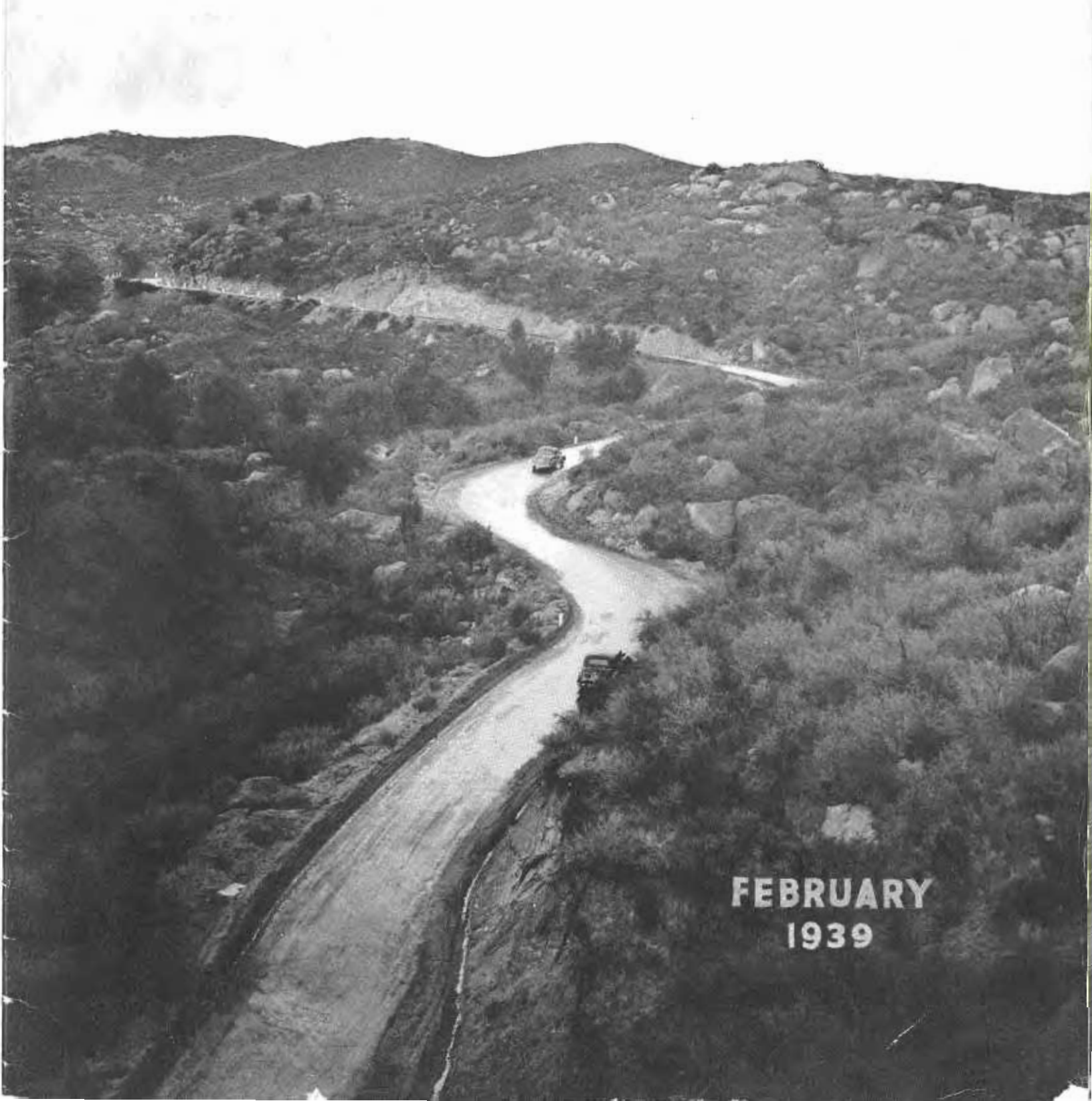


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HIGHWAYS AND PUBLIC WORKS



FEBRUARY
1939

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

FRANK W. CLARK, Director C. H. PURCELL, State Highway Engineer J. W. HOWE, Editor K. C. ADAMS, Associate Editor

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\$28,066,102 Total Available Funds for Major Highway Projects During Next 2 Years

RECOMMENDATIONS for allocations to major projects in the biennial State highway budget for the 91st and 92d fiscal years, July 1, 1939, to June 30, 1941, as submitted to Governor Culbert L. Olson by Director of Public Works Frank W. Clark, total \$28,066,102.

This amount will be available for major highway projects constructed throughout the State after statutory deductions are made.

The budget amount of \$28,066,102 is allocated to 200 items or projects of highway improvement as recommended by the Commission after extensive studies and hearings on projects totaling \$144,000,000 for construction costs and urged by individuals and civic groups for inclusion in the budget. These projects would have entailed an additional cost of \$20,000,000 for rights of way expenditures.

\$52,000,000 "MUST" PROJECTS

Recommendations from the eleven district engineers and the Bridge Engineer of the Division of Highways for inclusion in the budget of what were considered "must" projects for the next two years, totaled over \$52,000,000 for construction only, just about twice the funds that will be available for this purpose.

Preparation of the biennial program presented other decided difficulties for several reasons:

Damage to highways and bridges resulting from the storms of the 1937-1938 winter will cost in excess of \$9,500,000 to repair. In order to raise this large sum, it was necessary to borrow from maintenance funds, absorb all betterment and minor improvement funds and even to invade the programmed budget to the extent of over \$2,300,000.

These latter programmed projects were deferred by the Highway Commission with the understanding that they would be replaced as soon as funds became available. This biennial budget program, therefore, includes projects totaling over \$2,300,000 carried over from the current

program for which the commission was obliged to provide.

Another serious situation confronts the State in the allocation of funds. This is the bridge problem. Through the addition to the State highway system of some 6800 miles of county roads, by the Legislature in 1933, the State took over in excess of 1000 bridges, many of which, built in the early days, are of light construction, and inadequate for present-day loads.

BRIDGES REQUIRE \$11,000,000

About 400 of these bridges have been posted for limited loads and speeds because they are structurally inadequate to safely support legal loads. Many have reached the stage where reconstruction is imperative to assure a safe operation of vehicles. They are beyond maintenance operations.

It is estimated that \$11,000,000 is necessary for reconstructing such unsafe bridges within the next few years, and the State is faced with a total expenditure of more than \$30,000,000 to replace ultimately all of these inadequate structures.

Revenues derived from the use fuel tax or the Diesel tax assigned by statute to this purpose, are far from sufficient to reconstruct those bridges which are in immediate need of improvement to prevent accidents. It was, therefore, necessary to make a substantial allocation of State highway funds to such bridge projects.

STATE MUST MATCH FEDERAL AID

A substantial part of the revenues available for State highway construction are provided by Federal Aid appropriations made by Congress. Appropriations for the fiscal years 1940 and 1941, which include regular Federal aid applicable to projects on the Federal aid system, feeder roads, railroad grade separations and Federal lands routes, are considerably less than in previous years. The amount available to California for the next two fiscal years is nearly \$5,000,000 less than in the preceding biennium.

These appropriations are Federal contributions for special and definite purposes to be distributed in accordance with Federal regulations and over which the Federal government will exercise final approval. They are therefore limited in their application but in order to earn this material contribution to State highway construction, allocation of State funds to match such Federal aid is necessary and subject to the limitations imposed by the Federal regulations.

The entire sources of revenue available for the construction, maintenance and operation of State highways to meet the situation set forth above are:

SOURCES OF REVENUE

1—The 3-cent gas tax from which the counties receive 1 cent, incorporated cities, $\frac{1}{2}$ cent, and the State Highway Department $1\frac{1}{2}$ cents.

2—One-half the net revenues of motor vehicle fees after providing for the maintenance of the Motor Vehicle Department and California Highway Patrol.

3—The use fuel tax, or Diesel tax, available only for bridge construction.

4—Regular Federal aid appropriated for the fiscal years 1940 and 1941 by Congress.

The estimated amounts from these sources accruing to the State Highway Department for the two-year period are:

Gas tax	\$64,000,000
Motor vehicle fees....	7,600,000
Use fuel tax.....	600,000
Federal aid	8,000,000
Total.....	\$80,200,000

These estimated revenues for the 91st and 92d fiscal years must cover all activities devoted to the building and operation of State highways, including administration, construction, maintenance, engineering, both pre-

liminary and construction, betterments and minor improvements, joint highway districts, rights of way, contingency reserve, landscaping, maintenance and operation of the San Francisco-Oakland Bay Bridge, and the one-half cent apportioned to cities which the Highway Department is required to pay out of its 2-cent share of the gasoline tax.

LEGISLATIVE RESTRICTIONS

Allocation of these revenues is made in accordance with the various provisions of the legislative enactment requiring distribution to the north and south sections of the State, to primary and secondary highways, to cities, to joint highway districts, and other functions mentioned above.

Administration expenses include the general administrative operation of the headquarters office of the Division of Highways in Sacramento, eleven highway district offices, and the Bridge Department. Additional expenditures made mandatory on the Division of Highways in the support of other departments and functions include the Department of Public Works, the total expense of highway planning — surveys made during the biennium, as well as statutory contributions to the State Controller, Department of Finance, State Treasurer, and Attorney General, which during the present biennium are estimated at \$1,155,000.

\$1 PER MILE AVAILABLE

General maintenance covers the general repair and upkeep of the entire rural highway system for a period of two years. When this figure is reduced to funds available per mile of

road maintained it amounts to slightly over one dollar per day available for each mile.

Under minor improvements, are funds allocated to cover such items of work as short line changes, roadbed widening, additional drainage structures, and other small additions to the existing facilities which, under the law, are not eligible for maintenance expenditures. Very few of the individual allocations for minor improvement exceed \$5,000.

Betterment funds are construction funds handled by the maintenance

come entirely from State highway funds as the Federal Government will not participate in this expense. As many grade crossings are constructed in congested areas, an increase in this expense has been unavoidable. The demand for the establishment of so-called "freeways" in congested areas requires enormous expenditures compared to construction costs. In one instance on a project adjacent to a city in the San Joaquin Valley, far removed from the metropolitan area, right of way costs exceeded the total construction costs involved.

Administration and special study costs for the next biennium are estimated at \$3,600,000. Maintenance of the highways is estimated at \$18,200,000, an increase of nearly \$2,000,000 over the past biennium due to increasing maintenance costs resulting from excessive damage to the highways and to the reduction of Federal aid apportionments. The half-cent to cities is estimated at \$16,000,000. The total of these three items is \$37,800,000, leaving a balance of available funds for the other functions of \$42,400,000.

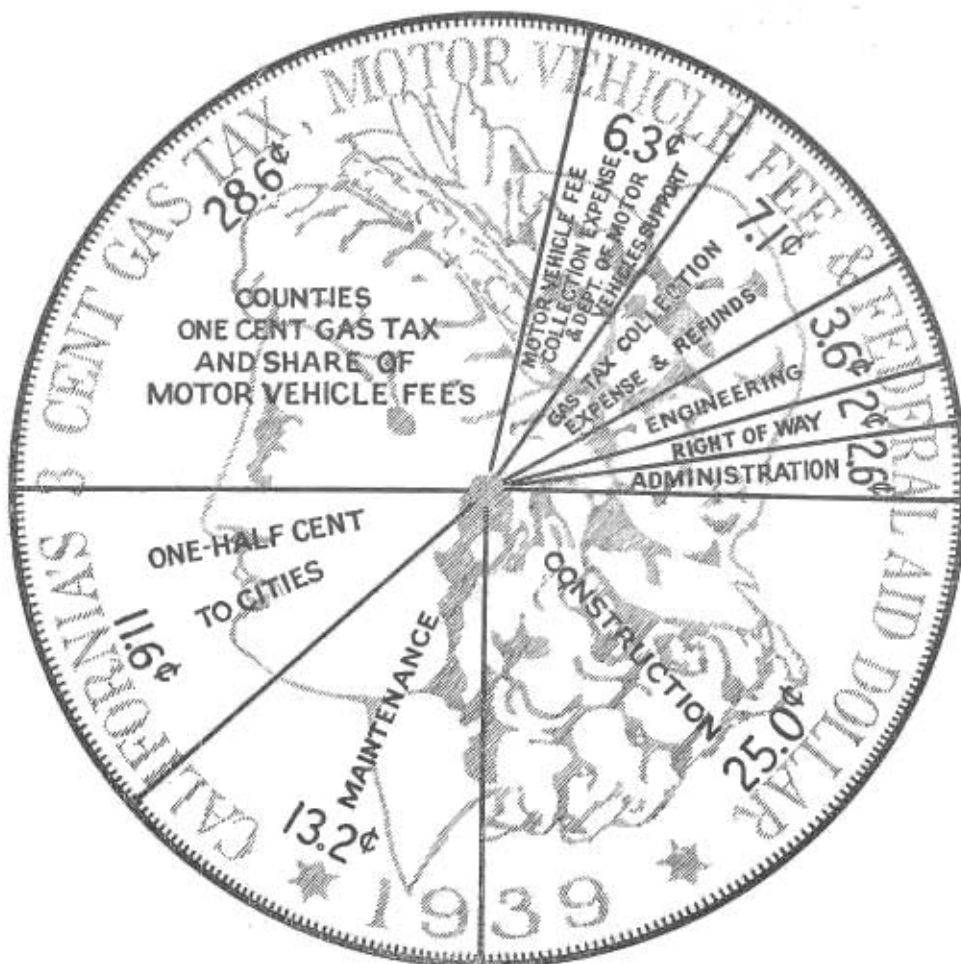
Distribution of this \$42,400,000 for the various purposes provided by statute to the north and

south county groups and to primary and secondary roads shows the final amount available for major construction projects to be \$28,066,102.

From this major construction allocation must come funds to provide necessary work during a two-year period on the 13,900 miles of State highways.

