

Industrial College

# CALIFORNIA

## HIGHWAYS AND PUBLIC WORKS

CALIFORNIA  
DOCUMENT

*Scene on Redwood Highway  
(State Route No. 1) near Prairie Creek*

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# 39 Grade Crossings

*On California Highways*

## *Being Eliminated*

*With \$7,500,000 Federal Funds*

By **GEORGE T. McCOY**, Assistant State Highway Engineer

**T**HE Federal Government, in proportioning the money set up by the Emergency Relief Appropriation Act of 1935, has allocated a considerable amount to the purpose of eliminating traffic hazards at railroad grade crossings. California's share of this allocation amounts to approximately \$7,500,000, and the Division of Highways has submitted a list of projects to the Bureau of Public Roads on which they recommend this money be spent.

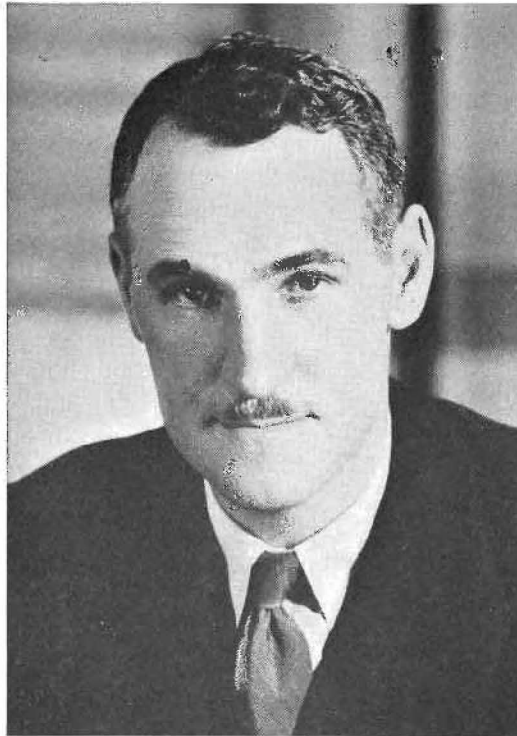
The primary purpose for which this money was provided by Congress is to provide work relief, which means that the work must be gotten under way immediately and should be carried on in locations where it will draw most heavily from the relief rolls, in so far as it is practicable to do this. The Government has made certain regulations governing the way this money must be spent. It is required that the money be apportioned to projects on the various railroads according to their mileage in the State and that no Federal funds be used to pay the costs of right of way and property damage.

It is also required that at least 25 per cent of the money be spent off of the Federal Aid Road System and at least 35 per cent within the metropolitan areas. The latter requirement imposes a serious restriction upon the

choice of projects, as the cost of right of way and property damage in metropolitan areas is likely to be excessive, and even if within reason, the local community may have no available funds.

The oft repeated statement that grade separation projects are the easiest to get under way within a short period of time must be taken with a grain of salt. In the first place, they are, as stated, likely to be located in settled areas where traffic is heaviest and where considerable dickering must be done with regard to acquiring property, moving buildings, changing street grades, relocating adjacent streets or roads, moving pipe lines and sewers, and

all of the thousand and one problems that must be solved before a contract can be let. This requires separate dealings with property owners, local government officials, officials of the public utilities and of the railroad com-



**GEORGE T. McCOY**

(Continued on next page)

## *Bad Record Crossings to be Abolished*

(Continued from preceding page)

panies, all of which require considerable time for exchange of views and proper study of the situation.

Although practical considerations, which in this case include the limitations placed by the Federal Government, are primary factors controlling the choice of grade crossing projects, the Division of Highways has, nevertheless, endeavored to restrict the choice of projects to only those on major highway and railroad traffic arteries, to grade crossings which have unusually bad accident records and to rebuilding existing dangerous grade separation structures.

### CROSSINGS TOTAL 12,500

Many people are of the opinion that the elimination of any grade crossing whatsoever represents a material step in making the highways safe for traffic. It will be found interesting to give this assumption a little study:

In the first place, there are some 12,500 crossings in the State of California, and to separate all of them would require an expenditure of at least three-quarters of a billion dollars and probably more. Suppose that this huge sum could be raised in some manner or other, what would be the general result with regard to reducing traffic hazards on highways?

From an examination of 1934 traffic statistics in the United States, it is found that by separating all our grade crossings, and assuming that no accidents take place afterward at the separations themselves, the total number of highway accidents will have been reduced by about  $\frac{1}{2}$  of 1 per cent. In the matter of deaths due to traffic accidents they will be reduced about 3 per cent.

### ACCIDENT RECORD RATIOS

However, before becoming totally discouraged, let us look further into the records. The California Railroad Commission keeps a record of all crossings in the State, with a list of the accidents which have occurred at each of them starting with the year 1926. In the report on grade crossings of 1931, prepared jointly by the Railroad Commission and the Division of Highways, it is stated that up to 1931, 70 per cent of grade crossing accidents occurred at 10 per cent of the crossings, and that 40 per cent of the accidents occurred at 3 per cent of the crossings.

