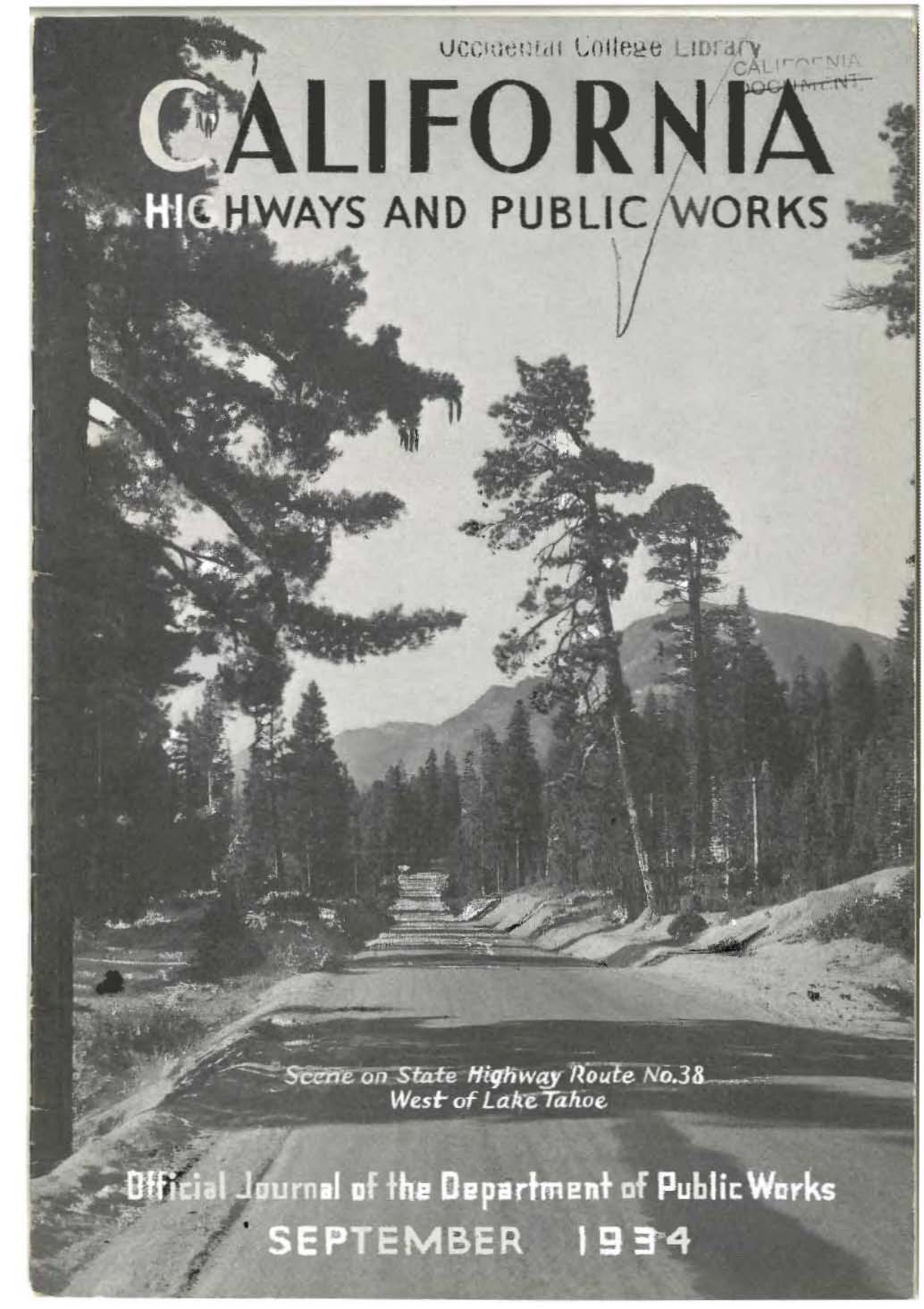


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# CALIFORNIA

## HIGHWAYS AND PUBLIC WORKS



*Scene on State Highway Route No.38  
West of Lake Tahoe*

Official Journal of the Department of Public Works

SEPTEMBER 1934



## Table of Contents



	PAGE
\$1,000,000 Relief Allocation Assures 12,000 Californians a Living Through Winter.....	1
<i>By Earl Lee Kelly, Director of Public Works</i>	
Slides Raise Total Excavation on American Canyon Cut-off to 1,306,000 Cubic Yards.....	2
<i>By R. E. Pierce, District Engineer, District X</i>	
American Canyon Cut-off Operations Pictured.....	3
Installing Sheet Steel Piling Seawall on Ventura Coast.....	4
<i>By R. C. Myers, Assistant Engineer, District VII</i>	
Illustrations of Steel Seawall and New Highway Features.....	5
Pavement and Construction Records for 1933 on California Highways	6
<i>By Earl Withycombe, Assistant Construction Engineer</i>	
Grapevine Grade Relocation Opened to Public September 11th.....	8
<i>By R. M. Gillis, District Engineer, District VI</i>	
Pictures of Grapevine Grade and New Alignment .....	9
Coast Route Improvement Between Arroyo Honda and Gaviota.....	10
<i>By L. H. Gibson, District Engineer, District V</i>	
New Highway and Construction Scenes.....	11
Traffic Count Shows Increased Travel over 1933.....	12
<i>By T. H. Dennis, Maintenance Engineer</i>	
Construction Begun on Indio Cut-off Link.....	14
Scenes on Indio Cut-off.....	15
Juries Protect State Against High Condemnation Claims.....	19
Old Sand Hills Plank Road Becomes Museum Exhibit.....	20
<i>By I. G. Thomas, Office Engineer, District IX</i>	
Sand Hills Plank Road Illustrations.....	21
Water Resources Report of State Engineer.....	22-23
Detailed Figures of Construction Records for 1933.....	26-27
Oiled Rock Surface Tabulation for 1933.....	29
McConnell Subway Has Largest Plate Steel Girders in State.....	30
<i>By H. D. Stover, Designing Engineer of Bridges</i>	
Photographs of New McConnell Subway.....	31
Bids and Awards for August.....	32





# \$1,000,000 Relief Allocation

*By Highway Commission Assures*

## 12,000 Californians a Living

*Through the Coming Winter*

By EARL LEE KELLY, Director of Public Works

WHEN the California Highway Commission held its regular meeting in Sacramento, September 7th, some 12,000 Californians faced a winter of privation and want through the exhaustion of the unemployment relief fund set up for the Division of Highways in October, 1933, by which 3200 heads of families had been provided part-time work on road maintenance crews throughout the State.

The laying off of these family men meant that their numerous dependents would be thrown back upon the charity lists of the various counties and communities thus putting an additional burden upon the already overburdened local relief agencies.

When Governor Merriam's attention was called to this serious situation he declared some way must be found to keep these family heads at work through the winter. He personally urged the members of the California Highway Commission to give the matter their most earnest attention and work out a solution whereby funds could be made legally available for continuing the part-time employment.

As a result, the commission at its meeting pooled the savings on contracts which had

been accumulating during the entire biennium and voted \$1,000,000 for continuing the relief program until about March 1, 1935. The heads of more than 3200 California families will thus be continued in their half-time jobs on the highways and the spectre of a winter without work and steady pay roll income is banished for them.



EARL LEE KELLY

been given employment. The men work in alternate weeks, eight hours a day for five days; by this method the Division of Highways maintenance crews have been enlarged by approximately 1600 men. The wages paid are \$4.40 per day.

In its vote appropriating the \$1,000,000, the commission provided for the distribution of the work throughout the State. To insure the work being well distributed over the highway system, a division of the funds was incorporated in the vote requiring that \$325,000 be expended for work on primary roads and \$675,000 on secondary roads.

Under the present relief program, which has been in force since last October and which is to be continued by the funds just provided by the commission, about 3200 men have

(Continued on page 16)

# Slides on American Canyon Cutoff Make Excavation Total 1,306,000 Yards

By R. E. PIERCE, District Engineer

**G**RADING on the so-called American Canyon cutoff, in progress since October, 1933, is now nearing completion. This project on California Route 7 and U. S. Route 40 extends from the Carquinez toll bridge to Cordelia, where it connects with State Route 8.

This project is a relocation of the important section between San Francisco and Sacramento, of the transcontinental route to the east via Donner Pass through the Sierra Nevada. It will effect a saving of six miles in distance and eliminate all grade crossings with the railroad. There are five such grade crossings on the present route, which runs via Jameson Canyon to the Napa Wye and thence through Vallejo. The only contact with a railroad on this new cut-off is at Cordelia, where a subway has already been completed.

## SLIDES IN BIG CUT

This grading contract, 10.3 miles in length, is especially noteworthy for the size of some of the cuts and fills. One cut, 130 feet deep and 2400 feet long, had an estimated volume of 520,500 cubic yards, nearly half the estimated total of 1,166,000 cubic yards of excavation on the job.

Adjacent to this cut, on the north, is a fill 75 feet high and 2500 feet long having an estimated volume of 605,600 cubic yards. This yardage comes partly from the "big cut" above described, and partly from another large cut adjacent on the north with an estimated excavation volume of 217,300 cubic yards.

Due to unforeseen soil conditions, the amount of material to be moved has exceeded the original estimates, and it has been necessary largely to abandon our plans for terracing cuts and fills, as set forth in a previous article published in CALIFORNIA HIGHWAYS AND PUBLIC WORKS.

## TERRACING ABANDONED

Our plans for terracing this work were based on our observation of the newly completed highway work on either side of the cutoff, which in rather large cuts already opened up indicated a fairly stable condition.

However, as work progressed it became evident that the conditions on this job were radically different.

The top soil and decomposed rock were underlain by a blue clay, lying in planes at abrupt angles, and as soon as support of the top soil was removed in several of the cuts, it began to move in toward the roadway. Generally, very little water was encountered, the top material sliding over the clay whether wet or dry.

Test borings indicated considerable water in the slide above one cut, and hoping to avoid moving all the material here, the power shovel was directed to cut a trench at right angles to the roadway, with the expectation of draining this water and stopping the movement; however, the clay planes formed a sort of basin and as the shovel advanced the material moved in toward the shovel so rapidly and became so broken up that it absorbed all the water and none escaped.

## STOPPED SLIDE MOVEMENT

We did, however, stop the movement of the slide into the roadway section, and were probably saved the expense of moving considerable material.

In the "big cut" the material continued to break back on both sides, especially on the east, in spite of our early attempts to relieve the load above the sliding plane by working it off on a slope of about 2 on 1 with bulldozer and large scrapers. We believe we have now stopped the trouble by working power shovels along the top of what appears to be a fairly stable formation, making a broad terrace and removing the material above the plane back far enough to prevent further movement into the roadway section.

These slides have caused an excess of material over our original estimate, and in order to dispose of it to advantage, some slight changes have been made in grade and alignment.

## 140,000 YARDS EXCESS

To the south of the "big cut" the material has been used to raise the grade over a flat

(Continued on page 13)





THE "BIG FILL" of the cut-off is rapidly growing to its designed proportions of 75 feet height and 2500 feet length with a width to accommodate a 40-foot pavement. Excess material from the Big Cut slides is being used to raise and widen the fill to its estimated volume of 605,600 cubic yards. In the center of the fill a timber and concrete bridge is being built.



THE "BIG CUT" of the American Canyon cut-off project is the scene of busy operations to prevent further slides of top soil underlain by blue clay that lies in planes at abrupt angles. Power shovels and trucks are at work making broad terraces and removing material above the sliding planes back far enough to prevent further movement into the roadway.

# Building Seawalls of Steel on Ventura Coast Effects a Saving of \$117,000

By R. C. MYERS, Assistant Engineer, District VII

**C**ONSTRUCTION of nearly three-fourths of a mile of seawall is one of the principal features of a contract which is now in progress for improving 8.47 miles of the Coast Highway immediately northwest of Ventura from Ventura to Mussel Shoal. This portion lies between the cities of Ventura and Santa Barbara and carries a considerable volume of local traffic in addition to the heavy through traffic of the Coast Highway.

The location of this route between Ventura and the Santa Barbara County line was originally confined to extremely narrow limits on account of the topography of the territory, and any widening or other improving of this section has been correspondingly difficult.

Back a very short distance from the shore line a range of very rugged bluffs rises sharply. These bluffs are so steep and rough that the cost of construction of a highway along their slopes would be almost prohibitive. The Coast Line of the Southern Pacific Railroad, which was built years before the State highway was constructed, follows a location back from the beach and as near the base of the steep mountains as practicable. The only location left for the highway was the narrow strip of land between the railroad and the ocean.

## FORCED TO THE BEACH

In 1912 and 1913 the 15-foot concrete pavement was constructed, following the railroad right of way as closely as possible. Later, when increasing traffic made it necessary to widen the pavement and roadbed, this work had to be done on the ocean side on account of the proximity of the railroad on the land side. At a few places where the ocean encroached too closely to the highway embankment to permit such widening without some kind of protective work, reinforced concrete seawalls were constructed against which to rest the widened highway embankment. This work was completed in 1927 and the seawalls constructed at that time have successfully resisted erosion by the ocean.

Traffic requirements have since made it necessary to again widen the pavement and roadbed of this important route, and with this further increase in width there are even

greater lengths of roadway embankment which would be exposed to wave action unless shore protection work were placed.

Although the reinforced concrete seawalls formerly built answered their purpose very well, their construction was extremely expensive.

A total of 3802 lineal feet of seawall is required on the present contract to permit widening the roadbed to 80 feet to provide room for a 30-foot pavement with wide oiled shoulders and future widening of the pavement which will eventually be necessary.

## STEEL WALLS ADOPTED

This length of massive concrete seawall construction similar to the ones previously built would have cost more than \$200,000 at the prices previously paid for this work, in addition to the cost of widening the roadbed, pavement, lengthening drainage structures and incidental work.

Several plans were proposed, but the one which was the greatest promise of economy and success was to construct these walls of interlocking steel sheet piling. The total cost of constructing the walls of this material is estimated to be \$83,000, or a saving of \$117,000 over the concrete wall.

This method was adopted and included in the contract for widening the roadbed and pavement. Three walls are being constructed at exposed locations, being 642, 2500 and 660 feet in length, respectively.