With regular Federal aid apportionments estimated at \$8,100,000 for

(Continued on page 17)



department, and, as in the case of minor improvements, provide for additions to the existing facilities which can not be made with maintenance funds. This money is used for blanketing shattered surfaces, reinforcing weakened bases, widening and oiling shoulders, strengthening weakened bridges, and other miscellaneous types of work.

Right of way expenditures include right of way for grade crossing projects on State highways which must

\$30,286,000 Estimated Cost to Modernize Roads in District XI

By E. E. WALLACE, District Engineer

DISTRICT XI of the State Division of Highways with headquarters in San Diego covers an area of 12,700 square miles, extending over the entire width of the State of California along the southerly sixty miles or more and includes San Diego, Imperial and the easterly portion of Riverside counties.

The State highway system in District XI includes 386 miles of primary highways, 642 miles of secondary highways and 81 miles of city streets, totaling 1,109 miles. The system is improved to the following standards:

Kind	Inferior		Adequate		Total	
	Miles	%	Miles	%	Miles	%
Oiled earth roads.....	215	19.5	66	6.0	281	25.5
Graveled roads with light oiled surface....	28	2.5	8	0.8	36	3.3
Intermediate type.....	208	18.9	77	7.0	285	25.9
High type.....	*350	31.8	149	3.5	499	45.3
Total roads	801	72.7	300	27.3	1,101	100.0
Bridges.....					8	

Total highways and bridges.....1,109

Recent developments in southern California have resulted in rapidly changing conditions, with which highway development has not kept pace.

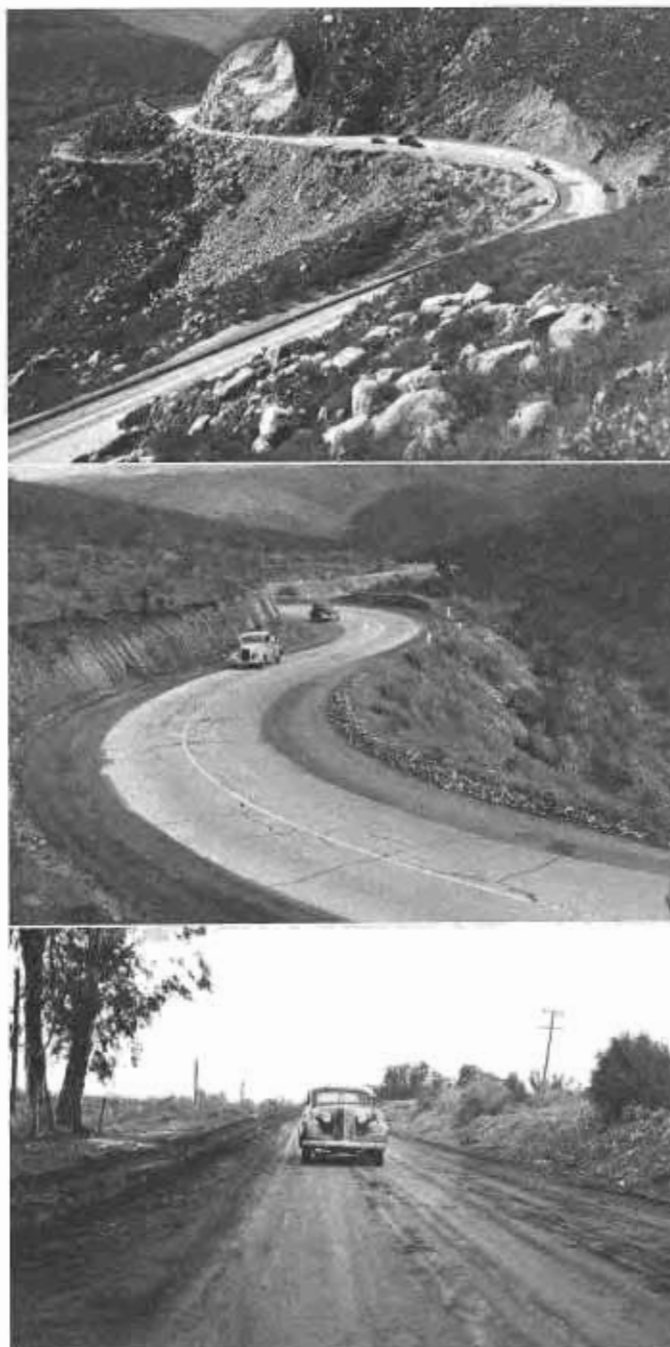
The population in San Diego has doubled in each of the last three Federal censuses and the anticipated population of the San Diego metropolitan area for 1940 is 240,000, as developed by consulting engineers for the water development in San Diego County.

San Diego has many natural advantages in climate, harbor and recreational facilities, including many beaches and mountain resorts, seven State parks, twenty-seven county-owned parks, nine lakes, and the Palomar Observatory. The full use of these areas and the further development of the country are greatly restricted by inadequate or obsolete highways.

Similarly, the development in Imperial and Riverside counties has progressed rapidly since the start was made—about 1910. Before that time the Imperial and Coachella valleys were practically desert wastes, but in 1937 Imperial Valley produced \$43,000,000 worth of important agriculture and animal products, ranking first among all of the counties in vegetable acreage, and third in total State production. Approximately 46 per cent of this production is moved to market by trucks over distances in excess of 100 miles.

The early completion of the All-American Canal will double the irrigable lands and will place additional burdens on the highway system.

* Of the 499 miles of high type surfacing, 350 miles or 70% are obsolete because of poor alignment and grades, and inadequate width.



Top—U. S. 80, San Diego County, narrow, steep grade, sharp curves. Center—U. S. 395, dangerous curves. Bottom—Imperial Valley road lower than fields and roadside irrigation canals.



Top—This picture of a section of State Sign Route 94 in San Diego County shows a narrow road with poor alignment and hazards caused by inadequate slopes. Center—Poor alignment and many blind curves on this stretch of State Route 195 near Oceanside, San Diego County. Bottom—One of many “dips,” frequently flooded, on State Sign Route 94. It exists because there are no funds for a bridge.



U. S. Highway No. 80, entering the State through Yuma, is one of the main trancontinental highways and is an all-year route over which a large percentage of the foreign traffic enters California.

In 1933, 642 miles of secondary highways were added to the State system within this district, and no additional financing was provided for either maintenance or improvement.

In Imperial County, the additions were practically all of very low standard, unsurfaced and with inadequate bridges. It was impossible to use them after rains, and heavy loss of crops occurred because of the difficulties encountered. At other times the dust was almost as objectionable as the mud.

In view of these conditions and the need for surfacing of the roads, a policy was adopted of obtaining the maximum possible mileage of bituminous treated surfacing with the limited funds available, and within three years all of the newly acquired roads had been oil surfaced, providing surfaced highways which were dustless and mudless. But with this improvement, traffic on these roads has increased rapidly and in some cases over 300 per cent. It is now necessary that the light surfaces be increased in thickness and width and that the roadways be properly graded and drained.

The improvements which have been made to the recently acquired secondary roads have been financed from the 1½ cents State highway gas tax fund and the increase in mileage caused by the addition to the State system has resulted in the necessity for spreading the funds available for construction and improvement over a much greater mileage than was originally contemplated.

The secondary highways in San Diego County are an inheritance from the county bond issues and they were all located and graded prior to 1919. Highways planned for traffic twenty



Top—State Route 78, east of Ramona, San Diego County. Poor alignment and narrow pavement. Center—Route 187 in Riverside County. This is only one of 82 "dips" as they exist today on the North Shore Road. Bottom—Section of U. S. Highway No. 80 in San Diego County. Combination of poor alignment, steep grade, narrow pavement and improper passing, all of which result in high accident record.

years ago and for 30 miles per hour cars are obviously obsolete. At that time the registration of motor vehicles in San Diego County showed 13,622. In 1937, 107,086 vehicles were registered here and San Diego County ranks fourth in motor vehicle registration in the State.

The primary highways are overcrowded and improvements are not keeping pace with the increase in traffic, nor with the rapid development in motor vehicles. The increase in traffic in 1938 on Route 12 between El Centro and San Diego was 9 per cent as compared with a state-wide increase of only 3.3 per cent.

Route 2 is the main coast highway on which improvements have been concentrated during recent years and a good three- and four-lane highway with 14.0 miles of divided roadways has resulted. The road is not yet adequate to handle the rapidly increasing traffic now amounting to 10,000 cars per day.

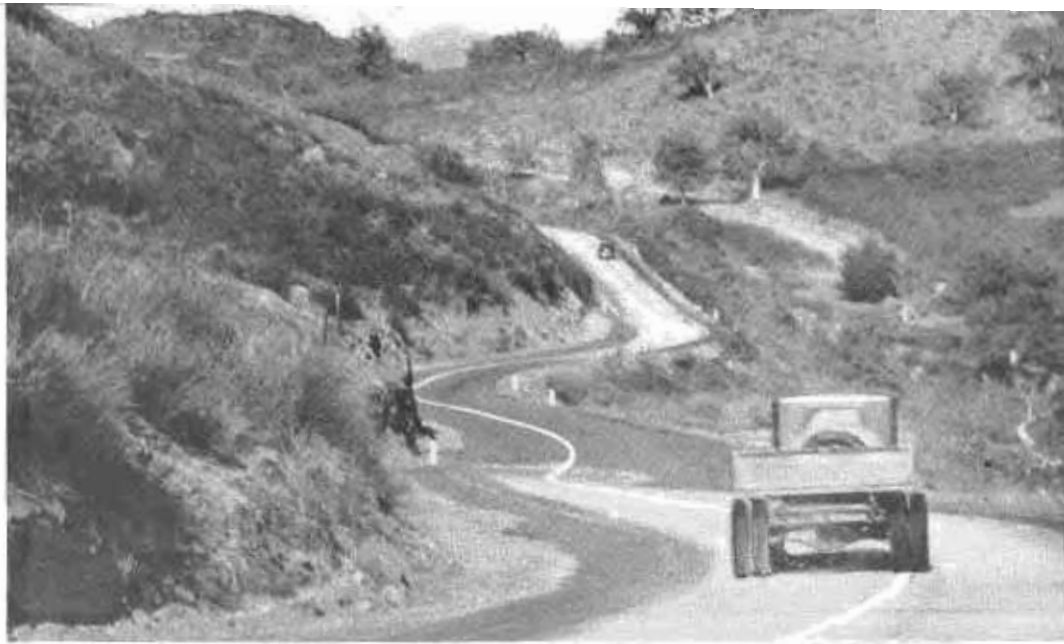
Floods occasionally block this main artery, after which the only outlet to the north is via U. S. 395, known as the Inland Route, which is a very low standard road, inadequate to handle even the normal traffic.

Congestion is occurring on the major highway entrances to the cities, due not only to the increase in highway traffic but also due to the adjacent roadside development which in turn retards traffic and increases the hazards.

Rights of way become increasingly expensive as the adjacent territory builds up. Many of the secondary roads are located on rights of way only forty feet in width, and delays in relocating such highways and securing adequate right of way widths add greatly to the ultimate expense for this item which again reduces the funds which might otherwise be available for construction.

Of the 491 structures in the district, 108 are posted for restricted

(Continued on page 16)





Scene at official opening and dedication of San Francisco-Oakland Bay Bridge Electric Railway Terminal Building in San Francisco.

Bay Bridge Terminal Dedicated

WITH a few formal words uttered at the dedication ceremonies held in San Francisco January 14, Director of Public Works Frank W. Clark turned over to Lieutenant Governor Ellis E. Patterson, representing Governor Culbert L. Olson, the State-owned Bay Bridge and State-built Bay Bridge terminal building and electric railway, the first railway ever to operate directly between Sacramento, Alameda County and San Francisco.

Director Clark said, "Lieutenant Governor Patterson, I, as State Director of Public Works, declare the San Francisco-Oakland Bay Bridge rail facilities completed for train operation and recommend acceptance by the California Toll Bridge Authority."

Lieutenant Governor Patterson,

representing Governor Olson, who is Chairman of the California Toll Bridge Authority, accepted the completed facilities for the Authority and turned the use of them over to the railroads for operation. Mr. Patterson said,

"On behalf of Governor Culbert L. Olson, Chairman of the California Toll Bridge Authority and member of the Authority, your recommendation is accepted and the California Toll Bridge Authority hereby assumes possession."

To the strains of "The Star Spangled Banner," and "I Love You, California," the National and Bear flags were then raised by the California Highway Patrol.