To put it another way, no accidents occurred during this period at 67 per cent of the crossings. Assuming that these ratios will not change appreciably, and there is no reason to believe that they will, the answer would be plain except for the fact that the 67 per cent of the crossings, at which no accidents occur, are not always the same particular crossings.

In other words, there are a large number of crossings of relatively light traffic density where the lightning of traffic accidents seldom strikes twice. These infrequent accidents, when they do occur, may be serious, and perhaps appalling and then may never happen again in the history of the crossing.

### OTHER CONSIDERATIONS GOVERN

For this reason it is necessary to estimate the probability of such accidents at a crossing, and then to decide if they can be prevented by additional protection, by realignment of the approach roads, or finally if a separation can be built at a small enough cost to justify it. However, we see that it is necessary to confine ourselves to a limited number of relatively important crossings if we are to materially reduce the hazard to traffic with a reasonable expenditure of public money.

It is doubtful in many cases, if concern for human safety is the chief consideration in our minds when asking for the separation of some particular crossing. Very often we are in a hurry to get somewhere and find ourselves sitting at a crossing watching a long freight train drag by. If this happens too frequently we are likely to demand that some steps be taken to do away with this delay, which usually requires a separation of grades at the crossing.

Even if you are one of those happy individuals who can remain content under such circumstances—perhaps by counting the cars, observing the number of nonpaying passengers, or noting the home railroads on the various box cars—it is doubtful if any human being can remain entirely calm as a switch engine with a cut of cars shuttles back and forth in front of you, alternately arousing hopes that you may pass, and immediately dashing these hopes to the ground by backing up again.

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**A DANGER SPOT** with a high accident record in the city of Los Angeles where Mission Road crosses the Pacific Electric tracks. The tracks will be raised, permitting traffic to pass under them.



**PEAK HOUR PERILS** confront motorists at Graham Station on State Route 174 where Pacific Electric Interurban trains cross Firestone Boulevard in Los Angeles. The danger will be eliminated by construction of a subway under the tracks.



**FOUR TRACK CROSSING** of the Union Pacific's Main and Butte Street line on Soto Street in the city of Los Angeles. A subway will provide safety for vehicular traffic.

# List of Grade Separation Projects Recommended for Construction

County	Route	Project	Railroad	WPA Funds
Monterey	2	Subway on Main Street in Salinas	S. P.	\$294,350 00
Kern	4 and 33	Subway on Golden State Highway at Famoso	S. P.	203,200 00
Tehama	3	Widening Subway South of Red Bluff	S. P.	116,430 00
Alameda	Feeder	Subway on San Leandro Street at 105th Street in Oakland	S. P. & W. P.	372,065 00
Sacramento	Feeder	Overhead on Jibboom Street in Sacramento, connecting with new "I" Street Bridge approach	S. P.	144,580 00
San Joaquin	5	Subway on Charter Way in Stockton	S. P. & W. P.	268,059 00
Sacramento	3	Widening Subway at 16th Street in Sacramento	S. P.	54,200 00
Santa Clara	Feeder	Subway on Lafayette Street connection to Bayshore Highway in Santa Clara	S. P.	171,860 00
Alameda	69	Overhead on East Bayshore Highway at El Cerrito Hill in Albany	S. P.	352,050 00
Santa Clara	Feeder	Subway on Almaden Road, San Jose	S. P.	97,770 00
Santa Barbara	Feeder	Rebuilding old Overhead on Los Positos Road in Santa Barbara	S. P.	14,370 00
Monterey	2	Subway on Coast Highway is Soledad	S. P.	150,870 00
San Joaquin	5	Subway on State Highway East of Tracy	S. P.	203,590 00
Riverside	26	Overhead on State Highway north of Indio	S. P.	128,800 00
Los Angeles	165	Bridge and Overhead on the Figueroa Street Extension in Los Angeles	S. P.	703,900 00
Los Angeles	Feeder	Overhead on Soto Street in Los Angeles	S. P.	208,580 00
Santa Clara	Feeder	Subway on Embarcadero Street, Palo Alto	S. P.	221,280 00
Imperial	27	Subway on Main Street in El Centro	S. P.	231,110 00
Alameda	5	2 Grade Separations on Revision of State Highway Alignment at Niles	S. P. & W. P.	388,188 00
San Francisco	Feeder	Reconstructing subway on Army Street in San Francisco	S. P.	60,900 00
San Francisco	Feeder	Reconstructing and Widening Overhead on Williams Street in San Francisco	S. P.	57,050 00
Riverside	19	Reconstructing Overhead on new Alignment Jack Rabbit Trail West of Beaumont	S. P.	104,925 00
San Diego	2	Widening Overhead North of Del Mar	A. T. & S. F.	41,640 00
Los Angeles	9	Subway on Foothill Boulevard at Azusa	A. T. & S. F.	249,620 00
Contra Costa	Feeder	Reconstructing old Overhead near Maltby	A. T. & S. F.	16,250 00
Fresno	4	Overhead on Golden State Highway at Calwa, South of Fresno	A. T. & S. F.	222,960 00
Los Angeles	60	Overhead on Relocated State Highway Route via N & O Streets near Wilmington	A. T. & S. F.	270,520 00
Los Angeles	167	Subway on Atlantic Avenue near Hobart Station	A. T. & S. F.	179,800 00
San Bernardino	31	Subway on State Highway at Verdemon, North of San Bernardino	A. T. & S. F.	86,550 00
Orange	171	Subway on State Highway at Northam Station, Buena Park	A. T. & S. F.	164,230 00
San Bernardino	58	Overhead on State Highway near Java	A. T. & S. F.	96,040 00
Los Angeles	174	Subway on Firestone Boulevard at Graham Station	P. E.	416,330 00
Los Angeles	Feeder	Raising tracks at Intersection of Mission Road and Huntington Drive in Los Angeles	P. E.	382,320 00
Los Angeles	Feeder	Subway under Main and Butte Street Line of Railroad on Soto Street in Los Angeles	U. P.	227,660 00
Alameda	105	Removal of Railroad track from 12th Street in Oakland	W. P.	50,414 00
Alameda	69	Washington Avenue Subway, South of San Leandro	W. P.	181,575 00
Alameda	105	Subway on Jackson Street in Hayward	W. P.	168,550 00
Alameda	Feeder	Rebuilding Subway on Mountain Boulevard in Oakland	S. N.	59,468 00
Alameda	Feeder	Subway on Broadway Terrace near Landvale Drive in Oakland	S. N.	124,292 00