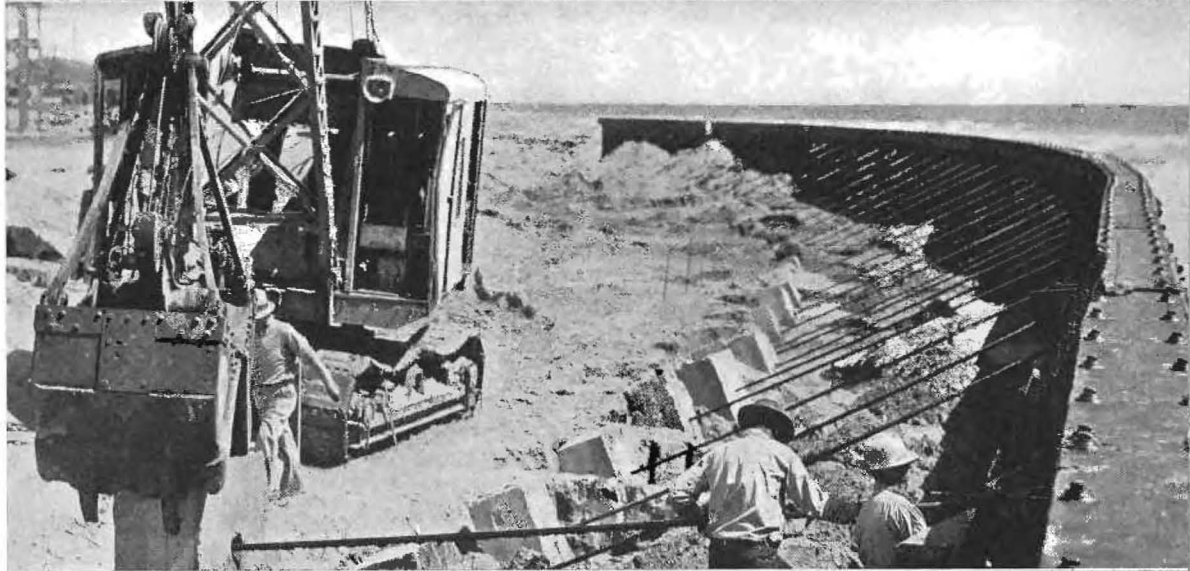
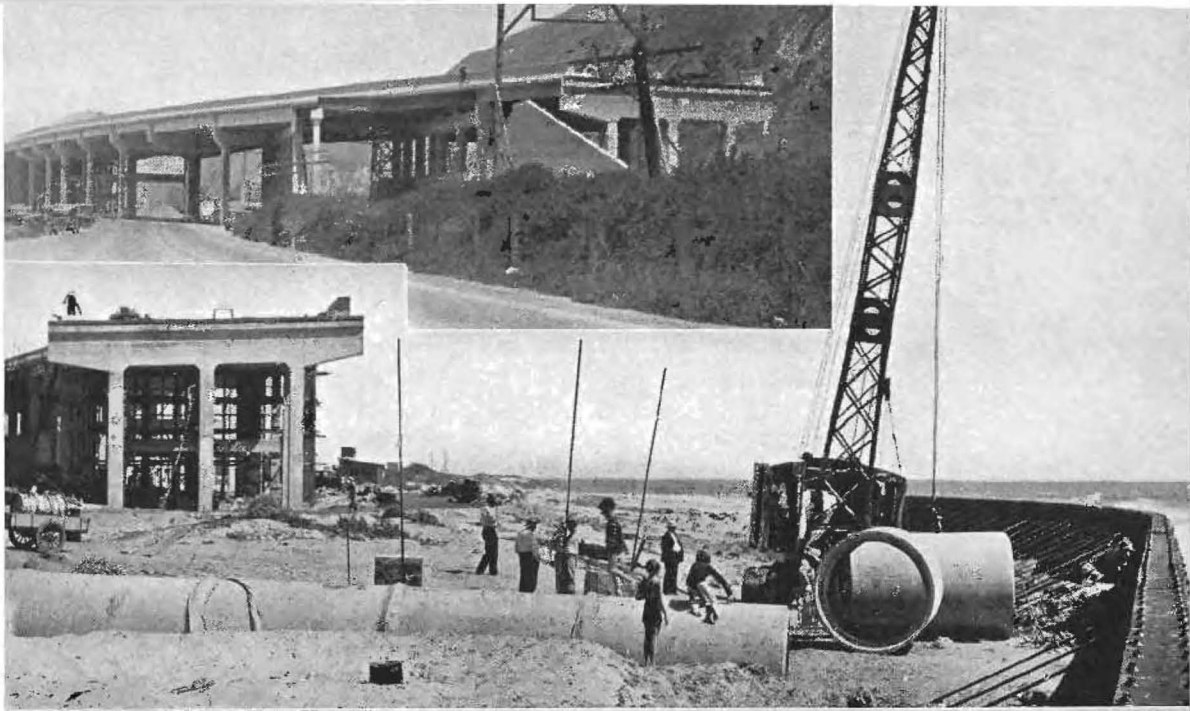
The construction consists of interlocking steel sheet piling driven down through the beach sand and into solid clay or shale beneath. Each sixth pile or "anchor pile" is driven 3 feet deeper than the intermediate piles.

## CONCRETE DEADMEN USED

The tops of piles are driven to elevation 10.0 feet, the line of the tops being held securely by creosoted Douglas fir timber wales and caps. Steel throwback plates  $\frac{3}{8}$ " in thickness are bent to fit the piles and wales and bolted on the ocean side. The whole assembly at the top of piling, including wales,

(Continued on page 20)





**STEEL WALLS DEFY OCEAN'S** power on the Coast Highway North of Ventura where a change of alignment, elimination of a dangerous underpass and widening operations compel the use of more ocean front right of way. The upper photos show the new overhead structure crossing the existing highway and swinging out on the beach with a portion of the protective steel sea wall already built. The central picture is a close-up of the interlocking sheet steel piling driven to elevation 10.0 feet held in line by the rods extending to concrete dead men. Below, general view of the 3,802 lineal feet of new seawall.



# *Pavement Records and Construction Progress Made During the Year 1933*

By EARL WITHYCOMBE, Assistant Construction Engineer

**D**URING the year 1933, a special effort was made not only to improve the finished product of high type pavements, but to build into these pavements such lasting qualities as assure maximum service by the ever increasing volume of traffic in California. Structural excellence of pavements is desirable, but equally so are smooth riding surfaces, and it is essential that every possible precaution be taken to prevent the roughening of pavements with increased age.

This article deals not only with accomplishments affecting the pavement surface, but also touches on what has been done with those invisible features such as the subgrade and underlying foundation.

## TREATMENT OF SUBGRADES

During the year 1928, the joint interval in Portland cement concrete pavement was reduced to 20 feet. This reduction in interval was made in an attempt to control transverse cracking and, as results have proven, was effective in this respect.

During the following winter season, however, it was discovered that considerable objectionable roughness developed in these shorter panels on heavy soils. An investigation of the most affected sections disclosed that the lineal shrinkage of the underlying subgrade material was in excess of 5 per cent.

In 1929, the practice was adopted of selecting material of less than 5 per cent lineal shrinkage with which to construct the upper layers of the roadway. When such selection could not be done during the progress of grading, the grade line was constructed low enough to blanket later to the desired depth with suitable imported material. The thickness of blanketing material was varied according to the results of the soil analysis.

## EXPERIMENT WITH FILLER

During the same year, experimental sections were constructed with sponge rubber filler for expansion joints in an attempt to seal against the infiltration of water. These treatments were effective temporarily on the lesser adverse soils.

During 1931, a section of concrete pavement was laid between Maxwell and Williams over

rice field adobe which had previously been blanketed with two feet of cementing gravel. The following winter, curling of the slabs on this project became such as to result in a harmonic throw to vehicles at certain speeds.

An investigation was instigated by the construction department and carried out under the direction of the testing and research laboratory. This investigation disclosed that the joint difficulty was the direct result of infiltration of water through the transverse joints, both weakened plane and expansion, causing an uplift of the subgrade at each joint and resulting in curling of the pavement. The pavement was cored at certain intervals in various locations, and samples of the adobe under the gravel blanket disclosed that the moisture content decreased as the distance from the joint increased. Likewise, distortion of the slab varied directly with the moisture content of the adobe.

## STUDY REVEALS PHENOMENON

An intensive study of these soils was then made in the laboratory and it was found that when consolidated to maximum compaction with the normal moisture content the specimen, when submerged in water and subjected to a load comparable with the weight of the blanketing material plus that of the pavement, exerted a tremendous force in expanding and swelled to an astounding extent.

To confirm this phenomenon, water was introduced over a period of time through the core drill holes in one of the slabs with the result that the center of the panel was raised to the level of the ends of panel. This led to the discovery that the amount of water absorbed and the resulting swell in any soil when submerged in a consolidated state was inversely proportional to the superimposed load. It then became evident that any adverse soil might be made inactive by blanketing with nonswelling material to a predetermined depth.

This method in many cases, however, is economically impractical, and the present practice is to use one of the following three procedures.





TWO PAVERS laying Portland cement concrete on Ridge Route alternate.

#### THREE PROCEDURES ADOPTED

(1) Seal off the adverse soil by means of an impervious membrane of  $\frac{1}{2}$  to  $\frac{3}{4}$  gallon per square yard of E grade asphalt. Blanketing of such membranes is necessary to a depth sufficient to prevent perforating with stakes supporting the side forms and chairs supporting the pavement steel and dowels.

(2) Saturate the adverse soil sufficiently in advance of paving to obtain the normal expansion before it is covered.

(3) Under-consolidate the upper layers of the grade to reduce the swell when subsequently saturated.

A bearing value test has been developed to determine the supporting value of soils when saturated from a consolidated state. The results of this test determine if blanketing is necessary under either of the two latter cases.

Membranes applied to the immediate subgrade have been experimented with, but are recommended only for protection against alkaline soil conditions. Such membranes soon become an integral part of the pavement slab and, with seasonal slab movement, crack at transverse joints.

#### FORMER METHODS UNRELIABLE

The laboratory is now engaged with the problem of predetermining the depth of a blanketing material necessary to insure an adequate reduction in load over subgrade material of known bearing value in a saturated condition. These studies have proven the unreliability of our former methods of evaluating the qualities of soils and have resulted in the adoption of newer and more workable yardsticks with which to make our selections.

For the valuable work which has been done with soils and blanketing material we wish to give due recognition to O. J. Porter, who is in charge of the

soils and aggregates department of the testing and research laboratory.

#### Special Investigation of Portland Cement Concrete Pavement Distortion

An investigation by independent agencies was instigated by the construction department to determine the cause or causes for increased roughness which had been noted in several sections of Portland cement concrete pavement and to determine means of preventing its occurrence on future projects. In the early part of 1933, the investigation was carried on cooperatively by the State, the U. S. Bureau of Public Roads and the Portland Cement Association, under the direction of A. A. Anderson, research engineer for this association.

The findings in this investigation indicated that roughness was sufficient in some cases to cause objectionable riding qualities, but rarely exceeded an average of  $\frac{1}{4}$  inch from a 20-foot cord. It was apparent from this study that no one cause could be assigned for the distortion found on all projects. The most outstanding observation was the definite relationship of warping to the type and character of subgrade soil.

#### CAUSE DEFINITELY ESTABLISHED

It was definitely established that the warping of the pavement on heavy clay soils was due to heaving or expansion of the over-compacted soil at the transverse joints where surface water entered. This caused uplift or curl of the ends of slab and was undoubtedly the chief factor in those cases where the warping produced objectionable riding qualities.

These studies also disclose that pavement slab distortion or curling has developed which was apparently caused by internal forces. Such distortion is generally small, amounting to an average of  $\frac{1}{8}$  inch or less for a 20-foot slab. The use of concrete mixes with a

(Continued on page 24)

# Grapevine Grade Relocation Abolishes Curves Totaling Seven Complete Circles

By R. M. GILLIS, District Engineer

**W**ITH the opening on September 11th of a 20-foot strip of concrete pavement and shoulders on new alignment the Division of Highways has abolished the Grapevine grade and its series of dangerous hair-pin curves that have stood as a barrier to traffic between the San Joaquin Valley and Los Angeles.

This improvement is part of the relocation project for 5.2 miles of the Ridge Route at its north end between Fort Tejon and Grapevine Station.

Five miles more of the old 20-foot pavement will still remain to be rebuilt between the

and a half which in itself constitutes a heavy grading contract and includes 30-foot pavement will require two hundred fifty days for its completion.

Practically all of this five mile improvement is in the canyon of Grapevine Creek and is on a sustained 6 per cent grade. One of the complications that has entered into the construction through this narrow canyon is the fact that it is also occupied by the main gas lines from the Kettleman Hills into Los Angeles (a 12", a 22" and a 26" pipe line), in addition to the pipe lines and pumping plants of two major oil companies, and the



SKETCH MAP showing Grapevine Grade realignment. Heavy black line indicates new highway.

Los Angeles County line and Fort Tejon but it contains no "Dead Man's Curve."

Work has been under way on the Grapevine grade since May of 1933. Under the contract now nearly completed the State has, at a cost of approximately \$350,000 graded three and a half miles from Oak Glen to one mile north of Grapevine station to a width of 46 feet and paved it with a 20-foot width of concrete. A new contract adds another 10-foot strip of concrete to this to make the full 30-foot width adopted as standard over the Ridge.

## COMPLETED BEFORE WINTER

Under the terms of the new contract this three and a half miles must be completed within sixty days after the approval of the contract so that this section will be completed within several weeks. The remaining mile

electrical transmission lines of two other companies.

All of these utilities were on private rights of way and had to be moved to new locations where there was a conflict with the alignment of the new road. This work could only be done at times when there would be the least interruption to the service. The total cost of moving these lines will amount to over \$150,000.

## MANY CURVES ELIMINATED

The extent of the improvement that will result from the work now under contract is shown by the following comparison of the present and the new lines between Fort Tejon and Grapevine Station where the old road is one continuous series of curves in a distance of 6.04 miles.





A SINUOUS COURSE with many sharp turns is followed by the existing Grapevine Grade sector of old State highway between Fort Tejon and Grapevine Station on the Los Angeles-Bakersfield arterial. The new alignment soon to be opened is shown at the extreme left center passing a huge slope cut of the high hill and joining the present straightaway to Bakersfield a mile to the north.

	Old road	New road
Maximum grade.....	6.3%	6%
Total curvature in degrees.....	3396	459
Minimum radius of curvature.....	80 feet	1000 feet
Length in miles.....	6.04	5.22

The opening of the twenty-seven miles "Ridge Route Alternate" in October, 1933, between Castaic and Gorman with 30-foot pavement and long curves emphasized the necessity for the early completion of the Grapevine section. The increase in traffic that immediately resulted from the former improvement is well shown by the traffic counts before and after opening:

	16 hour count Sunday	16 hour count Monday
July 1933.....	2857	2316
July 1934.....	4177	2976

The fact that the April, 1934, count was still higher is an indication that the July traffic was affected by the waterfront strike conditions existing at that time.

### IMPERIAL VALLEY APPRECIATES IMPROVED SECONDARY ROADS

The State Highway Department is not getting its full credit for the splendid work done in Imperial Valley since the last session of the Legislature. Promises of a great road building campaign in the State, with the inclusion of several of our county roads in the secondary system, turned out to be more than mere political gestures. They have become realities.

Distance to Holtville has been shortened 12 miles on the newly oiled Weist and Alamorio road connection. I skimmed down to Holtville from here at 45 miles an hour this week with nary a chuck hole or dust cloud. Twenty-two miles have just been oiled and six miles is the old Sandia-Holtville pavement. The highway by way of Brawley and El Centro is 40 miles long and is no faster.—J. W. MeK. in *Calipatria Herald*.