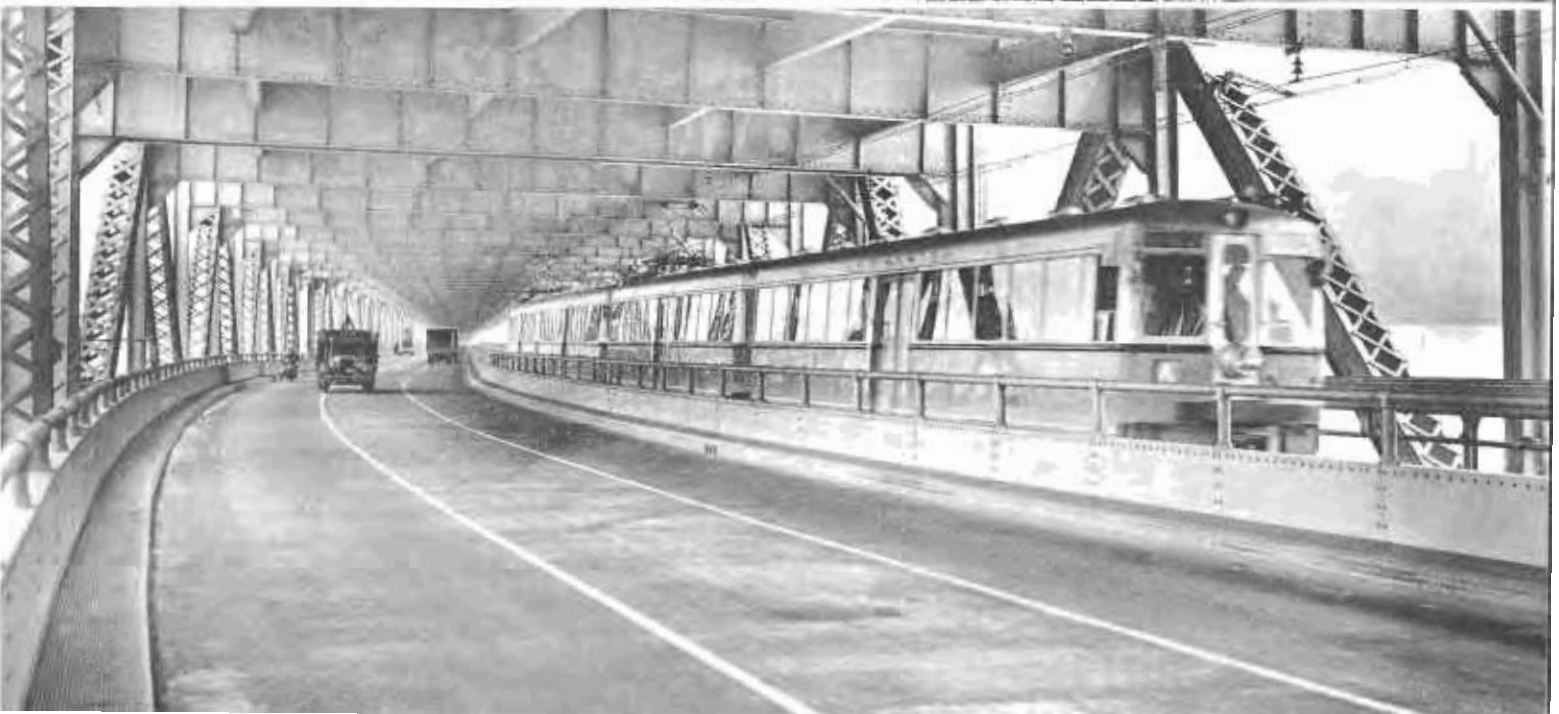
In completion of the formal steps necessary to the occasion Lieutenant Governor Patterson then turned to the

railroad representatives present and said:

"In accordance with the agreement between the California Toll Bridge Authority and Interurban Electric, Key System, and Sacramento-Northern, I formally place the use of these railway facilities in the hands of representatives of the railroads here today. I am certain, gentlemen, that it will be your policy to operate these facilities to the best interest of the public."

A. T. Mercier, president of Interurban Electric; Alfred J. Lundberg,

At Top—One of four passenger platforms on upper terminal level where trains on six tracks load and unload passengers. Center—Mezzanine concourse entered from street car ramp and ground floor waiting rooms. Bottom—Lower Bridge deck carrying train and truck traffic.



president of Key System, and H. A. Mitchell, president of Sacramento-Northern, then formally accepted the use of the facilities for their companies.

The ceremonies were held in front of the newly completed terminal building facing Mission Street in San Francisco with more than 1500 dignitaries from cities of northern California, Alameda and San Francisco counties participating before a great throng of citizens who came to witness the epochal event.

The legal and essential formalities concluded, the program continued with a number of notable speakers.

"C. H. Purcell, Chief Engineer of the Bay Bridge and its railway facilities, was introduced by Supervisor John Ratto of San Francisco, chairman of the San Francisco citizen committee for the celebration, acting as chairman of the day. Mr. Purcell was described by Mr. Ratto as "a man who has probably accomplished more for the San Francisco Bay Region as a whole in a shorter period of time than any single person" and "a man who has quietly shouldered tremendous responsibilities and who has executed these responsibilities with great skill and amazing success."

Mr. Purcell said, "Into this project have gone the skill and experience of the engineering profession—civil, electrical and mechanical. Great praise is due the staff of engineers employed by the State Department of Public Works on design and in the field. Also to Bridge Engineer Charles E. Andrew and to Engineer of Design Glenn B. Woodruff, who worked faithfully, conscientiously, and ably, special praise is due.

"Appreciation is also due the fine cooperation given by the American workmen employed on the project; by the contractors engaged in the construction of the facilities and by the railroads who will operate the system.

"To the Federal Government, through the Reconstruction Finance Corporation, and to city and county governments thanks are given for the invaluable aid given us."

Mayor Angelo J. Rossi of San Francisco welcomed the visiting Mayors. Among those who spoke

briefly were Mayor T. B. Monk of Sacramento; Dr. William McCracken, Mayor of Oakland; Edward N. Ament, Mayor of Berkeley; Henry A. Weichart, Mayor of Alameda; Oliver Ellsworth, Mayor of Piedmont; Earl Derry, Mayor of San Leandro.

Florence M. McAuliffe, special counsel for the California Toll Bridge Authority, read a telegram of regret from Jesse F. Jones, chairman of the Reconstruction Finance Corporation. The telegram, addressed to Charles H. Purcell, said:



FRANK W. CLARK
Director of Public Works

"I very much wish I could be present at the dedicatory ceremonies starting interurban service on the San Francisco-Oakland Bay Bridge. Again I am reminded that the design and construction of this bridge is one of the outstanding engineering feats of our generation. It is beautiful as well as being of great service and will stand a credit to all who had part in the great achievement. I extend hearty congratulations to San

Francisco, Oakland and California."

Howard J. Klossner, a director of the Reconstruction Finance Corporation, spoke for the Corporation; and H. R. Judah, chairman of the State Highway Commission and member of the California Toll Bridge Authority, gave a brief but impressive talk.

Frank C. MacDonald, general president of the State Building and Construction Trades Council of California, who was introduced by Director Clark, spoke on behalf of labor.

The 1500 guests had been brought to the ceremonies by Key System and Sacramento-Northern trains. Two six unit Key System trains left 22d and Broadway in Oakland at 10:30 a.m., traveling smoothly over the bridge and arriving at the San Francisco Terminal for the ceremonies at 11:15 o'clock. Labor representatives, contractors' representatives, and civic officials of Alameda and San Francisco counties were present.

A Sacramento-Northern train, originating at Chico, carried mayors and distinguished guests of the Northern California towns along the route. Members of the State Legislature, who had been invited by Governor Olson to attend, were among the guests.

More than 5,000 persons gathered in the plaza before the handsome new Terminal to listen to the ceremonies. After completion of the dedication program the building was opened to the public for inspection. Thousands wandered through the modern structure during the day and evening.

Operation and maintenance of the Bridge Railway is now in the hands of the railways, a board of governors having been named by the railroads for management of the facilities. Named were R. E. Hallawell, General Manager of Interurban Electric; and William P. St. Sure, Vice President of the Key System. F. E. Sullivan was appointed Superintendent of the Bridge Railway and Orman Lutz was named Business Manager by the Board.

The construction chronology of the Bay Bridge Electric Railway facilities is as follows:

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Terminal Plaza showing trolley car loop ramp to mezzanine level and street entrances for pedestrians and automobile passengers.



OFFICIAL GROUP—Left to right—Frank W. Clark, State Director of Public Works; Lieutenant Governor Ellis E. Patterson; Mayor William McCracken of Oakland; Mayor Angelo J. Rossi of San Francisco; John F. Hassler, City Manager of Oakland, and C. H. Purcell, Chief Engineer of Bay Bridge and its railway facilities.

Pacheco Pass Realignment Deletes 31 Curves, Steep Grades

By JNO. H. SKEGGS, District Engineer

THE NAME "Pacheco Pass" recalls to surviving pioneers a memory of long ago when Indians used to cross to and from the fertile valleys by a trail which in after years developed into a stage road. This road became the route of stages traveling between San Francisco and New Orleans. The stage route was along a short toll road in eastern Santa Clara County which paralleled Pacheco Creek near the summit of the pass.

by Merced and Santa Clara counties, would have been to marvel at the progress made in ease of transportation. This county road served the area for many years until the route was included in the State highway system.

The first modern road to be constructed by the State was entirely over new rights of way in this same general territory of the former trails and roads and was built on standards of construction in accordance with

day. The corresponding July count was 1020 and 592, respectively. This so encouraged civic bodies of adjacent cities that the plea was soon made for the State to pave the highway in order to alleviate the dust which prevailed here and along many of our cross laterals. Paving operations soon followed section by section until the greater portion of the road was surfaced as a modern highway.

The annual increase in vehicular



Map shows old toll road along Pacheco Creek, the existing road, realignment under construction and the proposed realignment.

Remains of an old toll station which later became a house of shelter for the weary traveler of the early 60's is all but destroyed. The elements have gradually reduced this remnant until the present day reveals little more than the stone masonry foundation which is now a familiar landmark to those who travel this road between the Bay area and the lower San Joaquin River Valley.

To have ridden a stage over the rough road of 1856, as compared with the first county road, later completed

the early activities of the State Highway Commission. The year 1924 saw the Pacheco Pass highway graded, surfaced with gravel, and opened to traffic. Motorists then had their first opportunity to travel over the pass on a new, modern mountain road in far less time than it was possible to cover but a few miles on the pioneer road.

Early traffic counts taken by the State following completion of the first State highway showed approximately a count of 300 vehicles for a December Sunday and 187 for Mon-

traffic and the development of commercial carriers has steadily increased the flow of traffic over Pacheco Pass until the traffic count of July, 1937, indicated a Sunday volume of 2764 vehicles and a Monday count of 1611 vehicles. Heavy traffic of this volume over a relatively new cross-state lateral through sparsely settled country has opened a new avenue of fast transportation in central California.

To modernize this route to present day standards in order to cope with increasing heavy traffic there re-



View of construction operations on section of Pacheco Pass realignment showing cuts and fills eliminating curves on upper level.



Several of the thirty-one sharp curves on Pacheco Pass mountain highway being eliminated by realignment project.



maintained a six-mile section to be constructed in District IV between the north fork of Pacheco Creek and the summit. Funds within the current biennium in the amount of \$398,817 were sufficient to reconstruct the westerly 2.6 miles of the incomplete six-mile section. It is within this portion that heavy grades and sharp curvature prevail.

BIG EXCAVATION JOB

To remedy this condition a contract was recently awarded to Granfield, Farrar & Carlin of San Francisco for reconstructing 2.6 miles of highway to be graded a normal roadbed of 36 feet and surfaced with gravel base and armor coat 22 feet wide, the seven-foot shoulders to be oiled treated. The principal item of the contract involves moving approximately 500,000 cubic yards of excavation. This together with some 35 other items of construction which include two bridges and six medium-sized arches are the major work features.

The heavy work involved in the contract extends over a period of 270 working days and the tentative date for completion is set for early in October of the current year, after which the many hazards and sharp curves of the old road will become but a memory.

The great benefit to be gained when this new 2.6 miles of road is completed may best be visualized by comparing the standards of the old with the new.

Old Highway

Length	3 46 miles
Total curvature	2,313 degrees
No. of curves.....	39
Minimum radius.....	100 feet
Maximum grade	7 percent

New Highway

Length	2.63 miles
Total curvature	295 degrees
No. of curves.....	8
Minimum radius.....	850 feet
Maximum grade	6½ percent

It is readily noted that the new highway will save .83 of a mile in distance in this short length of road, and that the total curvature is re-

(Continued on page 27)

Two of the six steel and concrete culverts involved in the Pacheco Pass realignment are shown under construction. Contract includes two bridges.

"Highways of Tomorrow" Theme of Road Builders' Conventions in S. F.

WITH GOVERNOR Culbert L. Olson participating in the opening sessions, the American Road Builders Association and the Western Association of State Highway Officials, meeting concurrently in San Francisco during "Construction Week," March 6-9, will focus the 1939 highway spotlight on the Exposition City.

Mayor Angelo J. Rossi of San Francisco; Frank W. Clark, Director of Public Works of California; Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads; Charles H. Purcell, California State Highway Engineer and representative of the American Association of State Highway Officials; H. G. Palmer, president of the Associated General Contractors, and Murray D. Van Wagoner, president of the American Road Builders' Association and State Commissioner of Highways of Michigan are also programmed as speakers.

On March 7, the American Road Builders and the Western Association of State Highway Officials will hold a joint meeting in the Civic Auditorium in San Francisco, convention headquarters. Other meetings to be held concurrently during "Construction Week" are those of the Associated General Contractors, Associated Equipment Distributors and the California Association of County Supervisors. These organizations will hold joint feature meetings on Tuesday and Wednesday evenings, March 7-8, on Treasure Island.

"The Road Builders' Convention will be particularly interesting at this time for its theme will be 'Highways of Tomorrow,'" said Charles M. Upham, Engineer Director of the Road Builders' Association. "Our association has for some time been making a study for a national system of highways to adequately carry present day traffic, something in the nature of a super-highway system.

"It is conservatively estimated that if our present highway system could be modernized so as to incorporate now known safety features, traffic accidents would be reduced 50 per cent. One highway authority has



CHARLES M. UPHAM

estimated as high as 75 per cent. Therefore, the program for 'Highways of Tomorrow' will be of interest to everyone.

"Soil stabilization is a subject of particular interest to highway officials and two entire sessions of the program will be devoted to it—embracing such phases as: Stabilometer data in the design of flexible road surfaces; the use of asphalt emulsions, calcium chloride, cement, and tar in soil stabilization; stresses in subgrade soils under rigid type pavements; stabilization principles in fill construction, and new developments in equipment for soil stabilization.

"At the General Technical Session on Thursday morning, March 9, reports will be made on: Design, construction and heavy grading, drainage and other subjects of current interest.

"The Safe Highway Sessions will include reports on: analysis of accident data; highway intersections and grade crossings; highway illumination; skid resistant qualities of roadway surfaces; alignment, grade and

right-of-way; guard rail; cross sections and roadside development; treatment of icy pavements and public education.

"Special sessions will be devoted to problems concerning municipal officials, county officials and other specialized groups.

"The Highway Contractors Session will include papers on fair trade practices, P.W.A. contracts and several other subjects of particular interest to contractors.