**A DOUBLE DANGER** is encountered at Calwa where the Santa Fe railroad crosses the Golden State highway and the Southern Pacific tracks at grade. An overhead structure will be provided for motor vehicles.



**GRADE CROSSING** on "S" curve at Delano on the Golden State highway. This bad situation is being corrected with a realignment of the highway and construction of an underpass.



**UNDER CONSTRUCTION.** Both railroad and highway have been detoured to permit building of the Delano underpass. The new highway alignment, partially graded, is seen following along the cut embankment. Traffic is using the detour at right of picture.

## Grade Separation Projects Total 39

(Continued from page 2)

### DELAY AND COST FACTORS

Hence, it is plain that the other important factor governing the choice of railroad grade separation projects is delay to highway traffic.

During the past few years, the railroads and the Division of Highways have studied the amount and cost of delays at numerous crossings on the State Highway System and have found that on a large per cent of the crossings, the time that traffic is delayed, and the cost of this delay based on any reasonable assumption, is relatively small. They found, however, that on main trunk highways and particularly on important city streets where the total project cost is not unusually high, it is decidedly worth while to build a grade separation to end such delays.

The difficulty which faces us in solving the problem of traffic hazards and delays at railroad grade crossings is, therefore, that we are only justified in separating the grades at crossings on important trunk highways and city streets when this can be done at a reasonable cost, but due to the usual difficulties connected with such crossings in more or less settled areas, the cost is likely to be anything but reasonable.

### COLD-BLOODED VIEW

**Looking at the matter from a cold-blooded business view point, it is not just the actual amount of traffic or the number of accidents occurring at a grade crossing which decides the need for separation; it is the saving that will accrue to the traveling public from elimination of delays and accidents per dollar of cost of the separation.**

Sometimes, due to topographic or other conditions, a separation can be provided on a highway carrying moderate traffic at a relatively low cost, making the project justifiable from an economic standpoint but on the other hand, some of the most important and dangerous crossings in the State are practically impossible of separation due to the huge expenditure that would be necessary to practically remodel the adjacent land with the improvements on it, in order to take care of the adverse effect on existing business facilities, and on property values.

### EMPLOYMENT RESTRICTIONS CHANGED

Federal regulations originally required that, in constructing grade separations

through the use of these funds, 90 per cent of the labor must be taken from the relief rolls and at least 40 per cent of the cost of the project should be expended for labor. The first of these requirements would have restricted the choice of projects to only those close to large centers of population but it was rescinded some time previous to the preparation of a recommended list of projects mentioned above. The Government now requires only that labor be obtained through the U. S. Employment Service, as is done at the present time, with preference given to those persons now on the relief rolls.

It was known that the average cost of labor on separation projects on State highways was well below the 40 per cent required by the Federal regulations, and in order to comply with this requirement studies had to be made as to types of structures which would require the maximum of local labor.

To comply with this regulation it was proposed that the cost of labor would equal the required 40 per cent, which in practically all cases would have added to the total cost of the project. It was found also, that on account of this restriction, it would be practically impossible to do any work of placing additional protection at existing grade crossings.

### THIRTY-NINE PROJECTS PROPOSED

This was the situation just previous to the time that advice was received from the Federal Government to submit a recommended list of grade separation projects which could be gotten under way by December 15th. The 40 per cent labor restriction was removed a few days previous to the submission of this recommended list of projects, but there was not time to consider any program for additional crossing protection or to materially alter the choice of projects which it was proposed to include under the original set up.