Boulder Dam will contain more material upon its completion than the largest pyramid in Egypt, says a report. Excavators digging for the rock bottom of the river discovered a gorge 85 feet deep and 80 feet wide believed to be 25,000 years old.

# Curves and Dips Eliminated on Coast Highway Link North of Santa Barbara

By **LESTER V. GIBSON**, District Engineer

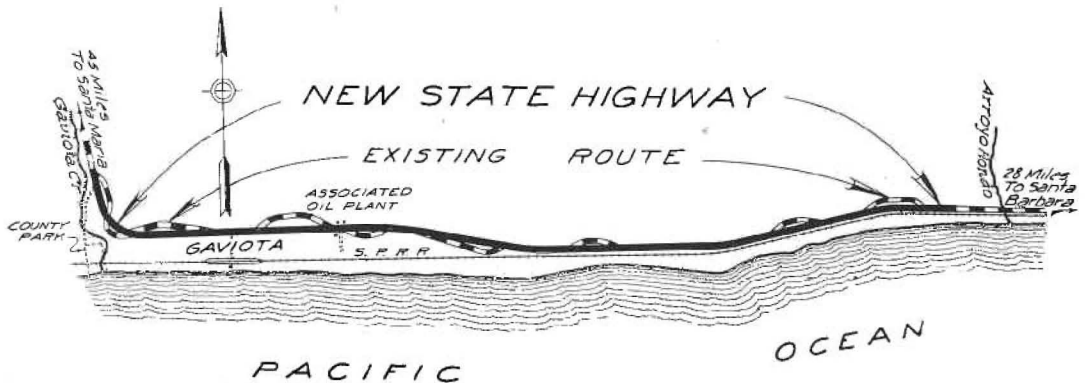
**A**NOTHER link in the progressive series of reconstruction of the Coast Highway in District V has recently been completed. Early this month, that portion of the highway in Santa Barbara County between Arroyo Hondo and Gaviota was opened to public travel, affording the motorist nearly five miles of modern highway construction in place of the former antiquated inadequate road.

This stretch of highway lies immediately south of the Gaviota Pass relocation project,

cement concrete shoulder strips set about  $2\frac{1}{2}$  inches higher than the pavement and the space between blanketed with  $2\frac{1}{2}$  inches of asphalt concrete surfacing.

The new road is of high speed line and grade, completely eliminating the dangerous conditions so prevalent in its predecessor. The roadbed width is 36 feet and the surfacing is the standard 20' x 9"-7"-7"-9" Portland cement concrete type reinforced with heavy wire mesh.

The table below gives a comparison of



which was completed about two and one-half years ago. It borders the Pacific Ocean about 30 miles north of Santa Barbara. At this point the Coast Highway swings inland from the ocean and winds its way through the historic Gaviota Gorge, up over the pass of the same name and thence northerly towards Santa Maria.

## CURVES AND RAVINES

The line and grade on the old road was far below present day standards and contained innumerable curves, many of radii of 500 feet or less and combined with 7 per cent grades. Several of these adverse combinations were at the bottom of deep ravines and an additional hazard was involved by insufficient superelevation. The original road was built to the old 21-24-foot standard with 15-foot Portland cement concrete pavement 4 inches thick. This pavement was later widened, using 2 foot by 7 inch Portland

important features between the old road and the new:

	Old	New
Total number of curves.....	41	10
Number of curves of 1000' radius or less.....	35	1
Minimum radius.....	300'	1000'
Length of 6 per cent grade or over.....	3750'	1450'
Length of 7 per cent grade or over.....	3000'	None
Maximum grade.....	7%	6%
Total delta.....	1037°	192°
Minimum vertical sight distance.....	290'	750'
Saving in distance.....		0.127 miles

This project, for about one-half of its length, parallels the Southern Pacific railroad, and a feature of the construction which will be well appreciated by the motorist is the adoption of the grade line at an elevation above that of the railroad, which affords an uninterrupted view across the Santa Barbara Channel towards the distant Santa Barbara Islands. To assure this scenic feature all prisms of earth between the highway and the

(Continued on page 13)





**MODERNIZING THE COAST HIGHWAY** between Arroyo Hondo and Gaviota in Santa Barbara County, the work of widening the roadway, realigning and removing dangerous dips and curves is about completed. No. 1 is a recently opened section of new highway. No. 2 view of big fill at north end of project looking toward Gaviota with rolling operations in progress. No. 3, fill under construction between railroad and old highway seen at left. No. 4, pouring concrete. Note two tamping machines at work, one for the base course on which to place wire mesh reinforcing and one for the surface course.

# July Traffic Count Shows General Increase Over 1933 in Daily Travel

By T. H. DENNIS, Maintenance Engineer

THE semiannual count of traffic using the State highways was taken by the Division of Highways maintenance organization July 1st and 2d, between the hours of 6 a.m. and 10 p.m. each day. The field sheets segregate traffic by hourly periods under the following vehicle classifications: California automobiles, foreign automobiles, light trucks, heavy trucks, trailers, buses and horse-drawn vehicles.

In addition to the detail taken at the regular locations on the State highways, the stations on county roads and city streets were included as for the January and March counts in connection with the state-wide traffic survey. The detail, therefore, covered some 2400 points and required 13,800 men. The greater part of this force was furnished from the SFERA and CCC crews.

The analysis of the detail in connection with all three counts is now nearing completion and is to be assembled in a single report. Information given at this time, therefore, only covers comparison of counts at stations on the State highway system showing increase or decrease in total traffic for the two-day period as compared to a similar period in 1933.

The per cent gain or loss for the 1934 count as compared to 1933 is as follows:

	Sunday	Monday
All routes	-0.8%	+4.8%
Main north and south routes	-2.3%	+4.0%
Interstate connections	+8.0%	+10.9%
Laterals between inland and coast	+0.1%	+5.0%
Recreational routes	+0.9%	+0.2%

From the above, it appears that the average daily traffic throughout the week has increased generally over that of a year ago.

Gain or loss in traffic volume for State Highway Routes 1 to 80, inclusive, expressed as a percentage of the July, 1933, count is as given below. No comparison can be given for highway Routes 81 to 202 as these latter roads did not become a part of the State highway system until August, 1933, and counts are not available. Of the 76 routes or portions

of routes listed, 49 show a gain in traffic for Sunday and 60 show a gain for Monday as compared to the July, 1933, count.

State Highway Route	Termini	1934			
		Sunday		Monday	
		Gain	Loss	Gain	Loss
1. Sausalito to Oregon Line	-----	---	12.0	2.3	---
2. San Francisco to Mexico Line	-----	---	10.6	---	6.9
3. Sacramento to Oregon Line	-----	3.1	---	12.4	---
4. Sacramento to Los Angeles	-----	14.9	---	15.5	---
5. Stockton to Santa Cruz	-----	---	3.5	1.0	---
6. Sacramento to Woodland Junction	-----	---	9.2	---	3.8
7. Benicia-Tehama Junction	-----	4.0	---	5.4	---
8. Ignacio-Cordelia	-----	---	13.4	2.9	---
9. San Fernando-San Bernardino	-----	15.2	---	5.7	---
10. San Lucas-Sequoia National Park	-----	1.8	---	---	3.0
11. Sacramento-Nevada Line via Echo Summit	-----	11.7	---	13.5	---
12. San Diego-El Centro	-----	1.0	---	4.5	---
13. Salida-Route 23 via Sonora Pass	-----	6.8	---	7.1	---
14. Albany-Martinez	-----	---	5.1	7.4	---
15. Route 1 near Calpella to Route 37 near Cisco	-----	0.2	---	16.3	---
16. Hopland-Lakeport	-----	23.6	---	16.4	---
17. Roseville-Nevada City	-----	10.3	---	21.5	---
18. Merced-Yosemite National Park	-----	---	20.7	---	20.3
19. Route 9 West of Claremont-Beaumont via Riverside	-----	1.7	---	8.1	---
20. Route 1 near Arcata-Lassen National Park	-----	3.9	---	67.1	---
21. Route 3 near Richvale-Route 29 via Buck's Ranch and Quincy	-----	17.1	---	24.3	---
22. San Juan Bautista-Route 32 via Hollister	-----	---	3.8	---	6.2
23. Saugus-Alpine Junction	-----	18.4	---	10.9	---
24. Lodi-Route 23 via Ebbetts Pass	-----	4.6	---	10.5	---
25. Nevada City-Downieville (Portion)	-----	22.7	---	37.6	---
26. Los Angeles to Mexico via San Bernardino	-----	2.5	---	5.5	---
27. El Centro-Yuma, Arizona	-----	6.2	---	---	1.1
28. Redding-Nevada Line	-----	18.2	---	21.6	---
29. Red Bluff-Nevada Line (Portion)	-----	3.8	---	2.9	---
31. San Bernardino-Nevada Line near Jean	-----	29.7	---	26.4	---
32. Gilroy-Route 4 near Califa	-----	---	2.5	---	2.7
33. Paso Robles-Famosa	-----	26.9	---	5.5	---
34. Twin Cities-Route 23, via Carson Pass	-----	10.9	---	12.8	---
35. Peanut to Kuntz (Portion)	-----	14.2	---	155.4	---
37. Auburn to junction Rte. 38, Truckee	-----	12.0	---	5.9	---
38. Meyers-Nevada Line via Truckee River	-----	---	9.2	2.3	---
39. Tahoe City-Nevada Line	-----	---	8.1	---	4.6
40. Route 13-Route 23 via Tioga Pass (Portion)	-----	20.4	---	62.4	---
41. General Grant National Park	-----	---	8.1	---	14.2
42. Route 55 to Calif. Redwood Park	-----	10.2	---	19.2	---
43. Newport Beach-Big Bear Lake via San Bd.	-----	1.3	---	6.0	---
44. Boulder Creek-Calif. Redwood Park	-----	---	17.9	---	17.0
45. Willows-Route 3 near Biggs	-----	30.1	---	40.6	---
46. Klamath River Road	-----	7.1	---	9.3	---
47. Orland to Chico	-----	21.7	---	27.1	---
48. McDonald's-Navarro River Road	-----	20.1	---	7.0	---
49. Calistoga-Route 15 near Lower Lake	-----	---	7.2	24.8	---
51. Santa Rosa-Schellville	-----	---	5.7	3.7	---
52. Alto-Tiburon	-----	---	0.6	---	8.9
53. Fairfield-Lodi	-----	---	11.5	---	2.1
54. Michigan Bar-Central House	-----	34.5	---	26.9	---

(Continued on page 13)



## American Canyon Excavation Total 1,306,000 Yards

(Continued from page 2)

overflow section, and to the north it has been used to raise the "big fill" and widen it to its ultimate width—that necessary to accommodate a 40-foot pavement. This widening has been done by dumping with trucks over the sides of the fill, and then bringing it up in layers with bulldozers, watering and rolling.

The original estimate of excavation yardage has been exceeded by about 140,000 cubic yards to date, and may run somewhat over this when the final quantities are worked up.

As the soil is largely clay and adobe with a high shrinkage, the grade is being built from 1½ to 2 feet low, so that under the next contract it may be brought to grade with selected material of a low shrinkage upon which a pavement may safely be placed.

### GRADING COMPLETE IN FALL

In the "big fill" a timber and concrete bridge is being built to provide a farm underpass and care for drainage. This is delaying the work somewhat, as this structure must be completed before all the material from the big cut can be placed.

This contract should be completed this fall, at which time the section will be ready for surfacing. The resident engineer on the job is A. N. Lund.

The Cordelia underpass and approach grading was handled by the Bridge Department. R. H. Twaddle was the resident engineer.

A salesman taking his bride South on their honeymoon visited a hotel where he boasted of the fine honey.

"Sambo," he asked the colored waiter, "where's my honey?"

"Ah don't know, boss," replied Sambo, eyeing the lady cautiously. "She don't wuk here no mo!"

Pupil: "Do you think it's right to punish folks for things they haven't done?"

Teacher: "Why, of course not, Willie."

"Well, I didn't do my home work."

—Philadelphia Public Ledger.

Sidney D. Waldon, president of the Detroit Rapid Transit Commission, stated recently: "Planning ahead of a growing city's needs is like putting money in a bank which not only guarantees principal but pays 100 per cent compound interest annually."

## Coast Highway Link Improved by Removal of Curves and Dips

(Continued from page 10)

railroad cuts have been daylighted, or removed on a bench section not exceeding 2½ feet above the pavement.

The native soils in this region consist largely of adobe and broken shales, both having high lineal shrinkages, and which are unsuitable material on which to place concrete pavement. This condition necessitated the use of a protective blanket under the pavement of a suitable imported material. This subbase was spread to a depth of 9 inches or more under the pavement and 4 inches on the shoulder. In addition, below the subbase, the native material was sealed with a bituminous membrane of heavy asphaltic road oil.

When formally opened, this road will be a welcome link to the constant series of improvements on El Camino Real and will prove a time saver and eliminate dangerous conditions through this section.

The project aggregates a total construction cost of about \$65,000 per mile and is financed and governed by the National Industrial Recovery Act.