"Another interesting session will be devoted to the Pan American Highway. In addition the convention program will include meetings of particular interest to manufacturers of road building machinery and materials.

"The highway exhibit of the American Road Builders' Association will be held in the San Francisco Civic Auditorium. Already the outstanding manufacturers have made arrangements to display their equipment, including air compressors, crushers, mixers, engines, trucks, tractors, and various other items. One interesting exhibit will be an operating model of a complete asphalt plant. Another will be a truck mixer model arranged in such a manner as to make the entire operation visible. Many companies are arranging moving pictures showing their machines in operation.

"The convention forum is one in which road builders will be interested. It will present a review of what has taken place in highway development as well as present and future needs. There road builders may discuss their mutual problems and become acquainted with new ideas.

"Another inducement to attend this A. R. B. A. convention is the opportunity to see the Golden Gate Exposition. It will be in full swing at that time. Schedules may be so arranged as to attend convention sessions and the Highway Exhibit and at the same time get in a trip to Treasure Island.

"The San Francisco Hosts Committee, headed by State Highway En-

(Continued on page 24)

Detail Of Major Project Allocations Budgeted For

Items and amounts in parentheses indicate projects lie in two counties that will share the expenditure allocation shown opposite only one of the counties.

County	Route	Location	Approximate mileage	Proposed expenditure for construction and right of way
Alameda	69	6th and Fallon to Fruitvale Avenue	2.4	\$860,000
Alameda	107	Near Niles—Niles Creek Bridges and Approaches	1.0	111,000
Alameda	108	Sunol to Livermore (portions); Arroyo del Valle Creek		150,000
(Alameda-San Francisco)	5-68	San Francisco-Oakland Bay Bridge (see San Francisco)		(1,000,000)
Alpine	23	Centerville Bridge	0.3	35,000
Amador	97	Jackson Creek Bridge and Approaches	1.5	85,250
Butte	3	South Boundary to Biggs Road	7.4	81,000
Butte	3	Pine Creek to North Boundary	0.4	21,000
Butte	3	17 Bridges between Marysville and Chico		22,500
Butte	87	Campbell Overflow Bridges and Approaches	0.2	18,700
(Butte-Glenn)	45	1 mile east Cherokee Canal to Sacramento River	10.0	75,000
(Butte-Yuba)	87	½ mile south to ¾ mile north Butte County Line (see Yuba County)	1.3	(150,000)
Calaveras	24	At Line Creek	0.8	33,500
Calaveras	65	San Andreas to Angels Camp (portions)	3.4	171,350
Colusa	15	Long Bridge to Colusa	2.4	90,000
Colusa	15	3.4 miles east Williams to Long Bridge	2.4	25,000
(Colusa-Yolo)	50	Cache Creek Bridge northerly (portions)		75,000
El Dorado	11	Upper Truckee River Bridge and Approaches	0.3	42,500
El Dorado	11	2 miles east Phillips to 3 miles east Meyers	2.3	18,000
(El Dorado-Sacramento)	11	3¼ miles east Folsom to 2 miles east Clarksville (see Sacramento)	5.5	(295,000)
Fresno	4	Fowler to Selma	5.0	204,000
Fresno	41	1 mile north to 1½ miles south Firebaugh; 2 canals	2.9	146,200
Fresno	41	Squaw Valley to Forest Boundary	3.0	153,000
Fresno	41	Boyden's Cave to Deer Cove	9.0	20,000
(Fresno-Madera)	125	San Joaquin River Bridge and Approaches	2.0	235,000
(Glenn-Butte)	45	1 mile east Cherokee Canal to Sacramento River (see Butte County)	10.0	(75,000)
Humboldt	1	North Scotia Bridge—Eel River	0.7	497,000
Humboldt	1	Robinson Ferry Bridge—Eel River	1.0	656,500
Humboldt	1	At Stegemeyer Bluff	0.4	10,000
Humboldt	1	Elks Creek Bridge near Miranda		51,000
Humboldt	46	Klamath River Bridge at Orleans		159,000
Humboldt	46	Weitchpec to Orleans (portions)		81,000
(Humboldt-Trinity)	20	Willow Creek to White's Bar (portion) (see Trinity County)		(240,000)
Imperial	26	Central Main Canal Bridge		15,000
Imperial	27	East Highline Canal to Gray's Well	24.5	250,000
Imperial	202	3 miles east Calexico to East Highline Canal	8.4	42,000
Inyo	23	Olancha to Cottonwood Creek	9.5	97,000
Inyo	23	3.3 miles north Alabama Gate to Independence	7.0	73,750
Inyo	23	2 miles south of Big Pine to Big Pine	2.0	34,850
Kern	4	Ft. Tejon to foot Grapevine Grade	5.7	510,000
Kern	23	5 miles north Rosamond to Mojave	7.8	94,190
Kern	23	12 miles north Mojave to Ricardo	13.6	62,630
Kern	58	Keene to Cable (portions)	5.0	366,000
Kern	58	Bear Mountain Ranch easterly	5.0	20,000
Kern	142	Beardsley Canal Bridge		20,000
Kern	58	Route 143 to Sivert	7.1	165,000
(Kern-Tulare)	129	Bakersfield to Ducor (portions)		110,000
Lake	49	Putah Creek to Route 15 (portions)		102,000
Lake	15	Clover Creek and Middle Creek Bridges		31,500
Lassen	28	Pit River and Overflow Channels—Bridges		81,000
Lassen	29	Milford to Doyle (portions)	6.0	112,000
Lassen	73	Madeline to North Boundary (portions)	5.3	27,500
(Los Angeles-Ventura)	2	Ventura Boulevard; Calabasas to Conejo Grade (portions)		237,500
Los Angeles	60	Walnut Canyon to Winter Canyon (portions)	6.0	320,000
Los Angeles	23	Placerita Canyon to Solamint	+3.5	350,000
Los Angeles	9	San Gabriel River Bridge Approaches		25,000
Los Angeles	205	Arroyo Seco Parkway (portions)		2,135,000
Los Angeles	26	Ramona Boulevard; Mission Road to West Covina (portions)		900,000
Los Angeles	26	Aliso Street separation at Mission Road		120,000
(Los Angeles-Ventura)	79	Castaic Junction to Santa Paula; Santa Paula and Piru Creek Bridges		300,000
Los Angeles	158	Sepulveda Boulevard; Centinella to Jefferson Boulevard	0.6	50,000
Los Angeles	172	3d Street; East city limits to Fetterly Avenue	1.7	280,000
Los Angeles	175	Strawberry Street; Artesia Avenue; Alameda to Normandie	5.0	360,000
Los Angeles	169	Bellflower Boulevard; Spring Street to Centralia	2.0	75,000

Construction of Highways In 91st-92nd Fiscal Years

Items and amounts in parentheses indicate projects lie in two counties that will share the expenditure allocation shown opposite only one of the counties.

County	Route	Location	Approximate mileage	Proposed expenditure for construction and right of way
Los Angeles	61	Verdugo Road; Glendale City limit to Foothill Boulevard	0.8	\$125,000
Los Angeles	165	Figueroa Street (portions)		425,000
Los Angeles	162	Santa Monica Boulevard; La Brea to Fairfax (cooperative)		80,000
Los Angeles	173	Olympic Boulevard (portions)		800,000
(Los Angeles-Orange)	166-174	Firestone-Manchester Boulevard (portions)		535,000
Los Angeles	61	Angeles Crest Highway; Cloudburst Summit to Mt. Islip		430,000
Los Angeles	161	Colorado Boulevard and El Modena; east city limits west		160,000
Los Angeles	156	Topanga Creek Bridge and Approaches		24,000
Madera	4	North Boundary to 2 miles south	2.0	47,000
Madera	4	Madera to 1/2 mile south Cottonwood Creek; Bridge	2.9	200,000
Madera	125	Friant-Madera Road to 1/2 mile north Kelshaw Corners	10.9	60,000
(Madera-Fresno)	125	San Joaquin River Bridge and Approaches (see Fresno County)	2.0	(235,000)
Marin	1	Grand Avenue in San Rafael to San Quentin Wye	1.6	869,000
Mariposa	18	Mariposa to 2.5 miles north	2.5	113,750
Mendocino	1	Outlet Creek to Reeves Creek	4.5	47,000
Mendocino	1	Crawfords Ranch to Ukiah; Robertson Creek	7.0	384,000
Mendocino	1	Haagneys to Bridges Creek Slide	1.1	99,000
Mendocino	16	Russian River Bridge		121,000
Mendocino	48	Flynn Creek to Navarro; Lazy Creek, Yorkville (portions)		101,500
Mendocino	56	Russian Gulch Bridge		172,500
Merced	4	Merced to Black Rascal Creek; Bear and Black Rascal Creek	1.5	254,500
Merced	4	South Boundary to 2.6 miles north	2.6	76,900
Merced	18	Merced to 5 miles east (portions)	5.0	80,000
Merced	32	7 Bridges east of Los Banos		46,000
Modoc	28	4 miles north Rush Creek to Pit River	7.7	230,000
Mono	40	East Boundary Yosemite Park to Gardisky's	2.5	68,000
Mono	96	Route 23 at Bridgeport, East Walker River Crossing	6.8	30,000
Mono	13	West Walker River Crossing to Route 23; 2 Bridges	2.3	75,050
Mono	111	4 miles south of Grant Lake to Grant Lake	4.0	69,850
Mono	13	Leavitt Meadow, Soda, Silver and Wolf Creeks		17,250
Monterey	2	South Boundary to Bradley; Salinas River Bridge	7.3	627,900
Monterey	2	2 miles south Greenfield to Soledad Bridge (portions)	5.0	198,300
Monterey	56	South Boundary to Sur River (portions)		80,000
Monterey	56	Big Sur River Bridge		51,500
Monterey	10	Peachtree Valley to Mustang Grade	5.0	213,500
Nevada	37	Donner Summit to 1/4 mile west of Donner Lake	1.0	36,000
Nevada	17	1/2 mile south to 1.7 miles north Rattlesnake Creek	2.2	131,000
(Nevada-Placer)	37	Hampshire Rocks to 1/2 mile west Soda Springs (see Placer County)	6.3	(75,000)
(Nevada-Placer)	38	Tahoe City to Truckee Wye (see Placer County)	14.6	(161,000)
Orange	2	South Boundary to Segunda Deshecha (portions)		150,000
Orange	184	Main Street Extension; Route 60 to Route 43; Newport Bay Bridge	6.4	200,000
Orange	43	Santiago Creek Bridge on Tustin Avenue		55,000
Orange	179	Through Garden Grove; Nutwood Avenue to Ninth Street	0.9	20,000
Orange	64	Route 2 to 1/2 mile easterly	0.5	47,000
(Orange-Los Angeles)	166-174	Firestone-Manchester Boulevard (portions) (see Los Angeles County)		(585,000)
(Placer-Nevada)	37	Hampshire Rocks to 1/2 mile west Soda Springs	6.3	75,000
Placer	37	Colfax Overhead to 0.7 miles north	0.7	55,000
Placer	17	Roseville to 0.6 mile east	0.6	17,500
(Placer-Nevada)	38	Tahoe City to Truckee Wye	14.6	161,000
Placer	39	Tahoe Wye through Tahoe City	1.0	15,000
Riverside	26	Junction Route 19 to 8th Street, Banning	5.8	213,025
Riverside	26	Banning to Junction Route 187	11.6	489,775
Riverside	19	Riverside to 3 miles west	3.0	231,000
Riverside	77	Temescal Canyon and Horse Thief Creek and Approaches	1.0	86,200
Riverside	187	Palm Springs to Cathedral City (cooperative)	9.5	188,500
Riverside	64	10 miles west of Hemet	3.5	59,500
Riverside	64	1/2 mile east Junction Route 146 to Blythe	2.2	63,000
Sacramento	3	American River to North Sacramento at Underpasses		44,000
(Sacramento-El Dorado)	11	3 1/2 miles east Folsom to 2 miles east Clarksville	5.5	295,000
Sacramento	11	Isleton to Walnut Grove	8.0	87,500
(Sacramento-San Joaquin)	53	Potato Slough to Mokelumne River and Bridge (see San Joaquin County)		(576,000)
San Benito	22	San Benito River Bridge		12,000
(San Benito-Santa Clara)	2	Sargent Overhead to 3 miles south Pajaro River; Pajaro River and S. P. R.R. Separation (see Santa Clara County)	1.9	(314,000)

DETAIL OF MAJOR PROJECT ALLOCATIONS BUDGETED FOR

Items and amounts in parentheses indicate projects lie in two counties that will share the expenditure allocation shown opposite only one of the counties.