**The list of projects submitted to the bureau for approval and printed here in connection with this article comprises 15 projects on State highways outside of cities, 10 projects on State highways within cities, 12 projects on other city streets, and two projects on county roads; a total of 39 individual projects, all of which include one or more grade crossing separations and such**

(Continued on next page)



## 20 Mile Section of San Simeon-Carmel Highway Not Open

**I**N AN EFFORT to clear up misleading information which concerns public travel along the Coast Highway between San Luis Obispo and Monterey, District Engineer L. H. Gibson of District V, Division of Highways, presents the following facts:

“\* \* \* This route, also known as the Roosevelt highway and the Carmel-San Simeon highway, is still in the state of road and bridge construction.

### SLIDES IN MOTION

“There are many narrow and steep stretches of road work along the route that are extremely hazardous. Several slides are still in motion, with consequent danger of rocks rolling down and striking cars. For these reasons and because of interference with construction activities, the Division of Highways can not permit the public to pass over this portion of the highway, a distance of about 20 miles.

### TWENTY MILES CLOSED

“Anybody wishing to view the completed portions of the Roosevelt highway may do so. It is open for 40 miles south of Monterey and for 80 miles north of San Luis Obispo.

Signs and gates are in place to prevent travel over the remaining 20-mile section still under construction, which will prevent anyone from making a continuous trip between the terminal points.”

## AUTO PRODUCTION FIGURES

### SHOW 20 PER CENT INCREASE

Motor vehicle production by members of the Automobile Manufacturers Association for the first eight months of this year was 20 per cent above that for the corresponding period last year.

The output of association members for the first eight months of this year was placed at 1,969,816 units. This compares with 1,641,949 vehicles produced in the January-August period of 1934.

August production, the association reported, was 178,196 units. While this was a decrease of 30 per cent under the July production, it was a 7 per cent increase over the output for August of last year.

The figures cover the operations of all but one of the major automobile companies in the United States.

### RECORD CLOSED CAR PRODUCTION

Last year's total production of closed cars in the United States and Canada was 2,242,874, 98.8 per cent of all cars produced and the highest number and percentage in the history of the industry.

### LITTLE STORY ABOUT THE DRIVER WHO FORGOT TO STOP, LOOK AND LISTEN

Here's a little story from Traffic Tidings, a publication devoted to the problems of the railroads:

He brushed his teeth twice a day with a nationally advertised tooth brush.

The doctor examined him twice a year.

He wore rubbers when it rained.

He slept with the windows open.

He stuck to a diet with plenty of fresh vegetables.

He relinquished his tonsils and traded in several worn-out glands.

He golfed, but never more than eighteen holes.

He never smoked, drank or lost his temper.

He did his daily dozen daily.

He got at least eight hours' sleep each night.

The funeral will be held next Wednesday.

He is survived by eighteen specialists, four health institutes, six gymnasiums and numerous manufacturers of health foods and antiseptics.

HE HAD FORGOTTEN ABOUT TRAINS  
AT GRADE CROSSINGS.

## Grade Crossing Projects

(Continued from preceding page)

road connections as may be necessary in order to construct them properly.

The Division of Highways, in submitting this list, expects that through savings on estimated costs, or through unforeseen difficulties in getting some of the listed projects under way, it will be found necessary to add or substitute other projects at a later date.

It is realized that, due to the limited amount of funds and other restrictions, many worthy projects of practically equal importance have to be omitted. The present list, however, is the result of careful consideration on the part of the Division of Highways and it has received the approval of the various railroads concerned, the district office of the Bureau of Public Roads, the State Director of the National Emergency Council and the State Administrator of the National Works Progress Administration, whose approval is required.

In order to get as many contracts as possible on this work awarded by December 15th, the Highway Department is putting forth every effort in order to clean up the preliminary details and prepare the plans, and expects to have a large proportion of the work under contract at that date.

## Bay Bridge Cables Get a Squeeze; All Channel Piers to Have Bells On

ONE of the most interesting tasks involved in the construction of the San Francisco-Oakland Bay Bridge now is being accomplished by the builders of the gigantic structure.

This job is the "squeezing" together of 17,464 wires into a compact, unbreakable cable. Two of these huge cables will cross from San Francisco to Yerba Buena Island and will carry the suspended weight of the bridge itself.

Each of these cables will be made up of 37 strands of 472 wires each, held together by soft sheet metal bands making a total of 17,464 wires to a cable.

### SQUEEZED BY RADIAL JACK

Work of compressing the north cable extending from the west shore to the Center Anchorage will be undertaken first, to be followed by the "squeezing" of the south cable.

Upon the loosely laid wires spun from the shore to the Anchorage, a compacting machine travels, "squeezing" as it moves along. This machine, known as a radial jack, brings to bear on the 37 strands of wires the pressure of six 75-ton jacks which form a circle about the cable.

The chain drive of these six jacks compresses the 37 strands into a tightly compacted cable  $28\frac{3}{4}$  inches in diameter.

The present cable has a somewhat hexagonal shape and is about 29 inches in width and 34 inches thick. The first compacting began this week from the top of Tower W-2. Six 75-ton jacks in each compacting machine, driven by air motors, will squeeze the cable, and temporary seizings or short spiral wrappings will hold the cable in its compacted form.