## JULY TRAFFIC COUNT SHOWS GENERAL INCREASE OVER 1933

(Continued from page 12)

State Highway Route	Termini	1934			
		Per cent gain or loss		Sunday	Monday
		Gain	Loss	Gain	Loss
55.	San Francisco-Route 5 Glenwood	---	8.9	---	18.3
56.	Carmel-San Luis Obispo	---	21.3	3.8	---
57.	Rte. 2, near Santa Maria-Rte. 23 near Freeman	19.6	---	21.2	---
58.	Bakersfield-Arizona line, near Topock	86.6	---	99.3	---
59.	Rte. 4 near Baileys to Route 31 near Cajon Pass	3.9	---	---	10.5
60.	Route 2 near El Rio-Route 2 near Serra	1.6	---	---	4.0
61.	La Canada-Route 62 at Pine Flats	7.7	---	80.0	---
63.	Big Pine-Nevada Line	20.6	---	20.4	---
64.	Mecca-Arizona Line	24.3	---	17.8	---
65.	Auburn-Sonora (Portion)	1.1	---	0.7	---
66.	Messdale-Manteca (Portion)	10.4	---	3.6	---
67.	Route 2-Pajaro River (Portion)	---	17.1	---	18.2
68.	San Francisco-San Jose via Bayshore	---	3.1	4.9	---
69.	San Rafael-San Quentin (Portion)	---	44.3	3.0	---
70.	Ukiah-State Hospital Talmadge	12.8	---	---	15.1
71.	Crescent City-Oregon Line	26.6	---	24.2	---
72.	Weed-Oregon Line	24.4	---	80.6	---
73.	Alturas-Oregon Line	---	20.1	9.4	---
74.	Napa Wye-Carquinez Bridge	---	4.6	5.1	---
75.	Oakland-Walnut Creek (Portion)	2.7	---	1.9	---
76.	Bishop-Nevada Line	22.5	---	6.6	---
77.	Pomona-San Diego	---	2.2	4.7	---
78.	Riverside-Temecula (Portion)	---	5.0	0.9	---
79.	Ventura-Castaic	7.4	---	9.2	---
80.	Zaca-Santa Barbara	---	5.9	17.2	---

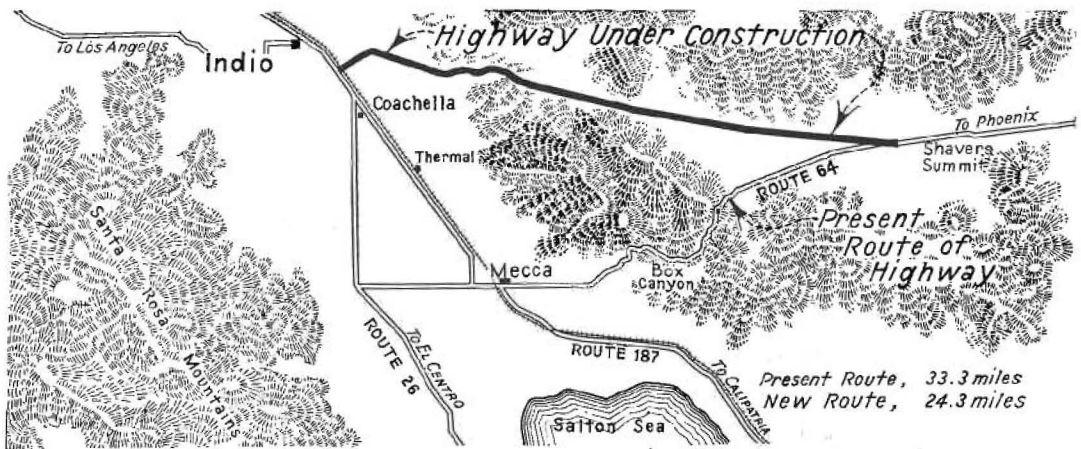
## Construction Begun on Indio Cutoff Eliminating Dangers of Box Canyon

CONSTRUCTION has started on the final uncompleted link of the highway between Indio and Blythe, known locally as the Indio cutoff. The Indio cutoff is part of the transcontinental highway U. S. Sixty, which extends from the eastern coast in Virginia to Los Angeles in California. The completion of the present project will mean still another step toward the realization of a high-speed, shorter and more direct route to the east from Los Angeles through the hazard of the great Colorado Desert.

The romance of transportation development through this section can best be con-

for some present-day private fortunes were started by the ancestors furnishing cordwood for these river steamers. They hired the Indians to gather the wood from along the river and then gave them half of the wood for gathering it.

The cutoff between Indio and Shaver's Summit is of great importance to the people who travel this region. That vast project of the Metropolitan Water District, whose construction parallels this highway, together with the increase in local and transcontinental travel, has put a heavy traffic load upon this desert highway.



trasted by looking back a few short years to that period when flat-bottomed steamboats plied the Colorado River. History tells us that it once took five months to reach the town of Erhenberg across the river from Blythe, traveling by boat from Los Angeles. One perhaps wonders at the amazement of those one-time passengers of the river boat *Esmeralda* had they been told that Los Angeles would be reached by highway in five or six hours.

### FORTUNES MADE IN WOOD

In view of the present unemployment problem, it might be well to mention here the labor situation and the manner in which it was solved in the days of the wood burning stern-wheelers on the Colorado. The foundations

The present traffic, as carried by this route, is far in excess of that estimated for 1940, the estimate being based on the traffic count of 1930. The number of cars using the road has increased nearly ten times in the period 1930-1934.

### ELIMINATES BOX CANYON

The present project accomplishes a shortening in distance of nine miles, with a resultant saving of construction and operation costs. However, it would be impossible to state the saving in the peace of mind to the tourist and other traveler in the elimination of the necessity of traveling the old Box Canyon road.

The Box Canyon road has been used since the first development of highway facilities in





**PIONEERING OPERATIONS** are well advanced on the Indio Cut-off from Shaver's Wells on the Mecca-Blythe highway to State Highway 26 just south of Indio in Riverside County. The new road is being cut through desert hills as shown in the above picture. Preliminary construction for one of the bridges over a wash is seen in the background.



**OVERLOOKING COACHELLA VALLEY**, the route rises from its westerly end near Indio at an elevation of 47 feet below sea level to a maximum elevation of 1688 feet at the summit.

this section. For the most part, it traversed a region subject to cloudbursts and sandstorms. The roadbed followed the many windings of the dry wash in the bottom of the canyon, and a new road or track had to be made after each major storm.

The physical characteristics of the canyon and its immediately surrounding terrain precluded the location of a highly improved highway, although several engineering studies were made as to its feasibility.

The oiling of the old canyon road last fall and its continual upkeep by State maintenance forces will make it serve very well the

smaller amount of traffic it will carry after the completion of the present Indio cutoff project.

The highway now being constructed leaves the Indio-El Centro Highway a short distance below Indio, then proceeds in a nearly straight line to its connection with the present improved section near Shaver's Summit. The project is 24.3 miles in length. Its alignment contains 18 curves with a minimum radius of 1600 feet. The route rises from its westerly end near Indio at an elevation of 47 feet below sea level to a maximum elevation of 1688 feet at the summit. The maxi-

(Continued on page 17)

## 80 Cents of Every \$1 Goes to Worker

(Continued from page 1)

Only men with families or dependents, who live in the locality, are employed on the work. The Department of Public Works contacts local officials or relief agencies and selects men adaptable to the work from lists furnished by them. The men live at home and board themselves and the State furnishes transportation to and from the work.

The method of supplying unemployment relief by the expansion of highway maintenance crews has proven to be most satisfactory, as through it a maximum of the money expended goes directly to the men employed. Recapitulation of expenditures on this work during the past year shows that out of every dollar spent on the work eighty cents is paid out in wages to the relief crews and twenty cents goes for supervision, tools, materials, supplies and transportation. The flexibility of maintenance crews is a feature which makes their expansion readily lend itself to providing work for a maximum of man power.

### MAXIMUM HAND LABOR

Another important feature of this method of supplying relief is that it provides improvements of undoubted value to the highways, which add materially to the capital investment of Californian motorists in their State road system.

The type of work performed by the men employed on expanded maintenance crews is selected on the requirement of a maximum amount of hand labor and a minimum amount of material. Improvements which are made to the road system by the work of these relief crews cover a wide variety of operations.

The improvements which are most noticeable to the motoring public are the widening and smoothing of roadbed shoulders, the improvement of sight distance by the cutting back of bank slopes at curves and the widening of the roadbed on curves.

### IMPORTANT DRAINAGE WORK

But probably the most important work performed by the men is the improvement of drainage conditions. This work consists of clearing roadsides and gutters, cleaning and extending culverts, installing subdrains, constructing rock gutters and planting slopes with shrubs or creeping vines to protect them from serious erosion.

### COMPLAINS THAT HIGHWAY IS HOGGING HIS HOG PASS

Carmel, Cal.  
July 7, 1934.

State Highway Department,  
Sacramento Cal.

Dear Sir:

"Bill" Nye once said, "Hogs, arguments about hogs, and the doings of hogs have filled more premature graves than all other farm animals combined."

Approximately twenty-two miles south of Hollister in San Benito County on the Pinnacles road, I have maintained a hog pass beneath the highway for years. A few days ago your road crew took it into their intellect to place a pipe in this pass so obstructing it that even the most progressive member of the Peccary family found it impossible to squeeze by.

This pass served a dual purpose, that of hog-pass and road-drain. I am asking your department to put this pass in a passable condition for hogs, and if you know anything about hogs you will agree I am not asking a heck of a lot.

Thanking you,

(Signed) JAS. B. McGREERY

Other improvements include the removal of material to eliminate possible slides, filling of low spots or sinks along the roadway, cultivating and trimming roadside trees and many other forms of work which add to the appearance of the highway, increase the safety of travel and prolong the life of construction investments which have been made.

With the funds which were appropriated by the commission for this unemployment relief, it is estimated that the Department of Public Works will be able to continue this work until late in February, 1935.

It is, indeed, a matter of deep gratification to the personnel of the department that the State is able to furnish these 3200 fellow Californians with the means of holding their families together during the coming months and to assist in conserving the morale of these citizens during the present period of readjustment.

Owner of a badly worn racing car: "You'd be surprised at the speed of this car. How much do you think I get out of it?"

Sarcastic Friend: "About every other block."



## Indio Cut-off Link of U. S. 60 to Require 15 Timber Bridges

(Continued from page 15)

mum grade attained is a short distance of 6.3 per cent.

While the new cutoff is subject to the same cloudbursts and wind storms as the old Box Canyon route, its drainage problems can be solved practically and economically by timber bridges and their associated means.

There are being constructed under the present project 15 timber bridges, a total of 1767 lineal feet, at a cost of approximately \$149,000. These, together with other crossings by means of dips and the necessary ditch and dike controls, will adequately care for the storm problems in so far as it is economically possible to do so.

### AIDS UNEMPLOYMENT RELIEF

This contract is financed through the National Recovery Act. As an aid toward unemployment relief, the contract will furnish employment for an average of 100 men during the period of construction. These men will practically all be furnished locally through the Riverside County Reemployment Agency.

The total construction cost on this project is estimated at \$456,000 with the chief items of work being the grading and timber bridges. The surfacing is to be the local material treated with 60-70 grade fuel oil by the road-mix method.

The contract was awarded March 30, 1934, and while the date of completion has been set for November 7, 1935, it is expected that the work will be completed by the first part of July of next year. The extreme heat of the summer in the desert makes working conditions far from ideal for this project, but in spite of obstacles, the work is being pushed to an early completion.

In the meantime traffic is using the old Box Canyon route via Mecca. This road is a State highway and will be maintained by State forces.

A hotel was on fire and the guests, gathering out in front were watching the flames.

"Nothing to get excited about," one traveling man was boasting. "I took my time about dressing. Lighted a cigarette. Didn't like the knot in my necktie and retied it. That's how cool I was."

"Fine," remarked a bystander, "But why didn't you put your pants on?"—*Copper's Weekly*.

### TRAFFIC SURVEY ELICITS AN EXCHANGE OF COMPLIMENTS

July 7, 1934

Mr. Frank Y. McLaughlin,  
Director General,  
Emergency Relief Administration,  
Los Angeles, California.

Dear Sir:

Your splendid cooperation during the state-wide traffic survey made June 30th, July 1st and July 2d, is responsible for the success of that project. This office wishes to extend to you its appreciation of the fine way your organization worked with the State Division of Highways.

The men selected at your various district placement offices and sent out to our numerous traffic stations were, with but very few exceptions, intelligent and well qualified for the work. Mr. W. M. Halpin, whom I believe is in charge of the district placement offices, cooperated with us in every way.

In connection with making up time cards and pay rolls for the SERA workers, the instructions and help we received through Mr. J. B. Miles' office made it possible for us to do that part of the work correctly and to your satisfaction. Both Mr. L. W. Vale and Mr. H. B. Upham, from your office, worked with us and gave us the benefit of their experience, and we were certainly glad to have them help us out.

Thanking you again for your splendid cooperation, I am

Yours very truly,  
S. V. CORTELYOU,  
District Engineer.

July 9, 1934

Mr. S. V. Cortelyou, District Engineer,  
Division of Highways, District VII,  
Los Angeles, California.

Dear Sir:

Replying to your letter of July 7th, it is indeed gratifying to receive letters like the one addressed to Mr. McLaughlin, and to receive the opinions of men who thoroughly understand the difficulties which we are encountering in the launching of this relief program. We especially appreciate your recognition of the efforts of the individuals mentioned in the letter for we know that whatever credit is given to this office is gained only through the efforts of the individuals who we believe are so earnestly devoting their efforts toward a successful program.

I might also take this opportunity of congratulating you on the splendid and efficient manner in which this work was directed. We have heard nothing but praise as to the completeness of the survey. I hope that our organization may be of further assistance to you and that you will feel free to submit projects such as the traffic survey for our approval.

With kindest personal regards, I am

Very truly yours,  
RALPH B. SMITH,  
Executive Assistant,  
Emergency Relief Administration.

## CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

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

EARL LEE KELLY.....Director  
JOHN W. HOWE.....Editor

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

Vol. 12 SEPTEMBER, 1934 No. 9

### "Best Drink in the World"

Everyone who has traveled the All-Year Highway to Yosemite has noticed the attractive drinking fountain erected by the maintenance crew of the State Highway Department a short distance above Briceburg. Many have paused for a cooling drink; in fact, observers have estimated that over a hundred cars a day stop at this oasis.

Last winter the local maintenance men diverted a spring which was flowing to waste and erected the present rubble stone fountain more or less as an experiment. In our opinion it is an eminently successful one. There are at least three more springs, one on the Briceburg grade and two between Sweetwater Creek and El Portal, that are not in use and could readily be piped, with small expense, for the convenience of travelers.

The Merced River Canyon in the summer is far from cool, and it is to be hoped that the highway department will see fit to erect more of these attractive fountains, that the parched traveler may refresh himself with the finest drink in the world—Mariposa County water.—*Mariposa Miner*.

### OILING PINNACLES ROUTE

On the Pinnacles Route from Hollister south, from two miles south of the San Benito River crossing to 3.5 miles north of the San Benito River crossing, and from one mile south of Paicines to Tres Pinos, a distance of about 12 miles, an oil treatment is being applied to the existing roadbed.

"What month is it in which it is unlucky to be married?"

"Goodness me! What a poor memory you have. We were married in March."—*Tit Bits*.

## Federal Funds Built 22,000 Miles of Roads and Streets in Year

**R**ECORD speed in putting highway work under way is reported by the Bureau of Public Roads, U. S. Department of Agriculture. On June 23, 1934, just one year after apportionment of the \$400,000,000 highway appropriation provided by the National Industrial Recovery Act, an average of nearly \$1,000,000 a calendar day had been put to work by the State highway departments in the construction of public works highways.

The improvement of more than 22,000 miles of public roads and streets—a mileage sufficient to build a road almost around the world—will be the result of the expenditure.

The record of the road building reported by the bureau showed on June 23, 1934, the following disposition of the \$394,000,000 apportioned:

Status	Number of projects	Public works funds	Miles of highways
Projects completed.....	2,161	\$66,040,000	6,360
Projects under construction.....	4,963	266,190,000	14,062
Projects awarded but not under construction.....	580	18,258,000	1,006
Total contracts awarded.....	7,704	\$350,488,000	21,428
Projects approved but not under contract.....	394	15,440,000	871
Total obligated.....	8,098	\$365,928,000	22,299
Amount apportioned.....		\$394,000,000	
Percentage of apportioned funds obligated to projects.....			92.9

On Federal-aid highways outside of cities, 95.4 per cent of the available money has been allotted for improvement of 11,922 miles of highways, of which 4061 miles have been completed.