County	Route	Location	Approximate mileage	Proposed expenditure for construction and right of way
San Bernardino	26	Redlands easterly (portions)	1 6	\$95,200
San Bernardino	9	Lytle Creek Bridge		25,000
San Bernardino	9	Malaga Grade Separation		15,000
San Bernardino	31	Mojave River to Junction Route 58	0 9	30,900
San Bernardino	43	Santa Ana River Bridge		83,500
San Bernardino	207	Route 190 to 5.1 miles north; City Creek	5 1	396,000
San Bernardino	190	Power House to Igo	3 0	106,400
San Bernardino	188	Mt. Anderson to Crestline	1 0	78,200
San Diego	12	La Mesa Overhead to El Cajon	4 6	284,000
San Diego	2	Las Flores Underpass to Onofre Overhead	7 2	15,000
San Diego	195-78	Lake Henshaw to Santa Ysabel	7 9	501,500
San Diego	2	International Boundary to 1 mile north San Ysidro	2 9	203,000
San Diego	198	San Diego River Bridge at Lakeside		187,000
San Diego	199	Coronado Heights line change	0 5	32,500
San Francisco	56	Funston Avenue Approach to Golden Gate Bridge	1 5	357,000
(San Francisco-Alameda)	5-68	San Francisco-Oakland Bay Bridge		1,000,000
(San Joaquin-Sacramento)	53	Potato Slough to Mokelumne River and Bridge		576,000
(San Joaquin-Stanislaus)	110	Vernalis to Gates Road	7 6	140,000
San Joaquin	97	East of Clements to 1.5 miles north of Mokelumne River	1 5	103,300
San Luis Obispo	2	Miles Station Bridge and Approaches		295,200
San Luis Obispo	56	Santa Maria River Bridge		12,000
San Luis Obispo	56	Old Creek Bridge and Approaches	0 8	53,400
San Luis Obispo	56	Torro Creek Bridge and Approaches	0 5	45,500
San Mateo	68	South San Francisco to Burlingame-Structures		40,000
San Mateo	2	Broadway-Redwood City to South Boundary	4 5	661,800
San Mateo	56	Tunitas to Lake Lucerne (portions); San Geronimo	6 0	340,000
Santa Barbara	2	Oreila to Tajiguas Creek; Refugio Creek	2 6	276,000
Santa Barbara	2	Zaca to 3 miles south; Zaca Creek	3 2	304,900
Santa Barbara	2	Eagle Creek and Dos Pueblos Creek and Approaches	1 2	153,600
Santa Barbara	2	Sheffield Drive to San Ysidro Road	1 2	235,000
Santa Clara	5	Oaks to Los Gatos	1 6	353,500
(Santa Clara-Santa Cruz)	5	Inspiration Point to The Oaks		100,000
(Santa Clara-San Benito)	2	Sargent Overhead to 0.3 miles south Pajaro River	1 9	314,000
Santa Clara	42	Austin Corners line change	1 3	115,000
(Santa Cruz-Santa Clara)	5	Inspiration Point to the Oaks (see Santa Clara County)		(100,000)
Santa Cruz	116	Waterman Gap	1 1	53,600
Santa Cruz	56	Watsonville to Rob Roy Junction	7 3	485,000
Shasta	3	Pacific Highway relocation at Shasta Dam	11 6	430,000
Shasta	3	Olney Creek Bridge		15,000
Shasta	3	S. P. Subway to Hill Street	2 0	123,000

\$30,286,000 Estimated Cost to Modernize Roads in District XI

(Continued from page 5)

loads and speeds, and excessive maintenance expenditures are required in order to keep them in safe condition for even the restricted loads. Many of the bridges are too narrow, thus creating serious traffic hazards.

Similarly the obsolete or inadequate highways require heavy maintenance expenditures, consequently diverting funds to maintenance which should be conserved for construction and any other more urgent needs.

The following tabulation indicates

the probable cost to improve the present State highway system in District XI to adequate standards to serve present traffic. This estimate contemplates the continued utilization of stage construction, using bituminous treated surfacing on a large percentage of the secondary highway system for the reason that the amount of traffic on secondary roads does not warrant the use of asphalt concrete, cement concrete or other higher type surfacing.

	Miles	Estimated Cost	Total
Roads should be rebuilt	268.6	\$4,674,000	
Roads should be widened	220.3	3,684,000	
Roads should be relocated	312.3	15,018,000	
Total roads requiring Imp.	801.2		\$23,376,000

CONSTRUCTION OF HIGHWAYS IN 91st-92nd FISCAL YEARS

Items and amounts in parentheses indicate projects lie in two counties that will share the expenditure allocation shown opposite only one of the counties.

County	Route	Location	Approximate mileage	Proposed expenditure for construction and right of way
Siskiyou	3	Bailey Summit to State Line	1 4	\$150,000
Siskiyou	72	Route 3 at Weed to 1.5 miles north	1 5	71,000
(Solano-Yolo)	6	North of Dixon to 1 mile east Davis; Putah Creek	7 8	385,500
Solano	205	Sears Point Toll Road payment		85,602
Sonoma	1	Walls to junction Stony Point Road	3 2	327,000
Sonoma	56	Russian Gulch line change and Bridge	0 8	61,000
Sonoma	56	Timber Cove Creek Bridge and Approaches	0 3	18,000
Stanislaus	4	South Approach Turlock Overhead	0 3	11,500
Stanislaus	4	Keyes to Hatch Crossing	6 0	321,250
(Stanislaus-San Joaquin)	110	Vernalis to Gates Road (see San Joaquin County)	7 6	(140,000)
Tehama	7	Proberta to Red Bluff Subway; Oat, Coyote and Red Bank Creek	6 2	270,000
Tehama	3	Red Bluff to 5 miles north; Dibble, South Fork Blue Tent Creek	5 0	270,000
(Trinity-Humboldt)	20	Willow Creek to Whites Bar (portions)		240,000
Trinity	20	Oregon Mountain and Helens to Weaverville (portions)	15 0	183,000
Tulare	4	Kings River Bridge to North Boundary	1 3	62,700
Tulare	10	West City Limits Visalia to Route 10	1 3	103,000
Tulare	135	Tule River Bridge and Approaches		22,000
(Tulare-Kern)	129	Bakersfield to Ducor (portions) (see Kern County)		(110,000)
Tuolumne	13	Keystone to Jamestown (portions)	4 0	50,000
Tuolumne	65	Columbia Wye to Sonora; Woods Creek Bridge	2 5	174,000
Ventura	2	Springville to Beetox (portions)	2 0	79,000
Ventura	60	Point Mugu to Little Sycamore Creek (portions)		185,000
(Ventura-Los Angeles)	2	Ventura Boulevard; Calabasas to Conejo Grade (portions) (see Los Angeles County)		(237,500)
(Ventura-Los Angeles)	79	Castaic Junction to Santa Paula; Santa Paula and Piru Creek Bridges (see Los Angeles County)		(300,000)
Ventura	2	Bluffs north of Seacliff		45,000
Yolo	6	West end Causeway Structure		75,000
Yolo	6	1 mile east of Davis to Swingle	3 0	200,000
Yolo	7	Route 50 at Woodland to Cache Creek	3 7	152,000
Yolo	90	Madison to Dunnigan (portions)	4 0	101,500
(Yolo-Solano)	6	North of Dixon to 1 mile east of Davis (see Solano County)	7 8	(385,500)
(Yolo-Colusa)	50	Cache Creek Bridge northerly (portions) (see Colusa County)		(75,000)
Yuba	15	0.3 mile west Bruces Corners to Dry Creek	1 1	34,500
(Yuba-Butte)	87	½ mile south to ¾ mile north Butte County Line (see Butte County)	1 3	150,000

	No.	Estimated Cost
Bridges to be rebuilt or widened	66	\$516,000
Bridges—new	232	4,394,000
Total bridges required or to be improved	298	\$4,910,000
Rights of way		1,500,000
Safety devices—guard rails, islands, signals, etc.		500,000
Grand total		\$30,286,000

During the past four years the average annual expenditure in District XI, for major construction, has been \$1,400,000. On that basis and unless some additional financing is provided it will require 21

years to finance the rather limited improvements above contemplated, assuming that the mileage in the State Highway System remains the same and that the maintenance costs will not increase because of this extended delay.

It is quite evident also that during the 21 years necessary for accomplishment of the improvements as outlined, traffic demands will increase and additional development will be necessary to provide for same.

Reasonable progress demands a program of construction approximately three times that which now seems possible.

We know a fellow who's so mean, he not only pulls the wool over his girl's eyes, but it's ninety per cent cotton.

BUDGET FOR MAJOR PROJECTS \$28,066,102

(Continued from page 2)

the coming biennium, it will be necessary to expend on the Federal aid system about \$16,000,000 or 64 per cent of Division of Highways construction funds, exclusive of grade crossings, as these Federal funds must be matched with State funds.

The Federal aid system represents 6150 miles or 44 per cent of the total State highway mileage, which means that there will remain but 36 per cent of construction funds to cover construction on 56 per cent of the State system.

"I hear Cupid almost got you last week."
"Yes; I had an arrow escape."



Channelization Islands on Divided Highway link of U. S. 99 relocation in Selma have 6 inch recessed curbs.

Selma Divided Highway Opened

By E. T. SCOTT, District Engineer

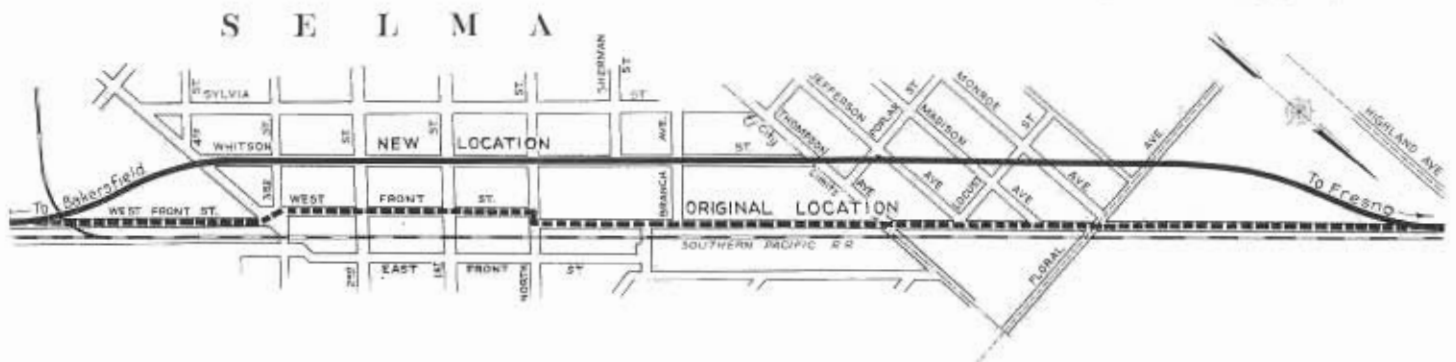
BACK IN 1913 when the State first constructed a highway to connect with West Front Street through the city of Selma, that ancient but faithful beast of burden, the horse, was very much in evidence. Early traffic counts taken in the vicinity revealed the fact that the horse outnumbered his new rival, the motor vehicle. The first count indicated 225 automobiles, 11 auto trucks and 328 horse-drawn vehicles.

The 60-foot right of way and the two-lane pavement along West Front Street was ample to carry the traffic at that time. The fact that there was an abrupt jog in the highway at McCall Avenue and another jog at North Street, together with two spur track crossings a little farther to the north, was not of much concern. By the time the horse-drawn vehicles had dwindled to 4 in 1928 the autos and trucks had increased

to 3869 and 455, respectively. The stretch of highway through Selma had become a "bottleneck" and the jogs and spur crossings only aggravated the situation. The last ten years brought an increase of 53 per cent in automobiles and 140 per cent increase in trucks.

Studies were made to determine the most practical way of relieving the congestion through Selma. Busi-

(Continued on page 26)





Two views of Divided Highway on relocation of a short link of U. S. 99 in city of Selma. Separation strips are bordered by six inch curbs recessed and painted white to reflect headlight beams.

Pinole Grade Crossing Project Presents Many Difficulties

By E. L. WALSH, Assistant Bridge Construction Engineer

FOR the past four months motorists traveling from the San Francisco Bay area to the east and Sacramento Valley on U. S. 40 have been detoured around extensive construction operations in the town of Pinole. Because of the scope of the project, which extends for a distance of 3500 feet along the highway, many people have been unable to visualize the exact purpose of the work and how the completed project will look.

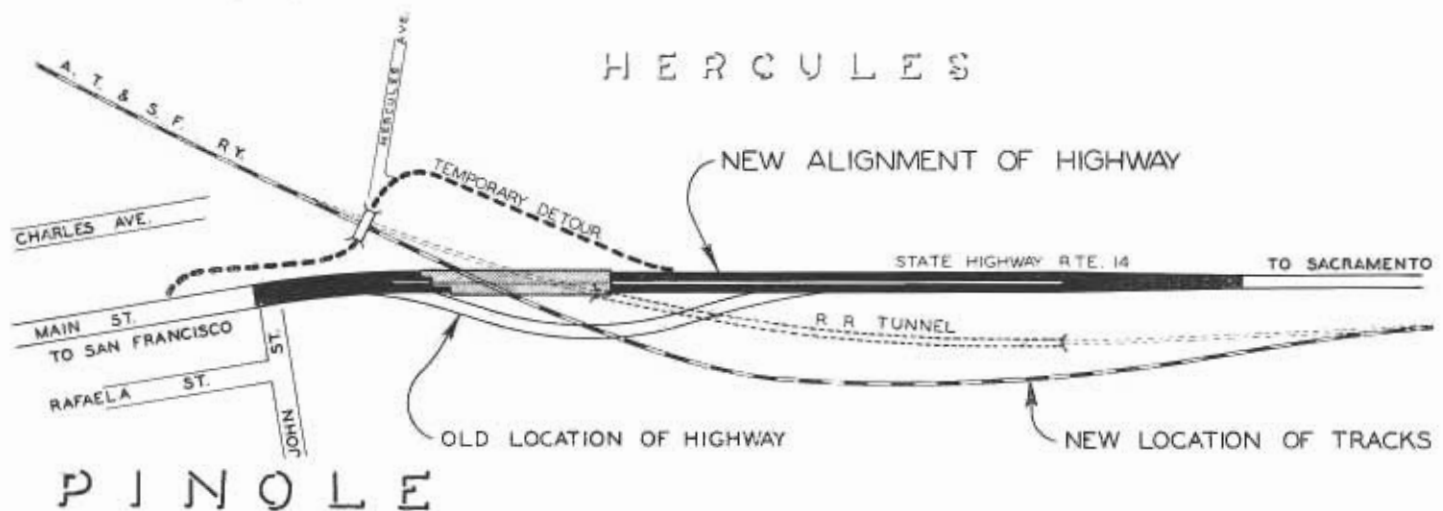
The original highway alignment utilized the Santa Fe Railroad tunnel as a means of crossing the railroad tracks. The old highway, which was

the removal of a row of eucalyptus trees which had been planted as an added protection in case of an explosion in the plant. It was necessary to readjust the alignment in order to cut down as few of these trees as possible.