### FOUR SUSPENDER ROPES

After the entire cable has been squeezed to size, and seized at intervals, and cable bands bolted on to supply grooves for the hanging of the suspender ropes, the compacting machines will be taken off.

The next operation will be to disengage the four  $2\frac{1}{4}$ -inch suspender ropes from the catwalks, leaving the catwalks supported by the main cables. The four ropes, of wrist thickness, which will be taken down will be cut up

into lengths already marked off, and dropped over the main suspension cable in grooves provided in the cable bands.

To the ends of these suspender ropes, ranging in length from six feet to 230 feet, will be attached the trusses, or the decks, of the bridge. These trusses will be hoisted up by hoisting equipment suspended from the cables. The sections of trusses will be barged into position underneath the cable and from there lifted and secured to the suspenders.

### WRAPPING FINAL JOB

After the decks, or the stiffening trusses, of the bridge have been suspended by means of the former catwalk ropes, paving will then be placed on the upper deck and on the truck lane. Thereafter when the bridge is fully loaded, the business of wrapping the cable will begin.

The cable is not wrapped until the total dead load is applied because only then has all the stretch been taken out of it.

Immediately before wrapping, a red lead paste will be applied to the cable. Then the cable is completely wrapped with steel wire except beneath the cable bands where the cable has been previously treated with red lead paste before the bands are bolted on.

### CATWALKS REMOVED LAST

At the anchorages, huge splay castings will be applied to the cables before the wrapping, which will graduate the size of the cable from its fan-shaped spread at the eyebars to its closely compacted load-carrying size. After being spirally wrapped with wire, the cable will be given four coats of paint.

Almost the last operation of the bridge will be the removal of the catwalks along the cables.

Work on the bridge is well ahead of schedule, according to Chief Engineer C. H. Purcell, and the transfer of cable spinning equipment from the western to the eastern catwalks was started a week ago.

### BELLS ON THE BRIDGE

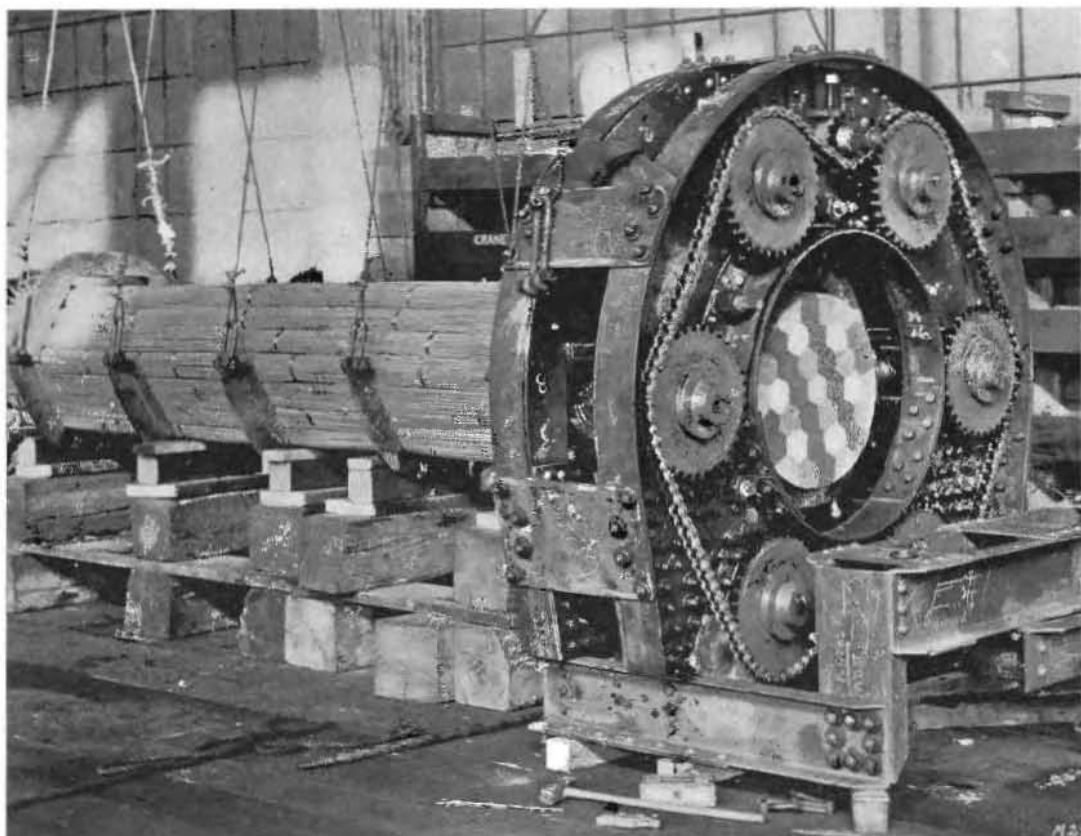
When cable spinning on the eastern catwalks is completed, compacting of the giant cables from the Center Anchorage to Yerba Buena Island will begin.