### 433 MILES IN CITIES

On extensions into municipalities, 89.3 per cent of the funds has been obligated on 1813 miles of wide city streets, of which 433 miles have been completed.

In the secondary road program, involving improvement of rural roads not on the Federal-aid highway system, 92.3 per cent of the funds has been obligated on 8564 miles with 1866 miles completed.

Employment under the program totaled 246,192 men on June 23, 1934. This is only direct employment on the roads and does not include workers indirectly employed in quarries, mills, factories and transportation of road materials, the number of which is estimated at nearly twice the direct employment.



## Juries Protect State Against High Valuations in Condemnation Suits

**F**ORCED to proceed in condemnation because of demands for right of way which were considered exorbitant, the Department of Public Works is gratified at the attitude taken by juries in three recent cases in Los Angeles and Alameda counties. One of the cases was of particular importance because it resulted in a decision by Superior Judge Thomas P. White of Los Angeles County that the State, in its sovereign capacity, may condemn cemetery property for highway purposes, despite the provision in the General Cemetery Act prohibiting the taking of such areas for public purposes.

In the case entitled *People vs. Pearce et al.*, on Route 26 at the easterly city limits of the city of Los Angeles, a right of way 100 to 136 feet in width was condemned across an area which the owners claimed had been dedicated for cemetery purposes but which had not yet been improved as a cemetery.

### COURT UPHELD STATE

The State attacked the dedication as irregular and ineffective, in view of the fact that the board of supervisors of the county of Los Angeles had rescinded its action in approving and accepting a map of the area. The superior court decided, however, that the dedication of the cemetery was legal but that, despite such dedication, a portion of it could be taken for State highway purposes.

In this case appraisers for the defendant cemetery association testified to values for right of way and damages as high as \$125,000. Appraisers for the State testified to much lower values, and the jury brought in a verdict of \$1,800. The area taken was approximately three acres. Considering real estate values in this area, this is considered a reasonable verdict.

### LAND WAS DONATED

The department was particularly pleased with the fact that the jury was not impressed with the claims of the defendants, because of the fact that much of the right of way on this important project had been donated.

In the case of *People vs. Livingston*, also on Route 26, in the city of West Covina, Los

Angeles County, the State required a small parcel of land at the intersection of Garvey Avenue and Glendora Avenue, containing about 159 square feet. The owners in their answer set up values as high as \$12,000, and testified to values at the time of the trial.

The jury awarded the defendants \$25 for the little tip of land taken and made no allowance for an alleged lease of the property, which provided for high rentals but under which no improvements had been made.

### REASONABLE COMPENSATION

The case entitled *People vs. Weeks et al.*, involved two parcels of right of way on the Dublin Canyon project, Route 5. The two parcels were recently consolidated for trial before a single jury in the superior court for Alameda County with the following result:

The owners of one parcel asked compensation of \$3,400 and were awarded \$544 by the jury. The owners of the other parcel demanded \$13,600 for compensation and damages and were awarded \$850 for land taken, with no allowance for damages.

The verdicts are considered reasonable compensation for the areas taken. A motion for a new trial has been denied by the court.

The department, as a general policy, dislikes to force owners to condemnation, but in the cases mentioned the demands were considered so unreasonable that no alternative was presented. The results, however, fully justify the course taken and indicate that, when the facts are fairly and fully put before juries, reasonable verdicts may be anticipated.

He had gone into the library to put the thing up to her father, and she was anxiously waiting on the front porch.

"Well," said the suitor when he returned, "he asked me how I was fixed, and I told him I had \$3,000 in the bank."

"And what did he say to that?"

"He borrowed it."

"A week after their wedding they were throwing crockery at each other," said a landlady in court recently. It is not every couple that settles down to married life so quickly.

## Engineers Devise a Method to Prevent Steel Pile Corrosion

(Continued from page 4)

caps and throwback plate, is securely held in line by tie rods which extend to concrete deadmen back of the walls.

The life of these structures depends to a large extent on protecting the metal from the corrosive action of the salt water, and a great deal of time and effort have been expended by the engineers in the district endeavoring to determine the most effective methods of treating the piles.

Piling was unloaded from trucks and spread out in orderly rows on timbers placed as high on the beach as possible. Rust and mill scale were removed by wire brushing and quick drying prime coats applied. After the prime coats had dried, hot asphaltic coatings were applied to about  $\frac{1}{8}$ " thickness. In order to protect these asphaltic coatings from chipping, during driving, the engineers designed special roller leads to keep the piles in line while driving.

### SCOUR LINE PROTECTION

One of the greatest difficulties has been found to be with the 3 or 4-foot scour line where pebbles are hurled against the piling with terrific impact by the waves. Here the protective coating was soon worn off and other means of protecting the metal had to be worked out. As the time between tides was limited, a very fast drying primer was used after which fairly hot airblown asphalt was applied and slightly damp beach sand thrown against the asphalt. This coating was built up to about  $\frac{1}{4}$ " in thickness and so far has successfully resisted the erosive action of the waves.

On the whole, this type of structure gives promise of being a very economical method of protecting embankment slopes adjacent to the ocean, and should it continue to resist wave and tide action, as it has so far, will probably be used quite extensively in shore protection work where conditions are similar to those on the Ventura coast.

"You say that you are the sole support of a widowed mother, your father having recently been killed in an explosion. How did the explosion happen?"

"Mother says it was too much yeast, but Uncle Jim thinks it was too little sugar."—*Wisconsin Highways*.

## Old Plank Road of Sand Hills Becomes a Museum Exhibit

By I. G. THOMAS, Office Engineer

A PORTION of the old plank road, that was constructed in 1915 and 1916 by the California Highway Commission and served in a semisatisfactory way, yet many times better than the shifting sands, to carry hot and weary travelers across the sand hills between Yuma and El Centro, is to be permanently preserved and made a part of a perpetual exhibit on the history of transportation.

The Ford Motor Company, through its local agents at Long Beach, made a request recently to obtain a portion of the old road. Director Earl Lee Kelly, upon learning the purpose of the request, granted the company permission to remove 100 lineal feet of the old road to Chicago where it is on exhibition in the Ford Building at the Century of Progress as a part of the exhibit showing various types of roads from the beginning of road history.

### GIVEN PERMANENT HOME

After the fair, the old plank road is to be placed in the museum of the Edison Institute at Dearborn, Michigan.

This portion of a novel, yet indispensable type of road in its day, a boon to mankind during its existence across the shifting dunes of the desert sands, will be preserved, reminding those who may view it of the California highway builders who made it possible by the creation of a movable road for the early-day motorist to cross these sands in comparative safety, although with much annoyance and discomfort due to the necessity of using turn-outs provided for passing at each half mile.

No part of the old plank road now remains in use, as it has been replaced with a modern asphaltic pavement laid on an embankment which has been so located and constructed that the drifting sands do not collect on the paved portion of the highway.

As one travels along the new road, portions of the old plank road are seen here and there reminding one of the days gone by when travel across this desert was something to be dreaded.

"Have you a skeleton in your closet?"

"No, it's out in the garage. I forgot to lock the doors last night and somebody took everything except two wheels and the frame."





**OLD PLANK ROAD** through the creeping sandhills of Imperial County as it existed in 1915 is shown at top. No. 2 shows a section of it reposing as a museum piece at the Chicago World's Fair. No. 4 shows a truck crew retrieving the section from its sandy tomb on the desert for the 2000 mile journey to Chicago. No. 5 is a scene on the modern paved highway that replaced the plank road and tamed the shifting sands.



The California District Securities Commission has approved the \$10,000,000 contract between the Coachella Valley County Water District and the Federal government for the construction of the Coachella branch of the All-American Canal as a result of the investigation and report of the State Engineer.

The Commission has also authorized the issuance of bonds to the Reconstruction Finance Corporation by four irrigation districts totalling \$2,375,000 for refinancing loans. Dam applications, flood control and other activities of the Division of Water Resources are given in the following monthly report:

#### IRRIGATION DISTRICTS

An investigation and report were made by the State Engineer on the proposal of the Coachella Valley County Water District to enter into an agreement with the United States for the construction of the Coachella Branch of the All-American Canal. The area to be served in the Coachella Valley by the proposed canal is about 140,000 acres and the cost of the work which the government agrees to do for the water district is estimated at approximately \$10,000,000.

Inspection was made of the work proposed under a \$225,000 loan and grant to the Modesto Irrigation District by the Federal Emergency Public Works Administration.

#### CALIFORNIA DISTRICTS SECURITIES COMMISSION

The Commission issued feasibility orders and authorized the voting of bonds to be issued to the Reconstruction Finance Corporation for refinancing loans as follows:

Albaugh Irrigation District.....	\$101,000
Lindsay-Strathmore Irrigation District...	859,000
Oakdale Irrigation District.....	1,162,500
Paradise Irrigation District .....	252,500

Other orders and reports issued by the Commission were:

Coachella Valley County Water District—Approval

of All-American Canal contract between the United States and the water district.

Lindsay-Strathmore Irrigation District—Approval of contract between district and Lakeside Ditch Company.

Nevada Irrigation District—Consent to expenditures from special reserve fund.

Palmdale Irrigation District—Consent to modification of refunding plan as heretofore approved; approval of readjustment plan under Chapter IX of the Federal bankruptcy act.

Palo Verde Irrigation District—Validation of refunding bonds.

South Fork Irrigation District—Approval of revised schedule of bond maturities.

Terra Bella Irrigation District—Approval of petition to proceed in the matter of exchange of refunding bonds under Chapter IX of the Federal bankruptcy act.

#### FLOOD CONTROL AND RECLAMATION

##### *Sacramento Flood Control Project.*

This office has been authorized by the Reclamation Board to move the Packer warehouse, located about six miles above Colusa, from the right-of-way upon which a levee is to be constructed by the California Debris Commission. This work is estimated to cost \$4,275.

On July 30th clearing and grubbing work in the Sutter and Tisdale By-passes commenced with men from the Federal transient camps located in District 1500 and District 1660. During this period various numbers of men, varying from 62 to 100, have been employed. Tools are being furnished by this office and the transportation and other costs are being furnished from the Joint Navigation and Flood Control Project Fund, authorized by the Reclamation Board. To date the man-hours worked have been as follows: Stohlman Ridge, Sutter By-pass, 2424; Tisdale By-pass, 504; lower Sutter By-pass, 2972; total 5900 man-hours.

Commencing on July 26th an average of about 35 men have been engaged in clearing and grubbing work on the American River overflow channel, and to date approximately 5100 man-hours have been worked. Tools, powder and supervision are furnished from the Joint Navigation and Flood Control fund.

The California Debris Commission has finished plans for the completion of the three pumping plants on the Tisdale By-pass and bids will be called for within the next two or three weeks so that the plants will be ready for operation during the next rainy season. The total cost of this work is expected to be in the neighborhood of \$300,000.



# L. A. Asks \$7,675,000 Water Permit

(Continued from preceding page)

## WATER RIGHTS

### Supervision of Appropriation of Water.

During the month of July, 46 applications to appropriate water were received, 13 denied, and 25 were approved. During the same period 7 permits were revoked and 5 passed to license.

Among the applications received were, one from South Fork Irrigation District proposing appropriations of 20 cubic feet per second and 1000 acre feet per annum from South Fork of Pit River and Clear Creek in Modoc County for power purposes, and two from the City of Los Angeles, one of which proposes an appropriation of 775 cubic feet per second and 60,000 acre feet per annum from Mill, Leevining, Walker, Parker and Rush Creeks in Mono County for power purposes, and the other a like appropriation from the same streams for municipal purposes at an estimated cost of \$7,675,000.

Projects under permit were inspected preliminary to the issuance of license in El Dorado, Tulare, Kern, Los Angeles, San Bernardino, Riverside, Inyo and Mono Counties.

## SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the past month the flow of the Sacramento River at Red Bluff has dropped to about the same flow as in August, 1931; that is, about 2600 second-feet. At Sacramento the minimum flow reached has been about 1000 second-feet and it is anticipated that there will soon be an increase in this flow due to decreased diversions upstream and to increased return flow and rice drainage. The flow at Sacramento on August 20, 1931, was 480 second-feet. The San Joaquin River near Vernalis has dropped to a flow of about 360 second feet during the past few days, compared to a corresponding flow in 1931 at this time of 200 second-feet.

Although the stream flow at Red Bluff is as low as in 1931, the combination of a considerably smaller rice acreage than in 1931 and the active conservation program which is being carried on has been instrumental in maintaining a much better flow of the river at Sacramento than in 1931. Routine measurements of diversions, stream flow, return flow, salinity, etc., have been maintained.

Salinity sampling at some fifty stations on the upper bay and in the Delta has been continued and weekly bulletins giving results of the tests are being mailed to Delta land owners. The following comparison of salinity at bay and Delta stations on August 14, 1924, 1931, and 1934, shows that the present season's encroachment of salt water is still considerably below the 1924 and 1931 encroachments. However, salinity in proportions dangerous to irrigation now extends above Isleton in the Sacramento Delta and to Bouldin, Venice and Mandeville Islands and Holland Tract in the San Joaquin Delta.

## Comparison of Salinity at Bay and Delta Stations on August 14, 1924, 1931 and 1934

Station	Salinity in parts of Chlorine per 100,000		
	1924	1931	1934
Point Orient	---	1860	1820
Bullshead Point	---	1570	1580
Collinsville	970	1120	920
Emmaton	702	880	640
Rio Vista Bridge	462	660	360
Liberty Ferry	183	390	124
Isleton Bridge	310	545	200
Sutter Slough	36	320	20
Walnut Grove Bridge	29	220	7
Antioch	946	1090	800
Jersey	648	700	520
Central Landing	230	300	96
Southwest Point	---	390	68
Ward Landing	---	238	90
King Island Pump	66	102	48
Rindge Pump	78	120	33
Orwood Bridge	---	144	45
Middle River P.O.	81	180	47
Clifton Court Ferry	---	68	17
Whitehall	---	21	10

## DAMS

Application was filed on August 13, 1934, for the enlargement of the Rodden Dam of the Oakdale Irrigation District, in Stanislaus County, at a cost of \$4,000.

On July 12, 1934, applications were filed for the repair of Weaver Lake and Jackson Lake Dams in Nevada County. These applications were approved by the State Engineer on July 23d.

Construction of the Fallen Leaf Lake dam immediately below the outlet of Fallen Leaf Lake in El Dorado County is proceeding rapidly and will be completed prior to the end of the present construction season.

## TOPOGRAPHIC MAPPING

Topographic mapping was in progress during July on the Paynes Creek Quadrangle in eastern Tehama County under the general State and Federal cooperative topographic mapping program. The Paynes Creek quadrangle is being surveyed as a Federal project.

## WATER RESOURCES

### Central Valley Project

The Water Project Authority met in the office of the Director of Public Works, chairman of the Authority, at 2.30 p.m. on August 2, 1934. The State Engineer, Executive Officer of the Authority, presented a report covering the activities undertaken in connection with the furtherance of the Central Valley Project since State election held December 19, 1933.