The most satisfactory separation of grades involved not only the realignment of the highway, but the realignment of approximately 3500 feet of railroad track. The scheme of relocating the railroad track by means of an open cut in lieu of the existing tunnel was adopted because such a scheme can be accomplished with as little interference as possible with

and thin bedded shales that permitted speedy removal by adequate equipment.

The cut was excavated on 1:1 slopes, except in the slide area, where it was necessary to excavate on a 2:1 slope. As insurance against future slides, in certain areas in the cut where the section was excavated at a 1:1 slope, there were built two horizontal benches about 20 feet wide—one approximately 20 feet from the top and the other about 40 feet from the top. To stabilize the railroad roadbed, an elaborate subdrainage system, consisting of a line of 8-inch and 10-inch



within the limits of acceptable standards of construction at the time it was built, crossed over the top of the tunnel at the easterly entrance to the town of Pinole. The condition of the old timber-lined tunnel was such that the railroad company found it necessary either to reline the tunnel or relocate the roadbed in open cut.

Preliminary studies to effect this improvement involved many difficulties because of the expense of relocating the railroad track and because of the close proximity to the nitroglycerine plant of the Hercules Powder Company. The realignment involved

either highway or railroad traffic. The day-lighting and relining of the existing tunnel could not have been accomplished safely without removing train service for a period of thirty days. In making the relocation of the railroad track, it was also necessary to lower the railroad grade in order to avoid changing the highway grade in front of the developed property through the town of Pinole.

The railroad open cut, over 2700 feet in length and reaching a maximum depth of 90 feet, contained over 400,000 cubic yards of material. The material consisted of soft sandstone

perforated pipe, was laid longitudinally on each side of the roadbed, with transverse pipe at intervals of 20 feet.

The old highway alignment consisted of two 750-foot radii curves 100 feet of tangent, and a 1500-foot radius curve, all reversing. The change will increase the sight distance by substituting one curve of 2000-foot radius for the existing three reversing curves. It will also make possible an improved approach condition to the town of Hercules. The old approach to the one major industry of the town was over an old wooden bridge across the

(Continued on page 28)



Two views of extensive operations involved in realignment near Pinole of a link of U. S. 40 carrying heavy traffic between San Francisco and Sacramento, owing to the abandonment of a tunnel by the Santa Fe Railroad and relocation of route in an open cut. The existing highway crosses over the top of the tunnel. Its realignment on a straighter line will cross the railroad cut on a bridge. Upper photo shows highway detour and bridge operations without halting train or motor traffic. Below—Bridge construction near tunnel. New tracks will swing under this section of bridge permitting other half to be built.

Snow Plows Kept in Communication By Novel Radio Equipment

By T. H. DENNIS, Maintenance Engineer

ONE of the most difficult problems faced by highway maintenance forces in their annual fight to maintain an open road in the snow country is the lack of adequate communication with the men at the front.

With the first storm, wires go down in many sections, and are not repaired until Spring. In other locations, communication facilities are either inadequate, or nonexistent. Messenger service is impossible over blocked highways. In short, communication channels are most inadequate when snow removal crews need them the most.

A serious aspect of the failure of communication is lack of advice at the entrances to the storm area as to what roads are traversable. Lines of cars are held needlessly long at the barricades, or worse, are released too soon. When snow is drifting, conditions may change in thirty minutes, often resulting in many cars being trapped, unable to move either way.

PLAN FOUND FEASIBLE

The situation became so critical at the time of the heavy storms last winter that it was decided to investigate the possibility of using radio to supplement the existing channels of communication. In March a preliminary estimate indicated that the plan was feasible, and in August a detailed study of the system in use by the State of Washington led to a decision to equip at least one highway district in time for the snows of this winter. We are indebted to Washington for the splendid cooperation they gave us.

Highway District II has approximately 25 per cent of the snow removal road mileage, and maintains the main north and northeastern gateways to the State. It was decided to establish radio stations at the District Office in Redding, and at each superintendent's headquarters, as well as on all rotary snow plows.

A test car was equipped with radio in August and tests were made to provide data on which to base estimates of the kind of equipment and power required to provide reliable communication between the plows and their base, and between Redding and the maintenance stations. Not only are the air-line distances great in District II—105 miles from Redding to Alturas, 140 miles from Yreka to Quincy—but the rough terrain hides sections of highway in deep canyons making radio reception difficult.

DUPLICATE TRANSMITTER SETS

The specifications for the equipment, written in September, covered the following types of transmitters: 50-watt telephone and telegraph sets for Mt. Shasta City, Burney, Alturas, Mineral, Susanville, Quincy and Pulga. These sets are designed to work on either standard house current of 110 volts, 60 cycles, or on a 12-volt truck battery. The change-over is almost instantaneous, involving only the insertion of the power plug into another socket. These transmitters are duplicates, in size and controls of the snow plow sets.

Transmitters for the plows operate on telephone only, with a power of 50 watts. The power is supplied from the battery of the plow, high voltages being developed by a genemotor. So efficient is the design of these 50-watt transmitters that the drain on the battery, while transmitting, is less than the maximum charging rate of the generators on the plows. The transmitters are mounted on rubber washers to minimize shocks, and are practically waterproof.

The transmitters at Yreka and Redding are of 200 watts on the voice frequency and 350 watts on telegraph to insure constant communication with plows in the deep and winding Sacramento River Canyon. If experience this winter shows this to be unnecessary it is probable that

the Yreka transmitter will be replaced with the standard 50-watt set, and the larger unit moved to another district office.

SPEAKERS IN PLOW CABS

Receivers are of the fixed frequency type, permanently tuned to the assigned frequencies of 2726 kilocycles for voice and 3190 kilocycles for telegraph. Those in the stations have speakers mounted in them, while rotary plow receivers, being of remarkably small size, utilize a separate speaker mounted on the wall of the cab. The station receivers can be changed from 110-volt a.c. to 12-volt d.c. operation by turning one panel knob. The rotary plow receivers are, of course, for 12-volt operation only.

One of the difficulties encountered in the design of these stations was to plan efficient antennae for the land stations and the mobile units. It was found that there was a fine stand of red fir timber at various locations in the district, so at five of the stations three 100-foot poles were erected in the form of a triangle.

At Mineral, Quincy and Pulga advantage was taken of standing trees. The land station transmitting antenna is a half wave (171' 6" long), the receiving antenna being of the doublet type 140 feet long with a coil in the middle.

DIFFICULT ANTENNAE PROBLEM

Plow antennae presented a much more difficult problem however. After consideration of all the types heretofore used or available, development work was started on an entirely new type. When not in use the antenna lies back over the cab and body of the plow. In this position it extends only 12 inches above the cab, and does not extend back beyond the bumper.

When it is desired to transmit, the operator raises the antenna by means of a lever in the cab, so that it stands 12 feet vertically, then turns a small



Upper left—Radio equipped snow plow with antenna raised working in isolated mountain section of Shasta County. Upper right—Foreman R. E. Frost in Shasta City maintenance station, KATR (lower left), transmitting instructions to plow operator (lower right), who hears and talks over loud speaker equipment in front of him.

crank which extends it to a height of 23 feet. The operation requires less than ten seconds. This part of the equipment was built in the Sacramento shops. It is very rugged in construction, and has proved to be a highly efficient radiator.

As soon as announcement was made in District II that a radio system was to be installed, the question naturally arose as to who were going to operate the stations. A call was sent out for volunteers to study for the examination for Federal Communications Commission licenses. The result was amazing, and showed the fine spirit of loyalty and cooperation that pervades the maintenance personnel.

WIVES QUALIFY AS OPERATORS

Not only did the snow plow drivers and helpers, office workers and executives begin to study, but their wives too prepared for the examination, which was held at various points in the district. There are somewhere between 125 and 150 licensed radio-telephone operators now available, and many are preparing themselves for the radio-telegraph examinations to be held before summer static forces use of telegraph instead of telephone communication.

The operating procedure has been greatly simplified by the use of printed forms upon which the daily road and weather report is compiled. A "round-robin" rapid fire exchange of information is accomplished in about 15 minutes each morning before the men go to work. At the end, each station in the system knows the condition of all roads in the district, the weather and temperature at each point, and the forecast for the next 24 hours.

Throughout the day there is an hourly time check, and plows in operation report each hour. A constant standby is maintained at all stations, and by all plows on duty, so that the district has an hour by hour picture of what is going on at the front, and the snowfighters know that they can report break-downs or call for assistance at any time. Only during storms is there a day and night watch.

BUILT BY MAINTENANCE MEN

The first equipment tests were made on January 16. From the various dates mentioned previously it can be seen that there was much day and night work involved in the period between the decision in late August to build the system and its advent on

Nicaragua and Mexico Express Appreciations

Consulado General De Nicaragua
San Francisco, California

January 24, 1939.

Mr. Frank W. Clark,
Director of Public Works,
Sacramento, California.

Sir:

I have the pleasure to acknowledge receipt of the January, 1939, edition of "California Highways and Public Works," in which I am informed that you have been appointed Director of Public Works and that you have assumed your official duties.

"California Highways and Public Works" is especially valuable to my government. I do not like to impose upon your good nature, but I am very interested in securing three copies of each edition, and if it is possible for you to send them monthly I will be grateful to you. The Honorable Dr. Antonio Flores-Vega, Minister of Public Works of the Nicaraguan Government, has read every edition I have sent him and found it contains interesting articles about modern design and full research applied to highways constructions.

With my congratulations and best wishes, please accept the assurance of my esteem and consideration.

Sincerely,

JUAN JOSE MARTINEZ LACAYO,
Consul General of Nicaragua.

BIBLIOTECA NACIONAL DE MEXICO

Senor John W. Howe, Editor,
Public Works Building,
Sacramento, California.

Through the kindness of the Department of Public Works (Division of Highways), for which we are very thankful, we have been receiving regularly two copies of your interesting publication.

In view of the constantly increasing interest that highway problems are awakening in our Country, I wish to ask if you can not increase the number of copies of your publication to five. These will be properly used, two copies for our use and three copies distributed among those persons and institutions to whom they will be especially useful.

Thanking you in advance for this favor, I remain

Yours very truly,

The Director (Mexican National Library) Manrique (Signed)
Prof. Aurelio Manrique, Jr.

the air in January. Manufacturers worked night shifts on the equipment, maintenance men worked night shifts on installation, and the weather man cooperated by holding off the first real snow until the system was ready.

All of the details of planning the system, preparing specifications and superintendent manufacture, construction and installation have been handled by regular employees of the maintenance department of the Division of Highways. The chief operator and service man at Redding is the only employee whose time is devoted exclusively to radio work, the operation of all other equipment being performed by regular employees as part of their routine duties.

With the experience gained in District II this winter it is hoped that an even more efficient installation can be developed in several other districts before the coming winter. A preliminary survey has already been conducted in Districts I, III, VIII and IX.

ROAD BUILDERS SWARMING IN SAN FRANCISCO

(Continued from page 13)

gineer Purcell of California, and including many prominent business men have arranged a most interesting program."

The Western Association of State Highway Officials will hold its 18th annual convention in the Fairmont Hotel, San Francisco, March 6, 7, 8 and 9. Topics of discussion at the March 7 session will include "The Safety Problem" and "Enforcing Time Limits on State Highway Contracts." Delegates will attend other group meetings and participate in the Construction Congress at Treasure Island on Wednesday, March 8. Discussion topics for March 9 include "Soil Studies" and papers to be read by Dr. L. I. Hewes, Deputy Chief Engineer, U. S. Bureau of Public Roads; Floyd Booe, Secretary-Manager Northern California Chapter of Associated General Contractors, and others.

Father—So you've been fighting and lost all your front teeth.

Son—Oh, no, Dad, I've got them right here in my pocket.

First Playwright—Gosh, that suit of yours looks as though it had been slept in.

Second Playwright—It was. I wore it to your new show last night.



THE activities of the Division of Water Resources in connection with the Central Valley Project have included engineering studies and the preparation of data for negotiations with various interests in connection with the acquisition of water rights, and negotiation for the relocations of public utilities. Studies were also continued on matters affecting the disposal of water and power made available by the project. In this connection conferences were held with Kern County interests and studies made of the possible exchange of water supplies from the Central Valley Project for supplies from Kern River which would be transferred to areas south of the river.

A review and study was made of a petition before the Railroad Commission of the State of California in the matter of the application of the San Joaquin and Kings River Canal and Irrigation Company for an order authorizing it to enter into a contract for the exchange of San Joaquin River water for water made available by the San Joaquin pumping system.

Work was completed on the preparation of a report on the acquisition of and plan of exchange for rights of the Edison Securities Company to water from the San Joaquin River proposed to be acquired for the use of the Central Valley Project.

Negotiations were continued with public utility companies for the relocation of power and communication facilities for the completed Central Valley Project and for temporary relocations necessitated by construction activities.

IRRIGATION DISTRICTS

Carmichael Irrigation District completed a pipe line replacement project during the month that has been in progress for the past two years with the aid of WPA labor. About 67 per cent of the old system has been renewed with welded steel pipe, and

several miles of wood stave lines have been rebanded. Total expenditures on the improvements made were in excess of \$37,000.

Nevada Irrigation District has a crew of 125 men employed at the Scott's Flat dam site five miles above Nevada City. The work of clearing brush and digging test pits will be carried on during the winter months in preparation for later construction of the project, for which a bond issue of \$253,000 was recently voted.

Refinancing plans of Merced, Lindsay-Strathmore, and James irrigation districts were approved as fair and equitable to creditors in an important decision of the Federal District Court issued this month at Fresno. The decision is the first to be made for a number of similar cases in which the districts are attempting to complete their refunding operations under the Federal Municipal Bankruptcy Act.

SUPERVISION OF DAMS

Construction is progressing satisfactorily on Palos Verdes Reservoir in Los Angeles County.

The Metropolitan Water District has filled Gene Wash Dam and is now filling Copper Basin Dam.

The repairs and alterations on a number of dams of the Los Angeles County Flood Control District have all recently been completed. This work included trash racks and improvements to various spillways.