Another interesting feature of the bridge equipment is a set of five huge bells which

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**SO BIG!** The two Bay Bridge workers are obligingly hugging one of the big cables to give an idea of its size before the compacting machine comes along and gives it a big squeeze.  
Photo courtesy of San Francisco Examiner.



**JACK THE SQUEEZER.** After the 17,464 wires making up the 37 strands are in place the cable has a somewhat hexagonal shape 29 inches in width and 34 inches thick. The radial jack compacting machine squeezes the cable to a circular form 28 $\frac{1}{2}$  inches in diameter.

## State Cooperation in the Improvement of Highways and Streets in Cities

The following article includes excerpts from an address by Director Earl Lee Kelly of the Department of Public Works before an assemblage of city mayors and councilmen at the annual convention of the League of California Municipalities in San Francisco September 24, 1935, in which he discusses the additional one-quarter cent gas tax allocation to cities by the 1935 legislature increasing the cities' share to approximately \$12,000,000 a biennium; the effect on the State highway budget and city taxes; the application of the money to State highways and major streets within cities and the resultant problems confronting the Division of Highways.

By EARL LEE KELLY, Director of Public Works

**P**RIOR to 1933, the expenditure of gas tax revenue by the State was, by statutory control, almost entirely on rural State highways. At that time the State's expenditure was limited to those roads officially designated as State highways.

lated cities and in sparsely populated areas of the larger cities.

While comparatively little gas tax money found expenditure within the cities, the amount was, however, fully commensurate with the mileage of highways under control of the State.

### EXTENDED INTO CITIES

Since 1933 the scene has changed. The State has been granted authority to extend its highway routings within and through incorporated cities, regardless of size. We have witnessed the culmination of a measure of which this league is the parent and which has brought, if not a more comprehensive, then surely a more equitable view of the distribution and expenditure of gas tax revenue.

We now have legislation by which we can comprehend the State Highway System, not as a disjointed system of roads broken and terminated at each city boundary, but as a potential system for providing a continuous and a direct thoroughfare improved to adequate traffic standards, through our cities. The barriers to expeditious passage that confronted the motorist of only a few years past have been broken.

No longer will the motorist on a State highway find himself, as you might say, deserted at the city limits and confounded with the difficult problem of navigating his passage through a city which for any number of reasons did not possess the resources to provide streets of a standard adequate for present-day traffic.

### CITIES ACCEPTED CHALLENGE

We say that no longer must these conditions prevail. By that we mean to recall the challenge that the municipal officials of California accepted two years ago to provide this

(Continued on next page)



EARL LEE KELLY

There was no specific provision in the law to extend the State highways into or expend the gas tax within municipalities. As a consequence, the Highway Commission generally halted the State highways at the city limits, except in the case of a few of the lesser popu-

## State Pays Half of Cities' Annual Street and Highway Expense

(Continued from preceding page)

motorist with a passage through the cities with as much facility as the State has afforded in his movement to the cities' door. That the officials have both the disposition and the capacity to satisfy this challenge is evident by their endeavor and their success in compounding this challenge in the recent legislature.

We now have legislation, enacted during the last session as Senate Bill No. 561, which increases the gas tax allocated for expenditure within cities by one-fourth cent per gallon. This act supplements the previous act of 1933, which provided one-fourth cent per gallon of the gasoline tax for expenditure upon the State highway routes within cities.

By the terms of the 1933 Act, the gas tax was to be expended, primarily, upon the State routes, and in the event the amount of money apportioned for any one city was greater than necessary to maintain and improve to adequate standards all State highways within the city, the surplus could be expended on other streets of major importance.

The increased amount to be allocated by the new legislation provides one-fourth cent to be expended upon streets of major importance within the city other than State highways, as may be agreed upon by the department and the legislative body of the city.

### CITIES GET \$6,000,000 YEARLY

One-quarter cent of gas tax revenue is estimated to yield, in round figures, \$3,000,000 per year. Thus, under the gas tax allocation, there will be \$3,000,000 per year for State highways within cities, and \$3,000,000 for city streets other than State highways, or a total of \$6,000,000 to be expended annually within the cities.

Represented in terms of tax rate, the revenue of the one-half cent to be expended within your cities is the equivalent to a tax rate of \$0.11½ per \$100 of assessed valuation within the municipalities.

This figure is taken from information recently published by the State Controller for the fiscal year ending in 1934, the latest information available. From this information it is calculated that the average tax rate for all the cities within the State amounts to \$1.72½ per \$100 of assessed valuation.

Again quoting from the Controller's report, the total expenditure by municipalities during the fiscal year ending in 1934 on highways, roads and streets within incorporated cities, in round figures amounted to \$15,600,000. This figure includes, in addition to maintenance and repair, construction and improvement of streets, roads and highways, the cost of street

### GASOLINE CONSUMPTION SLUMPS IN STATES THAT INCREASE TAX

Gasoline consumption in Pennsylvania dropped 20,000,000 gallons during July, the first month of the increased gasoline tax in the State, according to the report of the director of the Bureau of Liquid Fuels Tax. The drop amounting to 17 per cent, occurred in the face of increased consumption in every state with the exception of Delaware, which also increased its tax one cent a gallon on July 1.