# High P. C. C. Daily Output 914.1 Yards

(Continued from page 6)

minimum of mortar content consistent with workability required for satisfactory placement and reduction of cement content consistent with strength and durability would reduce shrinkage. This would be beneficial in reducing curling, due to unequal shrinkage of the top and bottom fibres, if the mix is placed and finished so as to be reasonably homogeneous throughout its depth.

## PORTLAND CEMENT CONCRETE

### PAVEMENT RECORDS

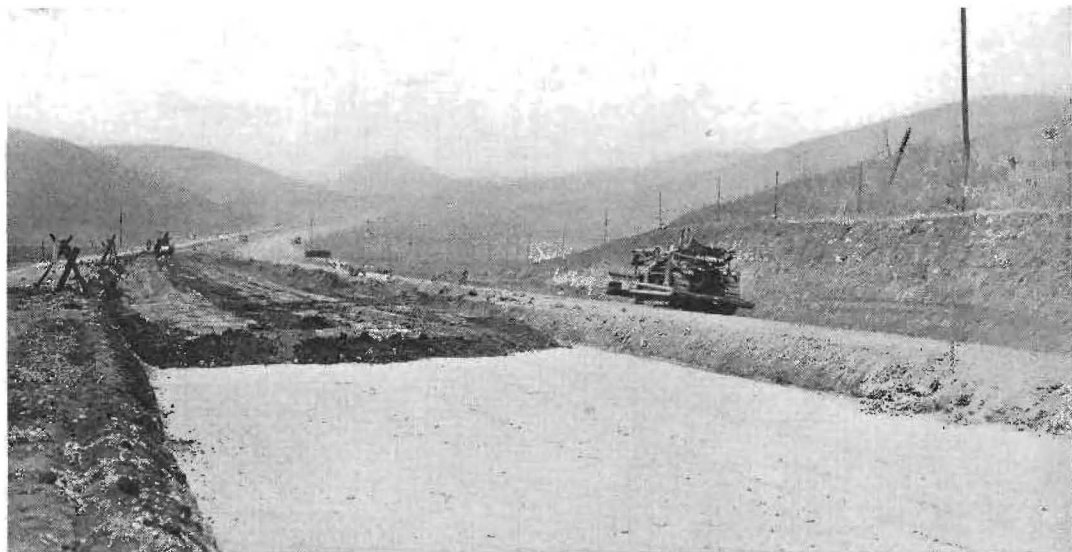
During 1933, contractors worked from 5 to 12 hours daily, and in computing average daily outputs we have reduced the hours worked to an 8-hour basis.

The maximum average daily output of concrete using one 27E mixer was placed on contract 47VC14,

between Santa Clara River and Ventura, where an average breaking strength of 5872 pounds per square inch was obtained. Kovacevich & Price were the contractors and F. B. Cressy was resident engineer, with P. L. Vaughn as street assistant. The average for the entire State was 4675 pounds.

The record for cement control was obtained on contract 45CN2, in Monterey County, 6 miles south of San Ardo to 1 mile south of San Ardo, with an average variation of 0.18 per cent; M. Bevanda was the contractor and V. E. Pearson resident engineer, with H. J. Doggart as street assistant. The average variation for the State was 0.80 per cent.

The record for surface smoothness was obtained on contract 47VC17, in San Diego County from Sorrento Creek to Del Mar, where the average roughness per mile was 5.0 inches. Griffith Company were the contractors and T. W. Voss resident engineer,



PLACING SELECT MATERIAL over oiled subgrade in Los Angeles County.

in Orange County between Irvine and Gustin, where the Griffith Company placed 460.1 cubic yards per day; W. D. Eaton was in charge as resident engineer with C. J. McCullough as street assistant. The average daily output per mixer for the entire State during 1933 was 390.6 cubic yards.

The maximum output for two mixers was on contract 44CN2 in Santa Clara County between Whisman Road and Lawrence Station Road where Basich Brothers placed an average of 914.1 cubic yards per day. This contractor was also high during 1932 when they averaged 880.7 cubic yards per day on a former Bay Shore Highway project. W. A. Rice was resident engineer and H. W. Purser street assistant.

### BREAKING STRENGTH 5872 POUNDS

The strongest concrete pavement placed during 1933 was on contract 47CS11, in Ventura County

with D. H. Greeley as street assistant. The average for the State was 9.4 inches per mile.

### CONSTRUCTION METHODS AND DESIGN

During 1933, finishing methods were changed somewhat from that of the previous year in that all one-man floats were at least 16 feet in length. For final cutting, a steel bottom float was first used successfully by F. B. Cressy, resident engineer, on contract 47CS11, and later perfected under W. I. Templeton on contract 47FC5. It is of interest to note on the 1933 work that all projects with a roughness record of less than 7 inches per mile were given a final finish with a steel cutting edge float.

No material change was made in the mixture or pavement design for Portland cement concrete during 1933.





PLACING ASPHALT CONCRETE BASE COURSE on contract in Sacramento County.

#### Joint Seals

Some experimenting was done with copper seals in an attempt to prevent infiltration of water at the joints. These seals were first tried out to a limited extent on contract 47FC4, and later more extensively on contract 47VC20. At expansion joints the seals were placed over the joint filler and tightly crimped on by a special tool.

A 1-inch galvanized clip was placed over the copper seal at each end and the joint carefully banked up with concrete by hand immediately in advance of the mixer. After floating, the clips were removed. At weakened plane joints a 3-inch area on each side of the joint was trenched out of the freshly struck off concrete and the steel forming strip, with the copper membrane attached, set in proper position and back-filled.

The steel strip was then removed at the normal interval. The copper membranes in each case were trough-shaped with wings slanting upward into the ends of the slabs on each side of the joint, the bottom of the trough encased the top of the joint filler at expansion joints and lined the bottom of the surface groove at weakened plane joints.

#### Joint Drains

Drains under designed joints were tried experimentally during this season. They consisted of trenching the prepared subgrade directly under the joint and making watertight with building or tar paper or by sealing with hot asphalt and backfilling with porous material.

#### Bulk Cement

Bulk cement came into use extensively for the first time in pavement construction this season, being used entirely by John & Bressi, contractors on the 26.5 miles of 30-foot paving of the Ridge Route Alternate in Los Angeles County.

#### Light-weight Aggregate

On contract 44TCS, in San Mateo County, experimental test sections were constructed using light-weight aggregate, 42-54 pounds per cubic foot, as a

trial for possible use on the upper deck of the San Francisco Bay Bridge. This work was under the supervision of the materials and research laboratory. On this same project two short sections were laid using 4 and 5 sacks of cement per cubic yard. The amount of material in the fine aggregate passing 30 mesh was increased along with the decrease in cement.

#### Mesh Reinforcement

On contract 44CN2, in Santa Clara County, mesh reinforcement was used with two pavers on the 20-foot strip, one ahead of the mesh placement and one behind, with a finishing machine striking off the base course ahead of the mesh placement. Contracts 44CN2 and 44TC6 were constructed by Basich Brothers simultaneously as though they were one project, one contract having full mesh reinforcement and the other standard bar reinforcement. Slightly better progress was made on the mesh section than the bar section.

#### Membrane Curing

Considerable bituminous membrane curing in lieu of the standard water cure was permitted on about 39 miles of pavement including 26.5 miles of the Ridge Route Alternate.

On work in District IV a broom mounted on wheels riding on the side forms and spanning the entire width of the pavement was used as a final operation to improve the appearance of the slab. This was used after the pavement was given the final cut with a steel shod float, and was immediately preceded by a fine spray of water from a hose by hand.

## ASPHALT CONCRETE PAVEMENT RECORDS

The 1933 maximum average daily output of 968.7 tons was laid on contract 47VC13, in Los Angeles County between Las Flores Canyon and Santa Monica Canyon. Palmer and Holland were the contractors and J. M. Lackey resident engineer, with A. W. Carr as street assistant. The average daily output for the entire State was 663.6 tons. This same project

(Continued on page 28)

# Detailed Figures of Construction Records

## PORTLAND CEMENT

District	County	Route	Section	Location	Miles	Contract	Contractor
IV	Alameda	5	B	Dublin-Castro Hill	6.7	44TC7	Union Paving Company
	Contra Costa	14	B	San Pablo-Carquinez Bridge	1.9	44BC7	Basich Bros.
	San Mateo	88	A	San Francisco-South San Francisco	3.1	44TC8	Basich Bros.
	Santa Clara	88	A	Oregon Ave.-Whisman Road	4.7	44TC6	Basich Bros.
	"	88	A, B	Whisman Road-Lawrence Sta. Road	3.5	44CN2	Basich Bros.
V	Monterey	2	H	6 Mi. S. of San Ardo-1 Mi. S. of San Ardo	5.0	45CN2	M. J. Bevanda
VI	Merced	4	C	Merced-Merced Airport	0.6	46CN2	C. W. Wood
			D	At Merced River Bridge	0.9	49TC4	N. M. Ball, Willard, Baisotti & Lovotti
VII	Los Angeles	4	A-I	Castaic School-Piru Creek	14.4	47FC4	Jahn & Bressi
			I, J	Piru Creek-Gorman	12.1	47FC5	Jahn & Bressi
			D	Gorman-Northerly Boundary	3.8	47CS13	Fredrickson & Watson
			B	Brea Canyon-Pomona	6.2	47XC2	Griffith Company
			B	At Brea Canyon Summit	1.3	47XC5	C. O. Sparks
			D	Oaks-Vasquez Rock Road	1.5	27FC20	von der Hellen & Pierson
			B	Mountain View Rd.-Orange Ave.	4.3	47XC3	Oswald Bros.
			B	At San Gabriel River	0.3	47XC6	Oswald Bros.
			C	Barranca St.-Pomona	6.1	47XC1	Griffith Company
			F	Long Beach, State St.-Anaheim St.	0.8	47VC20	United Conc. Pipe Corp.
			C	Irvine-Tustin	5.6	47VC14	Griffith Company
			A	Sorrento Creek-Del Mar	0.3	47VC17	Griffith Company
			C	Chocolate Creek-Alpine	3.4	47CS9	T. M. Morgan Co.
			D	Alpine-Viejas Creek	4.4	47CS10	T. M. Morgan Co.
			C	Santa Clara River-Ventura	4.0	47CS11	Kovacevich & Price
			C	W. City Limits Ventura-Sanjon Rd.	1.5	67VC2	Kovacevich & Price
			C, D	Meta St., Peking-W. Hemlock St., Ventura	1.6	47V6	M. J. Bevanda
Hueneme Rd.-Little Sycamore Creek	10.9	47VC11		J. L. McClain			
VIII	Imperial	27	H	At Brawley	0.4	48VC7	B. G. Carroll
			G	Avenue 74-Southerly Boundary	6.0	48FC2	United Conc. Pipe Corp.
			G	Avenue 62-Avenue 74	8.3	48CS2	Lee Moore Contr. Co.
			C	Mt. Vernon Ave. Crossing, San Bernardino	0.2	48CS5	United Conc. Pipe Corp.
			D	Vineyard Ave.-Sierra Ave.	10.2	48CS3	United Conc. Pipe Corp.
X	San Joaquin	66	A	Manteca-Mossdale	4.3	41OTC4	Fredrickson & Watson
			B	Hatch Crossing-Modesto	1.4	41OCN3	C. W. Wood
XI	San Diego	2	E	Broadway-Harasthy St. San Diego	1.8	47VC19	Griffith Company
				Total	141.6		
				Equiv. 20' width	164±		

## ASPHALT CONCRETE

District	County	Route	Section	Location	Miles	Contract	Contractor
II	Tehama	7	A	Southerly Boundary-Corning	8.9	42CN8	Hanrahan Company
III	Sacramento	11	B	Mills-Nimbus	4.5	28TC8	D. McDonald
IV	Contra Costa	14	B	San Pablo-Carquinez Bridge	7.2	44EC7	Basich Bros.
			C	Waldo-Sausalito	1.3	44CN3	Peninsula Paving Co.
			A	Lawndale-Baden	0.2	44EEC5	Union Paving Co.
VI	Fresno	4	B	Church Ave.-California Ave., Fresno	0.7	46TC3	Union Paving Co.
			G	Union Ave.-Minker Spur	2.9	46CS2	Gogo & Rados
VII	Los Angeles	9	A	Tujunga-La Canada	4.0	47VC12	Griffith Company
			A, B	Las Flores Canyon-Santa Inez Can.	4.1	47VC13	Palmer & Holland
			C	In Redondo Beach	1.4	47VC15	Griffith Company
			C	1.9 Mi. S. of Ventura-2.4 Mi. S.	0.5	47CS11	Kovacevich & Price
VIII	Imperial	27	B	Sand Hills-Araz Junction	7.8	48VC6	V. R. Dennis Co.
			E	Edom to Indio	11.0	48CS4	Oswald Bros.
X	Stanislaus	4	B	In Modesto	0.3	41OTC5*	A. Teichert & Son
XI	San Diego	2	E	Barnett Ave-Balboa Ave.	4.4	47DC18	Griffith Company
				Total	59.2		
				Equiv. 20. Width	74±		

\*Hand spread job.