Work on the spillway at the Saw Pit Dam is well under way as is the work on the spillway at the Little Rock Dam.

WATER RIGHTS

Fifteen applications to appropriate water were received during December; 5 were denied; 20 were approved; 7 permits were revoked and 2 licenses were issued.

During the month 198 reports were received from permittees and licensees and these with other similar reports previously received are under study. Progress is also being made in the preparation of reports in connection with the 228 projects which were inspected during the year.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

During the past month activities have been for the most part centralized on the office work necessary in order to compile and publish the annual mimeographed report. This

report will show the diversions, acreages irrigated, stream and return flows in the Sacramento and San Joaquin valleys.

A field survey of the crops in the Sacramento and San Joaquin Delta is virtually completed and the results are now being tabulated for inclusion in the annual report of this office.

The sampling of water in the delta for salinity is being carried on at all regular stations in order that the record of the seasonal advance and retreat of salinity may be complete. The Sacramento and San Joaquin rivers still remain at low stages. For purposes of comparison, some salinity and stream flow figures are given.

CALIFORNIA COOPERATIVE SNOW SURVEYS

With about two feet of snow in the mountains as a result of the early winter storms, rangers of the Lassen and Plumas National Forests were instructed in the details of making snow measurements at the snow courses established this year in their areas. Later in the month, snow surveying instruction was given to a class of 20 rangers from six national forests who had gathered at the Auburn Ski Club near Cisco for a course in ski instruction.

The end of January snow surveys are now being made at the key courses throughout the mountains. Some of the measurements have been received and preliminary work is being done preparatory to issuing the first snow survey bulletin of the 1939 season, scheduled for release about February 10th.

SPECIAL INVESTIGATIONS

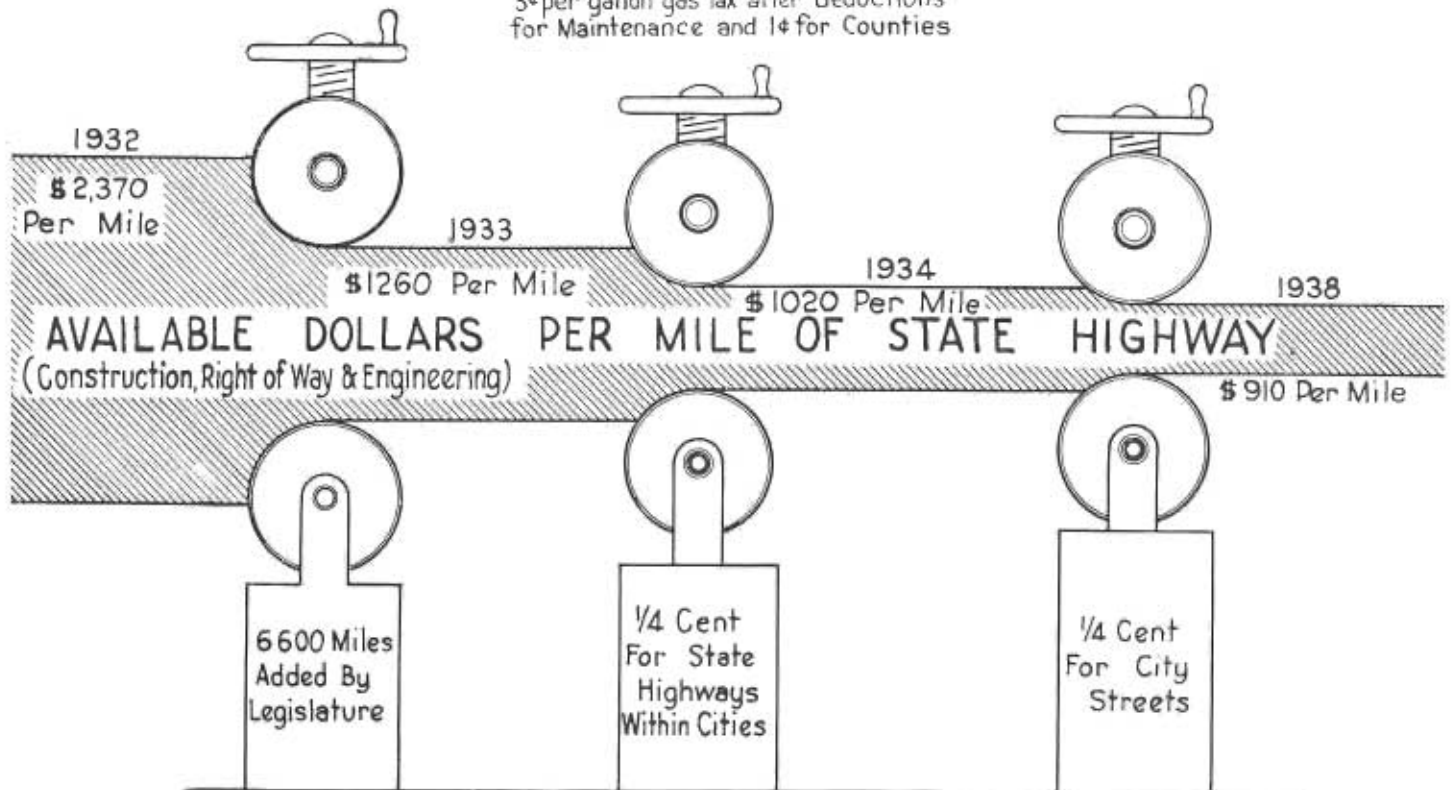
Flood Damage Repairs

Only one application was received during the month for an allotment from money appropriated from the Emergency Fund by Chapter 11, Statutes of 1938, Extra Session, for the restoration of property, levees, flood control works, county roads and bridges damaged by the floods of the 1937-38 winter season. During the month Senate Bill No. 421 restoring \$795,445.51 to the Emergency Fund for flood damage repairs and restoration was passed unanimously by both houses of the Legislature. This sum, by the provisions of the bill, will be available only to applicants who made requests for assistance prior to the effective date of the act.

Investigation and preparation of reports on work for which applications for allotment of funds have been made continue.

STATE HIGHWAY GAS TAX FUNDS THROUGH THE ROLLING MILL

Note: Figures derived from funds available from 3¢ per gallon gas tax after deductions for Maintenance and 1¢ for Counties



Divided Highway Opened Through City of Selma

(Continued from page 18)

ness had built up along the 60-foot right of way on West Front Street to such an extent that the cost of additional right of way there was prohibitive. By building an alternate route along Whitson Street one block west, a considerable saving could be effected. Besides, the "jogs" could be avoided and the two spur track crossings eliminated.

After careful consideration the State Highway Commission adopted the present new route. A 100-foot right of way was secured and a divided highway consisting of two 23-foot asphaltic concrete pavements with a 6-foot separation, were constructed.

The separation between the north-bound and south-bound traffic lanes consists of curbs with low growing shrubs, *Pyraecantha Formosiana*, planted between.

The curbs along the dividing strip are recessed in order to better reflect light from the curb face. The recessed area normal to the direction of the headlight rays has been painted white. These curbs stand six inches above the pavement surface, are 8½ inches wide at the bottom and 5 inches wide at the top, with the entire slope on the front face of the curb.

Along both sides of the divided highway have been planted eucalyptus trees of the *Sideroxylon Rosea* variety.

Temporary transitions to connect with the old highway both north and south of the improvement were provided. As funds become available the existing two-lane pavement extending from Selma to Fowler and also from Selma southerly to Kingsburg, will be reconstructed to provide for a divided highway.

The improvement through the city of Selma is only one short link in that long and important transportation route, U. S. 99, which connects the metropolitan area of Los Angeles with Sacramento and the San Francisco Bay region.

Heavy traffic composed of 16 per cent to 20 per cent trucks, now carried on this route, justifies a divided highway along its full length. However, unless more funds are made available it will be many years before this important highway can be made adequate for the traffic imposed upon it.

The improvement through Selma was made under contract by the Union Paving Company. Dan Morrison was superintendent for the contractor, while Fred Howard was resident engineer for the State Division of Highways. The highway was officially opened Dec. 10, 1938.

Highway Bids and Awards for the Month of January, 1939

LOS ANGELES COUNTY—Between North Main St. and Mission Road about 0.4 mile to be graded and paved with asphalt concrete, portland cement concrete and plant-mixed surfacing. District VII, Route 4, Section L.A. George R. Curtis Paving Co., Los Angeles, \$50,276; Griffith Co., Los Angeles, \$53,361; Radich & Brown, Burbank, \$53,368; Oswald Bros., Los Angeles, \$56,933; Robert M. Price, Huntington Park, \$59,789; P. J. Akmadzich, Los Angeles, \$64,524. Contract awarded to J. E. Haddock, Ltd., Pasadena, \$49,693.

MENDOCINO COUNTY—About 10 miles south of Fort Bragg, a bridge across Jack Peters Creek to be constructed and about 0.22 mile of roadway to be graded and penetration oil treatment applied thereto. District I, Route 56, Section E. A. Soda & Son, Oakland, \$42,591; C. W. Caletti & Co., San Rafael, \$43,146; Fred J. Maurer & Son, Eureka, \$43,808; Guerin Bros., San Francisco, \$39,401; Joseph Shaw, Oakland, \$40,106; Albert H. Siemer & John Coreano, San Anselmo, \$41,177; Harold Smith, St. Helena, \$41,869; J. M. Walker, Berkeley, \$42,019; Valley Construction Co., San Jose, \$44,242; E. E. Smith, Eureka, \$44,805. Contract awarded to M. A. Jenkins, Sacramento, \$36,572.50.

MERCED COUNTY—About 17.4 miles east of Los Banos, redecking and widening a bridge across Fresno River. District X, Route 32, Section C. C. W. Caletti & Co., San Rafael, \$17,902; F. Kaus, Stockton, \$20,695; L. C. Seidel, Oakland, \$18,671; M. A. Jenkins, Sacramento, \$14,628. Contract awarded to A. A. Tieslau, Berkeley, \$14,134.50.

MONO COUNTY—Between Benton Station and Nevada State line, about 7 miles to be graded and road-mix surface treatment and Class "A" seal coat to be applied. District IX, Route 76, Section B. Basich Bros., Torrance, \$52,376; R. L. Oakley, Pasadena, \$52,757; Nevada Rock & Sand Co., Inc., Reno, \$54,725; Oswald Bros., Los Angeles, \$55,259. Contract awarded to J. A. Casson, Hayward, \$49,877.20.

RIVERSIDE COUNTY—Between Orange County line and Corona, about 4.8 miles to be graded and paved with plant-mixed surfacing and portland cement concrete. District VIII, Route 43, Section A. J. A. Haddock, Ltd., Pasadena, \$184,499; Griffith Co., Los Angeles, \$185,041; United Concrete Pipe Corp., Los Angeles, \$187,365; Oswald Bros., Los Angeles, \$188,822; Heafey-Moore Co. & Fredrickson & Watson Construction Co., Oakland, \$191,780; Basich Bros., Torrance, \$205,946; Claude Fisher Co., Ltd., Los Angeles, \$207,123; C. O. Sparks & Mundo Engineering Co., Los Angeles, \$209,371; Hemstreet & Bell, Marysville, \$211,320; Clyde W. Wood, Los Angeles, \$212,964; Sully-Miller Contracting Co., Long Beach, \$215,450; Matich Bros., Elsinore, \$230,132. Contract awarded to V. R. Dennis Construction Co., San Diego, \$172,463.95.

SAN BERNARDINO COUNTY—Across San Antonio Wash, about 1/2 mile east of Los Angeles County line, a reinforced concrete slab bridge to be constructed; and about 0.2 mile to be graded and paved with asphalt concrete. District VIII, Route 26, Section C. J. E. Haddock, Ltd., Pasadena, \$46,189; Oscar Oberg, Los Angeles, \$46,445; White & Wilberg, Santa Monica, \$47,753; Dimmitt & Taylor, Los Angeles, \$48,125; J. S. Metzger & Son, Los Angeles, \$49,805; R. R. Bishop, Long Beach, \$49,813; C. O. Sparks

In Memoriam Sam G. Judd

With the passing of Sam G. Judd of Los Banos, District X of the Division of Highways lost a valued and loyal employee. Mr. Judd is mourned by his many coworkers and hundreds of friends in Mariposa and Merced counties.

Mr. Judd entered the service of the Division of Highways on February 5, 1924, and at the time of his death was foreman in District X to which he was transferred from District VI on September 1, 1933. As a supervisor, Mr. Judd won the respect and friendship of the men of his crew and by his superiors was considered an authority on pavement repairs and patching. He carried on his road work with responsibility and conscientious concern. His daily life was an inspiration to all who knew him.

Members of Mr. Judd's crews who worked through long, wet winter nights gratefully remember the hot coffee and sandwiches served to them at frequent intervals by Mr. and Mrs. Judd.

Mr. Judd was born in Silver City, New Mexico, October 8, 1891. He was engaged in ranching before he entered the employ of the State. He leaves a widow, Loretta, to whom is extended the deepest sympathy by the entire personnel of the Division of Highways.

PACHECO PASS REALIGNMENT DELETES 31 CURVES

(Continued from page 12)

duced 2018 degrees, a saving of over 5 1/2 complete circles, 31 curves having been eliminated and the minimum radii very materially increased. The saving of one-half per cent in maximum grades will be an improvement beneficial to heavy loaded vehicles.

The accompanying map shows the approximate route of the old original highway and toll road following the Pacheco Creek past Cape Horn and the old Mountain House to the summit. The existing State highway route constructed in 1923 far up on the mountain side and following the upper reaches of the east fork is also indicated.

and Mundo Engineering Co., Los Angeles, \$52,018; Valley Construction Co., San Jose, \$54,910; Byerts & Dunn, Los Angeles, \$58,057; The Contracting Engineers Co., Los Angeles, \$62,832. Contract awarded to G. E. Kerns, Long Beach, \$44,862.50.