The experiences of Pennsylvania and Delaware with increased gasoline taxes are substantially the same as that of New York and Nebraska, two other states which increased their levies on motor fuel this year. In New York, where the state tax was raised one cent a gallon on April 1, consumption in every subsequent month fell below that of the corresponding month in 1934. Consumption in Nebraska, which raised its tax from four cents to five cents on March 1, has also shown a decrease from the year before each month with one exception.—*Petroleum Industries.*

lighting, which during the year amounted to \$3,500,000.

### STATE PAYS HALF

Thus the net amount expended upon streets and roads within municipalities, attributable as of primary benefit to vehicular traffic, and excluding the cost of street lighting, amounted to \$12,000,000.

The \$6,000,000 per year of the gasoline tax to be expended on State highways and city streets within municipalities will amount to practically one-half of the expenditures by all cities for streets and highway purposes.

This relates only to the gas tax allocation required by law. It does not take into consideration any additional gas tax money that the Highway Commission may budget for construction within incorporated cities, or of any Federal Aid funds available to the Highway Commission which may be so apportioned.

### SAVES TAXPAYERS' MONEY

This, we submit, is an appreciable measure of State cooperation within municipalities. The prevalence and the benefits of this cooperation become more striking when we consider that of the total population in California, 75 per cent resides in these cities. The expenditure of gas tax money within cities provides an improvement or service for which these residents would otherwise have to pay in the form of city taxes or by presenting the possibility of a reduction in the city tax rate, or both.

Up to this point only the matter of funds to be expended within cities under legislative mandate has been discussed.

In addition to the State gas tax funds, California's share of the \$12,800,000,000 Federal Emergency Relief appropriation of 1935 for highways amounts to

(Continued on page 22)

# Construction Progress and Pavement Records Made During the Year 1934

By **EARL WITHYCOMBE**, Assistant Construction Engineer

A greater effort was concentrated in the selection of material for the immediate subgrade for pavements, during the past season's work. Complete soil testing equipment has been set up in five of the eleven districts and they are now in a position to perform their own routine testing.

For the remote districts, this procedure materially speeds up the decision relative to treatment of soils and has worked out very advantageously. The construction personnel are becoming more familiar with the identification of questionable materials, and the danger of such material not being recognized and used without testing is considerably lessened.

The test of soil quality to which most significance is attached is the bearing value. In this test the bearing value of the soil is compared to that obtained with a good crushed rock surfacing, and is reported in percentages.

The test is made on the material in a saturated condition as well as with a normal moisture content. For pavement subgrade, the material must show a bearing power of not less than 10 per cent of that obtained in a saturated condition.

## CORRECTIVE MEASURES

The proposed project is investigated as to soil conditions during the preliminary planning stage and wherever possible a complete soil profile is obtained. From this information the decision is made as to the corrective measures to be taken.

Should the bearing value fall below 10 per cent, the grade is blanketed with from 8 to 24 inches of selected material which will meet the above requirement, the depth depending upon the quality of the underlying material. Under pavements subject to leakage of surface water, a membrane of "E" grade asphalt is applied to the surface of the objectionable material before blanketing with selected material.

## PORTLAND CEMENT CONCRETE

### Construction Records.

The maximum average daily output of concrete by a single 27E paver, on the basis of an 8-hour day, was placed on Contract

67XC1, in Los Angeles County, between Orange Avenue and Barranca Street, where Oswald Brothers placed 459.5 cubic yards per day.

The resident engineer was G. E. Farnsworth and the street assistant, T. A. Roseberry. The average daily output per mixer for the State during 1934 was 402.0 cubic yards, as compared to 390.6 cubic yards in 1933.

The maximum average output for two pavers was on Contract 64TC4, in Santa Clara County, Lawrence Station Road to Alviso-Santa Clara Road, where Basich Brothers laid 933.0 cubic yards per 8-hour day. The previous year's record was held by the same contractor on an adjoining project where an average of 914.1 cubic yards was laid per day.