# for 1933 on California State Highways

## CONCRETE PAVEMENT, 1933

Resident Engineer	Street Assistant	Average strength of concrete, 28 days, pounds per square inch.	Average yardage laid per 8-hour day, cubic yards.	Average daily variation in cement, in per cent.	Roughness index, inches per mile.	Type of Equipment Used		District
						Mixer	Finisher	
W. A. Rice	F. W. Montell	5,216	453.9	0.90	11.7	Rex	Lakewood, Ord.	IV
E. E. Sorenson	E. W. Herlinge	5,276	371.3	0.87	17.5	Ransome	" "	
E. E. Sorenson	G. L. Beckwith	4,517	676.6	1.10	9.7	" (2)	" (2) "	
W. A. Rice	E. W. Herlinger	5,250	889.6	0.94	11.0	" "	" " "	
W. A. Rice	H. W. Purser	4,822	914.1	0.99	12.2	" "	" " "	
V. E. Pearson	H. J. Doggart	3,982	456.0	0.18	2.5	Foote	Lakewood, Ord.	V
F. M. Reynolds	P. E. Baxter	4,184	244.2	1.16	11.7	Foote	Ord.	VI
W. H. Craft	R. M. Cooley	5,253	334.2	1.10	7.9	Koehring	" "	
W. I. Templeton	H. D. Johnson	3,850	646.4	1.47	8.5	Rans.-Koehring	Lakewood, Ord.	VII
W. I. Templeton	H. D. Johnson	3,628	767.4	1.12	6.0	" "	" "	
F. A. Read	C. E. Abbott	5,390	435.9	0.95	7.9	Koehring	" "	
H. B. Lindley	C. J. Woodbridge	5,079	454.9	0.92	13.3	" "	" (2) "	
W. J. Calvin	G. H. Lamb	4,572	384.1	0.54	11.1	Ransome	Lakewood	
F. R. Pracht	G. H. Lamb	4,282	426.2	0.91	10.4	Rex	" "	
L. R. McNeely	C. E. Abbott	5,483	375.8	0.48	10.7	Foote	" "	
W. J. Calvin	G. H. Lamb	4,898	277.5	0.24	5.7	" "	" "	
C. N. Ainley	G. H. Lamb	5,600	515.2	0.45	11.8	Koehring (2)	" (2) "	
R. J. Hatfield	W. C. Holmes	5,070	457.5	0.99	5.9	Foote	" "	
W. D. Eaton	C. J. McCullough	5,494	460.1	1.38	9.7	Koehring	" (2) "	
T. W. Voss	D. H. Greeley	3,367	278.5	0.58	6.0	Foote	" "	
C. P. Montgomery	R. J. Allan	4,635	312.3	0.90	7.5	Koehring	Ord.	
E. L. Sietz	J. Fleharty	4,899	328.3	1.01	7.6	" "	" "	
F. B. Cressy	P. L. Vaughn	5,872	389.8	0.60	11.6	Ransome	Lakewood, Ord.	
F. B. Cressy	P. L. Vaughn	4,565	186.1	1.26	10.9	Ransome	" "	
E. S. Gripper	G. F. Allen	4,110	445.0	0.46	14.1	Rex	" "	
T. W. Voss	D. H. Greeley	4,470	417.8	0.58	7.8	Foote	" "	
W. L. McPadden	F. R. Pearce	3,185	325.0	0.51	7.2	Ransome	Ord.	VIII
J. M. Hollister	B. Nelson	5,423	453.6	0.31	11.7	Foote	Lakewood, Ord.	
R. C. Payne	B. Nelson	5,245	396.8	0.91	10.4	" "	" "	
J. M. Hollister	J. M. Cogwill	4,428	261.4	0.70	12.3	" "	" "	
R. C. Payne	B. Nelson	4,375	386.3	0.34	6.3	" "	Ord.	
J. W. Cole	R. H. Lapp	4,927	426.5	0.40	8.0	Koehring	Ord (2)	X
G. R. Hubbard	L. E. Ford	4,372	357.5	0.87	8.6	Foote	" "	
T. W. Voss	F. B. Stewart	3,311	334.4	0.94	5.8	" "	Lakewood	XI
	Averages	4,675	390.6	0.80	9.4			

## PAVEMENT, 1933

Resident Engineer	Street Assistant	Average tonnage laid per day.	Average stability of surface mix, in pounds.	Roughness index of surface, inches per mile.	Type of Equipment		District
					Mixing Plant	Finisher	
C. F. Waite	W. M. Douglass	412.4	3,006	15.1	Standard	Ord 20'-2	II
J. D. Greene	J. P. Murphy	732.1	3,150	11.1	"	"	III
E. E. Sorenson	E. Carlstad	697.5	2,630	16.2	"	" 30'	IV
M. C. Fosgate	F. W. Montell	866.2	3,100	11.4	Geiger	" 20'-2	
W. A. Rice	E. Carlstad	442.0	2,175	40.6	"	Lakewood, 20'	
D. G. Evans	P. A. Boulton	740.4	3,658	19.4	Bodinson	" 30'	VI
H. B. LaForge	L. J. Low	373.4	3,160	16.4	Standard	Ord 30'	
R. D. Kinsey	A. W. Carr	741.3	2,970	13.8	Madsen	Special 30'	VII
J. M. Lackey	A. W. Carr	968.7	2,311	9.6	Standard	" "	
R. McNeely	T. A. Roseberry	567.3	2,750	15.0	"	Lakewood 20'	
F. B. Cressy	W. E. Melcher	242.0	4,025	18.5	"	Ord 20'	VIII
F. R. Baker	F. D. Pearce	722.6	3,448	16.0	Geiger	" "	
J. M. Hodges	W. Ford	683.6	2,926	13.1	Standard	Ord	
C. M. Butts	J. F. O'Hara	154.4	3,560	36.4	Geiger	" "	X
W. D. Eaton	Dan Porter	575.8	2,515	20.9	Standard	" "	XI
	Average	663.6	3,026	14.9			

## Plant Mix Oil Won Smoothness Test

(Continued from page 25)

likewise holds the record for riding qualities for the year, averaging 9.6 inches per mile of roughness. The average smoothness for the State was 14.9 inches per mile.

The best average stability of surface course mixture was obtained on contract 47CS11, in Ventura County between Santa Clara River and Ventura, with 4025 pounds. The average for the State was 3026 pounds.

### CONSTRUCTION METHODS AND DESIGN

Stability requirements are now made a part of all specifications. Preliminary investigation of available materials for a project is made by the district and samples submitted to the laboratory. The materials are combined by the laboratory in the proportions necessary to produce the required stability, first consideration being given to the cost of materials delivered to the contractor, from information furnished by the field forces.

As an aid in the selection of sands, the laboratory makes use of the microscopical examination of the grains to determine their probable behavior in the stability test. Considerable can be learned of the possibility of sands by observing the shape and angularity of grains and their surface characteristics.

Paving is then started with the approved materials and during the progress of the work daily samples of the mix are submitted for control purposes. The materials quite often require adjustment from time to time to keep stabilities within requirements.

#### Mixture Design

In the design of mixture, the amount and grading of coarse aggregate is that which will give the desired workability and surface texture. Closer textures must necessarily be run during the winter season than those for more reasonable construction. Likewise the penetration of the asphaltic cement is adjusted for the season of year in which the work is to be done.

For work constructed during the summer months the texture of the surface course is maintained as open as is considered safe for the given locality in order to develop maximum nonskid qualities. To insure against too open a mix for watertightness, the construction department has devised a quick method of making a permeability test of pavement surfaces, and the results of this test determine the minimum of fines to be used.

#### Filler Materials

Various fillers have been used during the past season in surface mixtures. Specifications are now prepared so as to permit the use of any filler material that will, in combination with the sand proposed for use, make the specified stability. The type of fillers to be used is approved prior to the start of the job.

Limestone dust will in general produce the desired result with nearly any sand; substitute fillers will often produce stability with one sand from a given locality but fail with other sands from the same general source. This makes necessary the combining of the individual sands with the particular filler the contractor wishes to use. This throws a considerable burden on the laboratory in excessive testing, and if the privilege is abused by the contractor the amount

of work over and above that normally required is assessed to the contractor.

The most common substitute for limestone dust is diatomaceous earth, which is available along the Monterey coast. Considerable pumice material has been used in the San Joaquin Valley, where large deposits of this material are available. In the southern part of the State one contractor manufactures his own filler at a central plant from waste material of a commercial gravel producer.

### OIL SURFACED ROADS

The plant mix type predominated in 1933, 86.9 miles of this type having been constructed as compared with 27.9 miles of road mix.

The record for smoothness for the plant mix type, 5.6 inches per mile, was obtained on contract 48VC4-25CS4 between Shavers Summit and Desert Center, Basich Bros., contractor, and E. A. Bannister resident engineer. The average record for the State for 1933 was 23.5 inches per mile. For road mix type, 10.3 inches per mile was obtained on contract 49CS3, Keough Hot Springs to Bishop, Hemstreet & Bell, contractor, W. S. Dolliver, resident engineer. The State average was 34.4 inches.

It is of interest to note that in 1933 the average roughness for plant mix was considerably less than that for road mix, which is the reverse of that of previous years. This improvement is due principally to the change in finishing methods developed for plant mix type. We are now holding in reserve, along the edges of the surfacing, enough uncompressed material to make approximately one inch of compacted surfacing. During finishing operations this loose material is bladed across the surface as it is being consolidated. This levels up the roughness which is the result of unequal consolidation during spreading and distortion in the loose material from construction equipment.

It has been our experience with the heavier types of binders, such as cutback asphalts, that cutting of the surface during consolidation to produce this loose material is very unsatisfactory, and the change in methods has resulted in a material improvement.

#### CONSOLIDATION DIFFICULT

An interesting project was constructed under contract 42TC10 between Canyon Creek and Hat Creek Summit, in which the binder was E grade asphalt, 150-200 penetration, without cutting back. Upon a prepared crusher run base, 3 inches of compacted material was laid, mixed at a temperature of 300° to 375° F. The grading of the aggregate was the same as that used for oil treated surfacing and consisted entirely of aggregate obtained locally. Consolidation was difficult to obtain with this mix and it was found necessary to seal the surface immediately with a cutback asphalt to make it impermeable.

The practice of making detailed tests of aggregates and oil mixtures in conjunction with the testing laboratory has been continued with most satisfactory results. Field design has been checked by laboratory tests for stability, soundness and swell tests, and the construction of these low type oil surfaces has been perfected as much as possible, largely through the excellent cooperation between the field and laboratory engineers.



DISCING AND HARROWING road mix oiling project in Monterey County.

OILED ROCK SURFACE, 1933

Road	Contract	Miles	Location	Contractor	Roughness, inches per mile
<b>PLANT MIX</b>					
II-Sha-28-D	42CN3	8.7	Hat Creek Summit-Fall River Mills	E. C. Coats	22.9
Sha-28-C, D	42TC10	10.2	Canyon Creek-Hat Creek Summit	T. M. Morgan Co.	32.0
III-Lak-15-B	23WC5	3.2	Manila Ranch-Bartlett Spgs. Road	Hanrahan Company	31.5
Pla-37-C, E	43TC8	11.5	Gold Run-Airport	Peninsula Paving Co.	31.8
VI-Tul-10-E	46VC1	8.5	Lemoncove-Three Rivers	Thompson Bros. (Hornstreet & Bell)	39.7
VIII-Riv-64-B	48VC4	19.5	Shavers Summit-Desert Center	Basich Bros.	5.6
Sbd-31-M, N	28CS4	16.5	Halloran Summit-Mountain Pass	Basich Bros.	18.9
Sbd-43-A	48XC1	4.5	Camp Waterman-Arrowhead Spgs.	Jahn & Bressi	41.5
IX-Mno-23-C, D	49CS2	4.3	Whiskey Creek-Convict Creek	Southwest Paving Co.	23.9
		86.9		Average	23.5
<b>ROAD MIX</b>					
II-Las-29-C	42CN11	2.0	Susanville-Johnstonville	Hein Bros., Basalt Rock Co. & E. A. Forde	52.0
V-Mon-56-F, G	45WC2	8.7	Mojera Ranch-Rocky Creek	Santa Maria Const. Co.	72.1
Mon-56-H	45WC1	3.7	San Remo Divide-Carmel River	Meyer Rosenberg	18.0
IX-Iny-23-D	49CS3	6.1	Keough Hot Springs-Bishop	Hornstreet & Bell	10.3
Iny-23-E	49CS4	3.9	Bishop-Round Valley Road	Basich Bros.	10.0
Iny-23-E	49CS5	3.5	Bishop-Owens River Canal	Basich Bros.	15.2
		27.9		Average	34.4

FIRST STATE ROUTE SIGN PLACED

The first of 6000 new numbered State highway signs, No. 1 on Highway No. 1, was installed at Carmel September 10, with a public celebration sponsored by Monterey Peninsula civic groups. The exact point was Carmel Hill, at the junction of Monterey, Pacific Grove and Carmel highways.

Under a cooperative arrangement with the State Division of Highways the signs will be posted in the south by the Automobile Club of Southern California and in the north by the California State Automobile Association.

HIGHWAY STOPS BRUSH FIRE

Stressing the point that the Angeles Crest Highway again proved its firebreak effectiveness by stopping the recent 3200-acre Arroyo Seco brush fire from spreading west, the Automobile Club of Southern California sent a communication to Earl Lee Kelly, State Director of Public Works, advocating the early continuation of this highway into the back-country.

"Had this fire spread into the densely-covered area west of the present 10-mile section of Angeles Crest Highway the loss to the watershed would have been incalculable," the statement says.



# Longest Steel Plate Girders in State Placed at McConnell Subway Crossing

By H. D. STOVER, Designing Engineer of Bridges

**R**ECENTLY opened to traffic, McConnell subway removes another hazardous grade crossing from the State highway system.

Located 16 miles south of Sacramento, on the Sacramento-Stockton link of State Route 4, the Golden State Highway, this structure carries the double tracks of the Southern Pacific railroad over the highway on three heavy steel girders.

The State highway crosses the tracks at an angle of 23° 34' making 66° 26' skew in the structure, thus requiring 103-foot girders to span the 34-foot clear width of roadway.

**These girders were fabricated in the shop, and each girder was erected in place as a unit by the Southern Pacific forces. They are one of the longest and heaviest plate girders on the Southern Pacific system in California.**

Approaching the structure by easy grades, the highway passes beneath the railroad with three traffic lanes. A five-foot sidewalk through one of the massive abutments provides for the safety of pedestrians.

#### WATER PROBLEM SOLVED

At the time the elimination of this grade crossing was first considered some years ago, it was deemed impractical to construct a subway due to proximity of the Cosumnes River. High water elevation of the river, records show, reaches to base of ties on the railroad at the site of the crossing. Open test pits were made and observations of ground water level were made for three seasons. It was found that ground water elevations did not vary as water elevation in the river rose and fell, but remained constantly at elevation 32. This made it possible, by raising the railroad track one and a half feet to construct a subway with legal vertical clearance of 14 feet and keep the paving above permanent ground water. The construction of dykes was necessary to prevent water from the river from overflowing into the subway.

The subway is kept dry of storm waters during the wet season by a system of pipes and perforated drains leading to a sump in

which the two drainage pumps are located. These are electrically operated automatic centrifugal pumps capable of discharging a total of 800 gallons per minute.

A feature of this installation is the manner in which one of the drainage pumps is used in summer to provide water for irrigating the landscaped area of the subway.

A 10-inch well was sunk through the bottom of the sump to water-bearing gravel at a depth of 80 feet. Water from the well rises high enough to cover the pump runner so that no priming is necessary at any season of the year.

#### CONTROLLED BY VALVES

Valves controlled from the motor platform make possible the closing of the suction pipe to the sump and the opening of the suction pipe into the well, thus allowing the drainage pump to be used for bringing water from the well into an irrigation pipe leading to the landscaped areas when the shrubbery requires irrigation during the summer months.

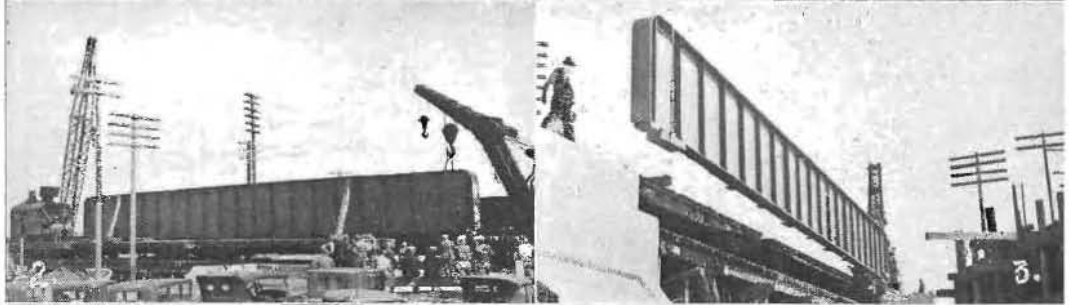
A convenient arrangement also allows tank trucks to be filled for hauling water to roadside trees planted on either side of the road in this vicinity.

