities	1,650,000
Industries in rural areas	170,000
Summer camps, homes, and resort equipment	610,000
National, State, and city parks or forests	510,000
Farm buildings, fences, and equipment	1,530,000
Livestock	500,000
Field crops and produce in storage	1,350,000
Orchards and vines[2]	90,000
Channel erosion and debris removal	1,670,000
Levees and other protective works	630,000
Total	$14,570,000

[1] Reports of Western Union and Postal Telegraph Co's. showed less than $5,000 damage. No report was received from the Pacific Telephone & Telegraph Co.

[2] Damages to orchards and vines from prolonged flooding of root systems will not become apparent until next summer.

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MAP
SHOWING
STATE HIGHWAY SYSTEM