SAN BERNARDINO COUNTY—Across Mojave River at Baker, a bridge 408 feet in length consisting of timber stringer spans with concrete deck on pile bents; roadway approaches to be graded, imported surfacing material placed thereon and roadmixed surfacing treatment applied. District VIII, Route 31, Section K. Valley Construction Co., San Jose, \$36,022; White & Wilberg, Santa Monica, \$36,078; S. A. Cummings, San Diego, \$36,603; E. G. Perham, Los Angeles, \$37,120; J. S. Metzger & Son, Los Angeles, \$37,246; J. A. Casson, Hayward, \$36,385; Ralph O. Dixon, Glendale, \$39,735; George Herz & Co., San Bernardino, \$40,165; Byerts & Dunn, Los Angeles, \$42,326; A. S. Vinnell Co., Alhambra, \$46,530. Contract awarded to R. M. Price, Huntington Park, \$35,924.90.

SAN BERNARDINO COUNTY—Between Devore and Camp Cajon, about 2.4 miles to be graded and surfaced with plant-mixed surfacing. District VIII, Route 31, Section B. Geo. Herz & Co., San Bernardino, \$149,912; C. O. Sparks & Mundo Engineering Co., Los Angeles, \$156,794; Claude Fisher Co., Ltd., Los Angeles, \$159,765; Guerin Bros., San Francisco, \$167,947; A. Teichert & Son, Inc., Sacramento, \$188,377; United Concrete Pipe Corp., Los Angeles, \$234,929. Contract awarded to W. E. Hall Co., Alhambra, \$149,510.95.

SANTA BARBARA COUNTY—Between Santa Ynez River and San Antonio Creek, about 10 miles to be graded and portions to be treated with liquid asphalt by the road-mix method and seal coat applied. District V, feeder road, Piazza & Hundley, San Jose, \$64,631; R. L. Oakley, Pasadena, \$64,953; C. G. Willis & Sons, Inc., and Chas. G. Willis, Los Angeles, \$66,275; United Concrete Pipe Corp., Los Angeles, \$66,567; W. E. Hall Co., Alhambra, \$67,547; Basich Bros., Torrance, \$68,172; J. E. Haddock, Ltd., Pasadena, \$71,604; Parish Bros., El-dridge, \$72,835; Granite Construction Co., Ltd., Watsonville, \$73,526; C. O. Sparks & Mundo Engineering Co., Los Angeles, \$75,425; Guerin Bros., San Francisco, \$75,531; Oswald Bros., Los Angeles, \$77,951; Valley Construction Company, San Jose, \$79,012. Contract awarded to Mountain Construction Co., Sacramento, \$58,059.15.

SISKIYOU COUNTY—Between 1/2 mile east of Hamburg and Scott River, about 1.4 miles to be graded. District II, Route 46, Section C. Guerin Bros., San Francisco, \$36,053; A. Soda & Son, Oakland, \$36,252; Claude C. Wood, Lodi, \$36,316; Harold Smith, St. Helena, \$38,226; J. M. Walker, Berkeley, \$38,245; Poulos & McEwen, Sacramento, \$38,324; Young & Son Company, Ltd., Berkeley, \$38,567; Wm. von der Hellen, Yreka, \$38,840; Larsen Bros. and Harms Bros., Sacramento, \$41,992; John Burman & Sons, Eureka, \$44,423; West Construction Company, San Francisco, \$44,545; Bennett & Taylor, Los Angeles, \$45,389; J. P. Brennan, Redding, \$53,377; Valley Construction Company, San Jose, \$65,458. Contract awarded to Hemstreet & Bell, Marysville, \$31,494.

A wife's an angel until she begins harping.

Pinole Grade Crossing Project Presents Many Difficulties

(Continued from page 20)

Santa Fe tracks with a very narrow intersecting road at the westerly end.

This section of highway is in the direct line of heavy auto and freight traffic between the East Bay cities and the Sacramento Valley. Its improvement will correct the substandard condition now existing. An average daily traffic of over 8000 vehicles passes this point. The Sunday traffic amounts to more than 12,000 vehicles.

DETOUR CONSTRUCTED

It has been necessary to maintain close cooperation between the railroad and highway construction operations in order to facilitate an early completion of the project. The maintenance of uninterrupted service on both the railroad and highway demanded close coordination in executing the various phases of the work in the proper sequence. Inasmuch as the railroad cut completely blocked and destroyed the old highway, and since there were no available roads over which highway traffic could by-pass the project, it was necessary to construct a highway detour around the work.

The construction and maintenance of such a detour involved the expenditure of approximately \$14,000. This amount was exclusive of the cost of the detour bridge which is to remain in place to serve as a permanent connection to the town of Hercules. Of this amount, approximately \$2,000 was required for the installation of warning signs, lights, traffic stripe and guard rail to warn and protect the traveling public.

HIGHWAY BRIDGE BUILT

The realignment of the railroad track, substituting an open cut for the existing railroad tunnel, makes necessary the construction of a highway bridge to span the track. This structure requires new alignment for the highway approaches which are being constructed to a standard divided highway with a 4-foot dividing strip.

The dividing strip separates two 23-foot highway lanes, each of which has a 7-foot shoulder. The 23-foot pavement lanes will be surfaced with six inches of crusher run base topped with three inches of plant mixed surfacing. The shoulders will be given a penetration oil treatment. The divid-

ing strip will be inclosed between concrete curbs. At each end of this section the dividing strip will be carried to the end of the vertical curves, and there will be a 400-foot transition in pavement width, narrowing down to bring the 4-lane pavement to the existing 3-lane pavement width.

At the west end the dividing strip will terminate in the restricted speed zone area within the city limits of Pinole, and the nose of the dividing strip will be provided with 3-inch ruby reflectors. At the east end, due to the faster speed of traffic approaching the divided roadway and the possibility of confusion during night driving and probable fog condition, an automatic amber flasher traffic signal will be installed in the nose of the dividing strip.

GRADE SEPARATION

The grade separation structure spanning the railroad track is of continuous flat slab construction resting on concrete bents with two expansion joints in the deck at the quarter points. The bridge is 425 feet in length, consisting of eleven 34-foot spans and two end spans each 25 feet 6 inches in length. The roadway width between curbs is 54 feet consisting of two 25-foot traffic lanes separated by a 4-foot dividing curb. A 2-foot 6-inch sidewalk is provided on each side of the bridge for pedestrian traffic.

After relocating the various public utilities which interfered with construction, constructing the detour and routing highway traffic over it, the next step was to start the excavation for the new railroad roadbed. This operation was so planned that work on the grade separation structure could be started immediately. The next order of work was to construct the southerly one-half of the structure, which portion spans the railroad track at its new location. When the southerly one-half was complete, the railroad realigned, and the new track placed in operation, it was then possible to construct the northerly one-half of the structure without interference from train traffic.

The work is being done in cooperation with the A. T. & S. F. Railroad. The railroad company is performing

Bay Bridge Terminal Dedicated Jan. 14, 1939

(Continued from page 8)

Dec. 21, 1936—First demolition of buildings for terminal site.

July 29, 1937—First shovelful of earth excavated for terminal site, southeast corner of Natoma and Fremont.

Nov. 29, 1937—First tie on bridge proper laid at Span E-22.

Jan. 12, 1938—First structural steel for terminal unit erected at First Street between Natoma and Minna Streets (12-foot steel columns).

Jan. 14, 1938—First major steel erected at Natoma and First Streets (43-foot steel girder).

Feb. 1, 1938—First spike for bridge railway placed at Span E-22.

Mar. 8, 1938—First steel for track level (third story) of Terminal Building erected at Fremont Street.

Sept. 23, 1938—First test train (Key System) ran from East Bridge head to Pier W-1.

Oct. 13, 1938—First test train of Interurban Electric (S. P.) on bridge.

Dec. 14, 1938—First train enters S. F. Terminal (Key System train) for signal tests.

Dec. 17, 1938—First Interurban Electric train enters S. F. Terminal from Oakland.

Dec. 20, 1938—Sacramento-Northern makes first test trip into San Francisco Terminal.

Jan. 5, 1939—Power turned on third rail.

Tests continue nightly until start of operation, January 15.

the work of relocating its track and is assuming the cost thereof. The railroad portion amounts to approximately \$125,000, and the State's portion, consisting of the construction of the overhead structure together with the cost of highway approaches, will cost approximately \$110,000. The State's portion is included in the Federal Aid Grade Separation Program and is being financed from Federal funds.

The excavation for the railroad location is being performed under contract by Sharp and Fellows of Los Angeles, and the construction of the grade separation and highway approaches is being performed under contract by the Union Paving Company of San Francisco. The contract date for completion is June 16, 1939.

STATE OF CALIFORNIA
Department of Public Works

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

CULBERT L. OLSON.....Governor FRANK W. CLARK.....Director
EDWARD J. NERON.....Deputy Director

CALIFORNIA HIGHWAY COMMISSION

H. R. JUDAH, Chairman, Santa Cruz
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R. M. GILLIS, Construction Engineer
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F. W. PANHORST, Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
J. W. VICKREY, Safety Engineer
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SAN FRANCISCO-OAKLAND BAY BRIDGE

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CARLETON PIERSON, Supervising Specification Writer
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ROBERT E. REED, Attorney

DIVISION OF PORTS

Port of Eureka—E. S. MACKINS, Surveyor

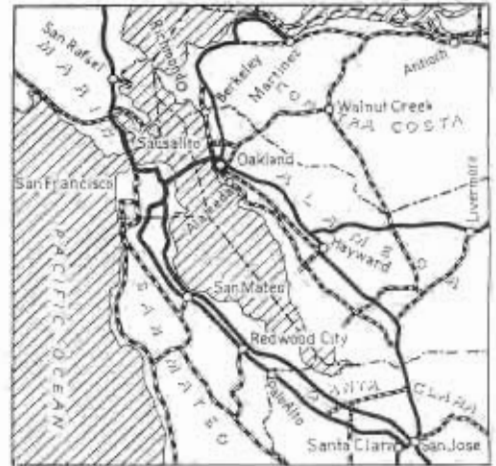
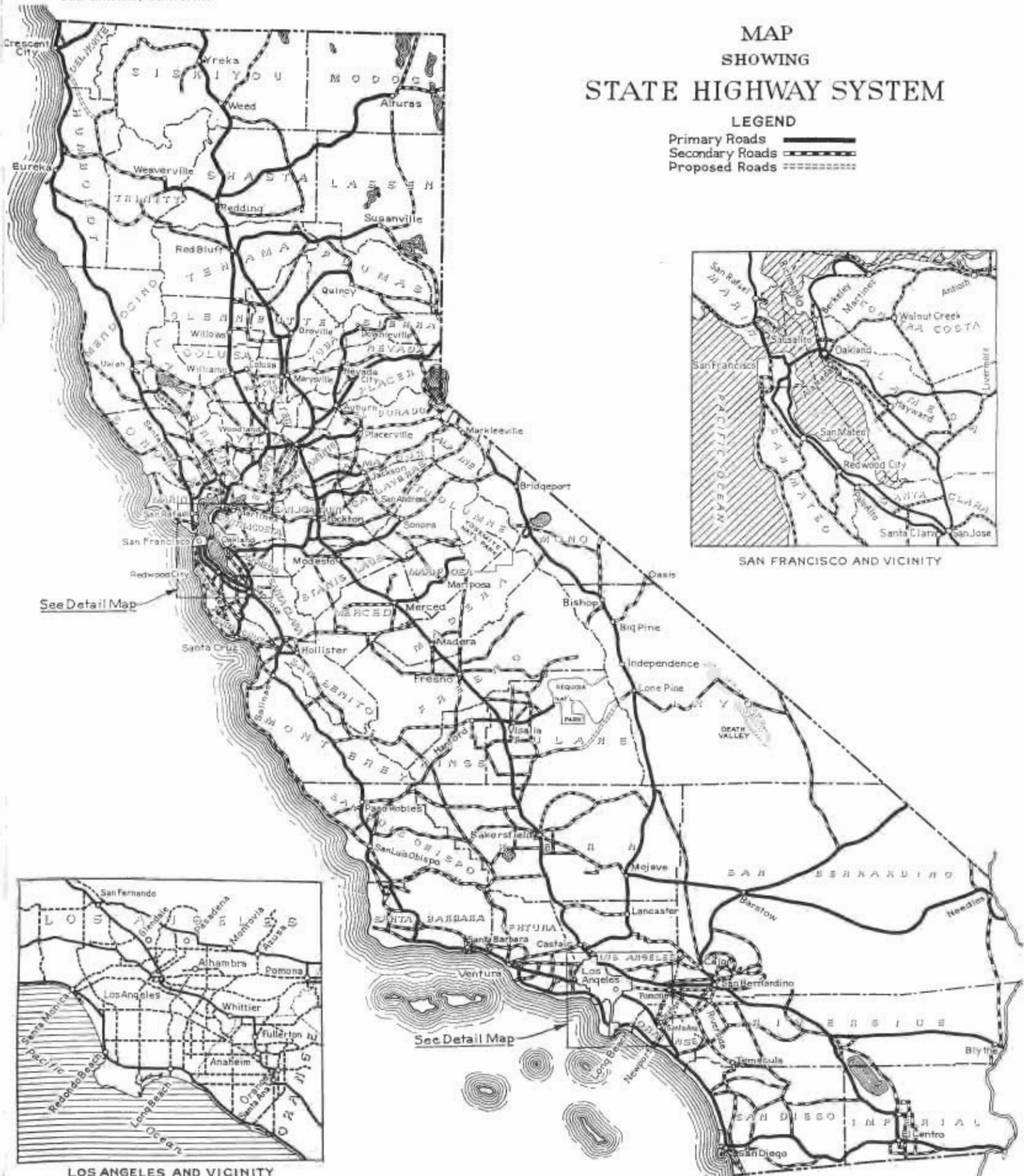
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MAP
 SHOWING
STATE HIGHWAY SYSTEM

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



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY

See Detail Map

See Detail Map