The grading, paving and the construction of the abutments and drainage system was done by the State under contract. The steel superstructure, track work and maintaining railroad traffic during construction was done by the Southern Pacific. The total cost of the work was approximately \$151,000.

#### SAFETY EXPERTS WILL MAKE STUDIES IN CITY STREETS

The streets of Cleveland will serve as a traffic safety laboratory for police officials, motor vehicle administrators and other interested delegates during the Twenty-third Annual Safety Congress and Exposition, which will be held in that city, October 1 to 5.

On the afternoon of October 4, as a part of the Congress' Street & Highway Traffic Section program, several hundred delegates will make a bus tour to places of interest to traffic men.



**ANOTHER SAFE CROSSING** where railroad and highway formerly met at grade has been constructed on the Sacramento-Stockton link of State Route No. 4, sixteen miles south of Sacramento near McConnell Station of the Southern Pacific Railroad. No. 1 shows the wide, straight approach to the new McConnell subway. Nos. 2 and 3 picture the difficult operations of raising and placing the 103-foot steel girders necessary to span the 34-foot roadway. They are the longest and heaviest plate girders on the Southern Pacific System in the State. No. 5 is a close-up of the subway structure that permits three lanes of traffic under the railroad and provides a 5-foot sidewalk for pedestrians through one of the massive abutments.

## Bids and Awards Made in August on Highway Contracts

**KERN COUNTY**—Between Fort Tejon and 1 mile north of Grapevine Station, 5.2 miles grading paving with Portland cement concrete. District VI, Route 4, Section A. United Concrete Pipe Corp., Los Angeles, \$375,542; Southern Calif. Roads Co., Los Angeles, \$342,962; Jahn & Bressi Const. Co., Los Angeles, \$231,414; J. L. McClain, Los Angeles, \$333,376; Fredrickson & Watson, Oakland, \$386,922; Union Paving Co., San Francisco, \$352,488. Contract awarded to Griffith Company, Los Angeles, \$320,753.50.

**KINGS COUNTY**—Building reinforced concrete box culvert at Meiga Ditch; a two 31-ft. span reinforced concrete bridge at Lakeside Canal; widening existing bridge at Cross Creek. District VI, Route 10, Section A. Oscar Oberg, Los Angeles, \$24,762; Ralph A. Bell, Los Angeles \$26,028; So. Calif. Roads Co., Los Angeles, \$22,524; Stroud Bros. and Seabrook, Bakersfield, \$23,124. Contract awarded to J. W. Halterman, Willows, \$21,208.20.

**MONTEREY COUNTY**—A reinforced concrete arch culvert to be constructed about 49 miles south of Carmel. District V, Route 58, Section E. Rocca & Caletti, San Rafael, \$12,412; Force Const. Co., Oakland, \$13,720; A. Soda & Son, Oakland, \$13,950; M. B. McGowan, Inc., San Francisco, \$13,162. Contract awarded to B. Rocca & Co., San Rafael, \$11,382.50.

**ORANGE COUNTY**—Between Gallivan & Irvine, between Huntington Beach and Newport, and on Hampshire Ave. in Huntington Beach, 15.3 miles to be treated with fuel oil. District VII, Routes 2, 69, and 171. Kovacevich & Price, South Gate, \$10,256; Sunset Dec. Granite Co., West Hollywood, \$11,531; Dimmitt & Taylor, Los Angeles, \$13,068; H. E. Cox & Son, Pasadena, \$13,567. Contract awarded to Gogo & Rados, Los Angeles, \$9,956.10.

**PLACER COUNTY & NEVADA COUNTY**—23.6 miles bituminous surfacing. District III, various locations. E. F. Hilliard, Sacramento, \$14,751; Tiffany Const. Co., Sacramento, \$14,751; A. Telchert & Co., Sacramento, \$14,850. Contract awarded to Lee J. Immel, Berkeley, \$12,766.

**RIVERSIDE COUNTY**—Eschscholzia Ave. between Frederick and Graham Streets, 0.7 miles grading bituminous surfacing. District VIII, Route Feeder Road. Contract awarded to George Herz & Co., San Bernardino, \$10,131.30.

**RIVERSIDE-SAN BERNARDINO COUNTIES**—Between Calimesa and Banning, 12.3 miles cilling. District VIII, Route 26, Sections B, A, B. Gogo & Rados, L. A., \$10,906; Matich Bros., Elsinore, \$12,210; Sunset Decomposed Granite Co., Hollywood, \$10,845; Dimmitt & Taylor, Los Angeles, \$11,514; George Herz & Co., San Bernardino, \$11,530. Contract awarded to George Gardner & Sons, Redlands, \$9,965.90.

**SACRAMENTO-NEVADA-BUTTE COUNTIES**—28 miles bituminous treated surfacing. District III, various locations. E. F. Hilliard, Sacramento, \$14,989; A. Telchert & Son, \$14,900; Tieslau Bros., Inc., Berkeley, \$13,314. Contract awarded to Lee J. Immel, Berkeley, \$12,900.50.

**SAN DIEGO COUNTY**—Between Julian and easterly boundary, 18.1 miles to be treated with fuel oil. District XI, Route 198, Sections E, F, and G. Lambs Transfer Co., Long Beach, \$6,960; Paulsen & March, Inc., Los Angeles, \$7,520; Morgan Bros., Huntington Park, \$9,000. Contract awarded to Gilmore Oil Co., Los Angeles \$6520.

**SAN DIEGO COUNTY**—Escondido Creek bridge, four 45-ft. reinforced concrete slab spans on R. C. piles and abutments. District XI, Route 2, Section A. Ralph A. Bell, Los Angeles, \$36,948; B. O. Larsen, San Diego, \$37,978; John Oberg, Los Angeles, \$38,452; Sharp & Fellows, Los Angeles, \$39,460; So. Calif. Roads Co., Los Angeles, \$41,745; Bodenhamer Const. Co., Oakland, \$39,303; R. R. Bishop, Long Beach, \$38,428; Contracting Engineers, Los Angeles \$47,969; Byerts & Dunn, Los Angeles, \$40,401. Contract awarded to Parish Bros., Hollywood, \$30,953.

**SAN FRANCISCO COUNTY**—Harrison Street between 5th and 10th Streets, 0.7 mile to be widened and paved with Portland cement concrete and asphaltic concrete. District IV, Route 68. Union Paving Co., San Francisco, \$91,592; Chas. L. Hamey, San Francisco, \$94,604; Fay Improvement Co., San Francisco, \$107,559. Contract awarded to A. J. Raisch, San Francisco, \$78,836.26.

### GOOD SAMARITANS OF THE HIGHWAY SERVICE

August 13, 1934.

Mr. S. W. Lowden, Division Engineer,  
California State Highway Department,  
Bishop, California.

My Dear Mr. Lowden: On August 10th, I was traveling up the mountain grade from Bishop toward Schober's Ranch, when at the number two dam of the Southern Sierra Power Company plant, my automobile developed some serious engine trouble, which could not be repaired without assistance from someone other than myself.

Your Mr. Carl Cleland and Mr. Jack Reger happened along at the time, saw my plight, and rendered assistance such as was invaluable. They not only helped me locate my trouble but they saw that I got to Bishop, into the hands of capable, honest mechanics, my faulty engine parts repaired and back up the mountain to my car, where I installed the parts and got my car on its way again.

If you will place yourself in my position, you will realize how much this help meant to me and will realize just why I want to bring this matter to your attention. California can well be proud to have such men in its service and it is my hope that I may some day be able to repay these gentlemen for their great kindnesses.

Yours very truly,

(Signed) WALTER L. MCKEE,  
Los Angeles, California.

**SANTA BARBARA COUNTY**—Reinforced concrete bridge over existing State highway at Las Positas Road at the limits of Santa Barbara, consisting of one 62-ft. span and one 22-ft. cantilever span. District V, Route 2, Section S.B. DOC Construction Co., Santa Barbara, \$13,690; David J. Reed & Jos. Maiser, Los Angeles, \$15,530; Oscar Oberg, Los Angeles, \$13,681; Louis C. Seidel, Oakland, \$15,777. Contract awarded to Theo. M. Maino, San Luis Obispo, \$12,818.20.

**SONOMA COUNTY**—Planing existing asphalt concrete pavement between Guerneville and Sebastopol, 3.2 miles. District IV, Route 104. Contract awarded to Asphalt Pavement Planing Co., Oakland, \$2,340.

**YUBA COUNTY**—In Marysville between the north end of D St. Bridge and Second St., 0.12 of a mile surfacing with bituminous crushed gravel. District III, Route 3, Section Mvl. A. G. Raisch, San Francisco, \$3,356. Contract awarded to Hemstreet & Bell, Marysville, \$2,942.

The auctioneer was trying hard to sell his stock of cigars.

"You can't get better, gents," he bellowed; "twenty-five in a box! You can't get better. I don't care how much you spend!"

Suddenly a voice put in from back of the crowd: "He's right, folks," it said. "I had one last week, and I'm not better yet."

Wife: "John, you play golf altogether too much, you are neglecting your business."

Golf Nut: "The doctor says I must take my iron every day."—*Boston Transcript*.



# STATE OF CALIFORNIA

## Department of Public Works

Headquarters: Public Works Building, Eleventh and P Sts., Sacramento

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EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

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DR. W. W. BARHAM, Yreka  
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JOHN W. HOWE, Secretary

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FRED J. GRUMM, Engineer of Surveys and Plans  
C. S. POPE, Construction Engineer  
T. H. DENNIS, Maintenance Engineer  
F. W. PANHORST (Acting), Bridge Engineer  
L. V. CAMPBELL, Engineer of City and Cooperative  
Projects

R. H. STALNAKER, Equipment Engineer  
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding  
CHARLES H. WHITMORE, District III, Marysville  
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General Headquarters, Public Works Building,  
Eleventh and P Streets, Sacramento, California

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HAROLD CONKLING, Deputy in Charge Water Rights

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

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Electrical Engineer

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HUGH K. McKEVITT, Attorney, San Francisco  
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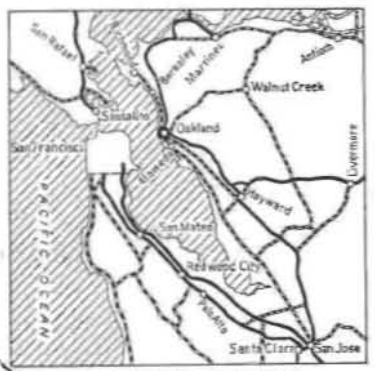
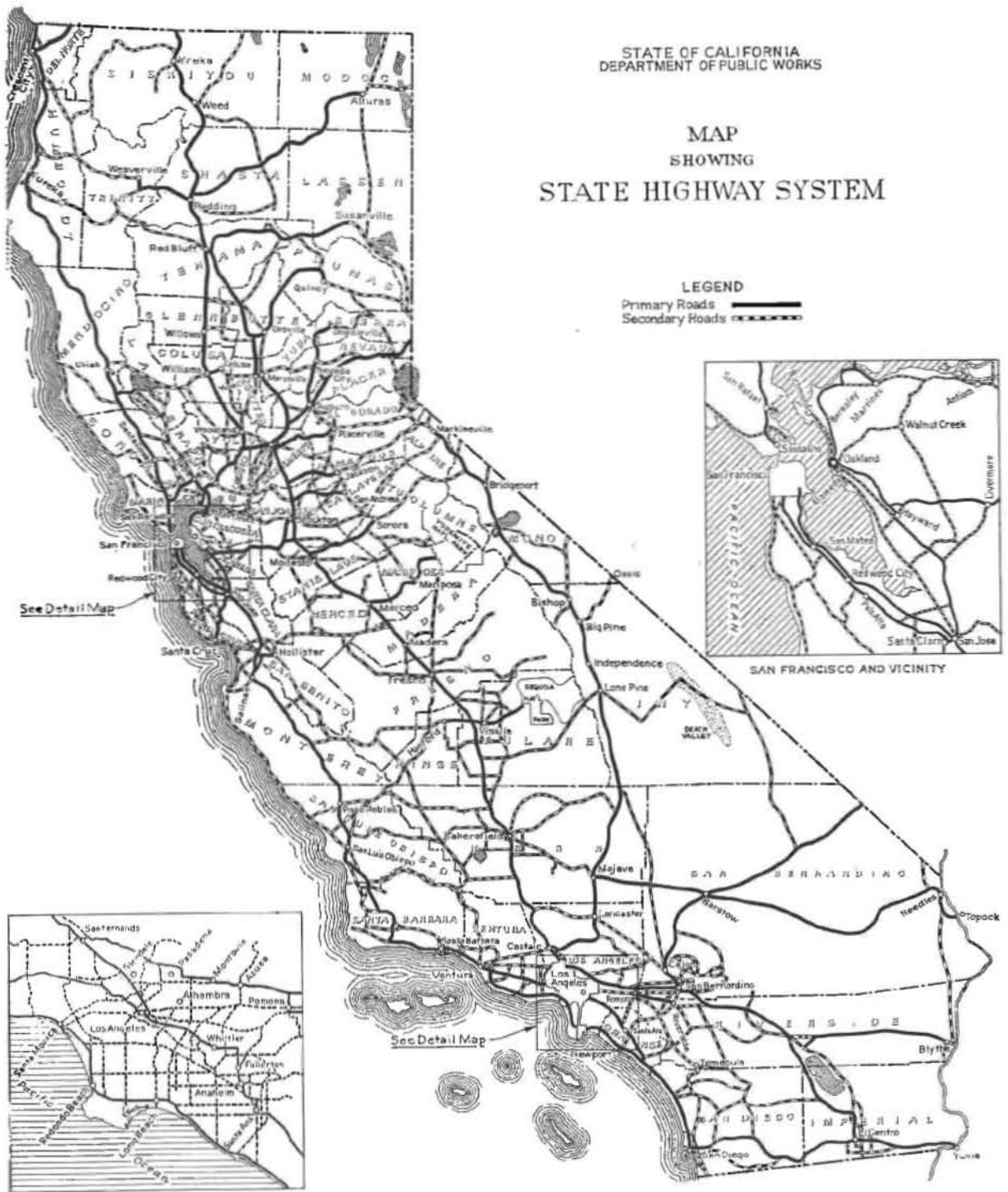
### DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor  
Port of San Jose—Not appointed

STATE OF CALIFORNIA  
DEPARTMENT OF PUBLIC WORKS

# MAP SHOWING STATE HIGHWAY SYSTEM

**LEGEND**  
Primary Roads   
Secondary Roads 



See Detail Map

See Detail Map