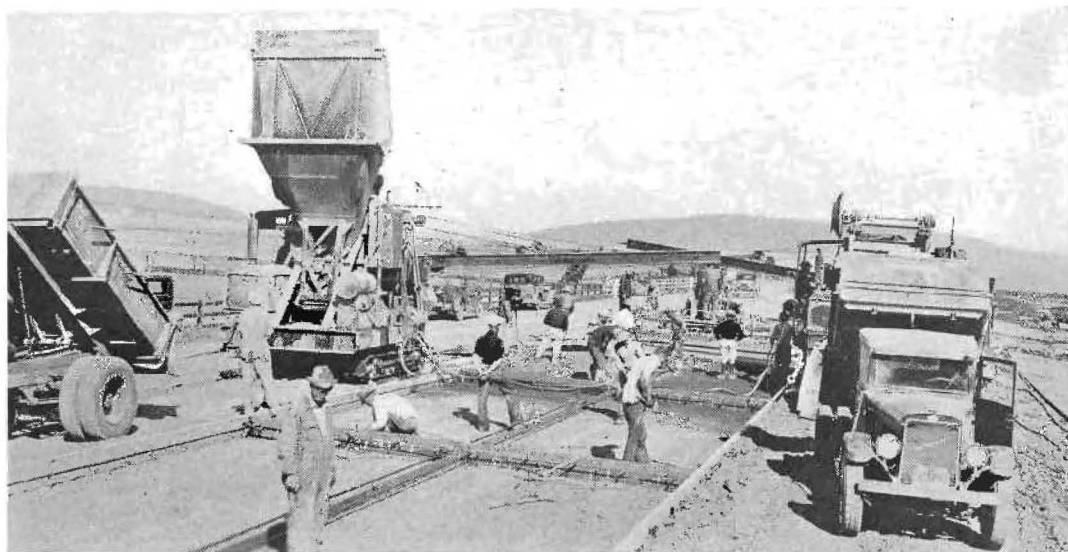
## HIGH MIXER EFFICIENCY

This average for two-mixer operation also exceeds the above average of a single mixer for each of the two used on this project and represents 97.2 per cent efficiency as based on the maximum yardage obtainable without any delays whatsoever during the elapsed time of operation. The resident engineer on this project was W. A. Rice and his street assistant was E. Carlstad.

### Pavement Quality.

The strongest concrete pavement placed during 1934 was on Contract 67XC1 which also has the record average daily output for one paver as mentioned above, in which the average compressive strength was 5686 pounds per square inch. The average for the State was 4465 pounds as compared to 4675 pounds for 1933.

It is worthy of mention that on Contract 65VC5 and 65VC6, in Santa Barbara County from the east city limits of Santa Barbara to Hollister Avenue, a base course was constructed of Class "C" concrete with 4.2 sacks of cement per cubic yard as compared to six sacks in other projects, and the average compressive strength was 2987 and 3074 pounds respectively. The contractor on both the projects was J. E. Haddock, the resident



**TWO PAVERS** working on 40-foot portland cement project on Bayshore Highway in Santa Clara County

engineer, H. J. Daggart and his street assistant, T. F. Baun.

#### CEMENT CONTROL RECORD

The record for **cement control** was made on Contract 67XC5, in Los Angeles County, Evergreen Avenue to Atlantic Boulevard, with an average variation of 0.34 per cent; the contractors were Jahn & Bressi, the resident engineer, C. N. Ainley, and the street assistant, G. H. Lamb. The average variation for the State was 0.90 per cent as compared to 0.80 per cent for 1933.

The record for **surface smoothness** was obtained on Contract 65VC3, in Santa Barbara County, Arroyo Hondo to Gaviota Creek, where the average roughness per mile was 4.7 inches. The contractors were Weymouth Crowell Co., the resident engineer, V. E. Pearson and the street assistant, F. C. Weigel. The average for the State was 8.3 inches, compared to 9.4 inches in 1933.

#### Construction Methods and Design

The 16-foot floats were used throughout the season's work and are now standardized on all work. On Contract 67XC1, a 20-foot float, used diagonally across the 10-foot strip and towed by means of a light car, was developed by G. H. Lamb as a substitute for the longitudinal float. The speed with which a long section of fresh concrete can be covered and the uneven subsidence eliminated is remarkable. This float met with immediate popularity both with inspectors and floatmen. It was used throughout Contract

65VC3, the project having the smoothness record for the season, and is now an alternate method in the Standard Specifications. This has been used successfully on 20-foot width of pavement by floating one-half the width from one shoulder and the other half from the opposite shoulder. A car, truck, tractor and a mule or horse have been used successfully as motive power for this float.

#### Reinforcement.

Two pavement projects in 1934 deviated from the conventional design of two longitudinal deformed edge bars placed in a vertical plane, by substituting a single round greased bar. One project was reinforced throughout with wire mesh placed in flat mats 16 feet in length.

#### Joint Construction.

Spacing of expansion joints has been varied in this season's projects, being 60, 90, 100 and 120 foot intervals with intermediate weakened plane joints. The panel lengths were 20 feet and 30 feet with about equal mileage of each length. One project had nonuniform panel lengths, the expansion joints being at 90-foot intervals and intermediate panel lengths being 26, 34 and 30 feet. The intent of this spacing is to prevent synchronized vibration in vehicles, should slab curling take place.

#### Curing.

This season's work marked the beginning of the use of colorless membrane for curing

(Continued on next page)

# Improved Method Devised for Grouting

(Continued from preceding page)

concrete pavements, and several projects were cured in this manner.

## ASPHALT CONCRETE

### Construction Records.

The maximum average daily output was obtained on Contract 64TC5, in Alameda and Contra Costa counties between Ashby Avenue and Potrero Avenue, with 950.0 tons per 8-hour day. The contractor was the Peninsula Paving Co., the resident engineer was L. G. Marshall and his street inspector, W. Thomas. The average daily output for the State was 594.4 tons, while in 1933 it was 663.6 tons.

### Pavement Quality.

The best average stability of surface course mixture, 3900 pounds, was obtained on Contract 511VC1-611VC5, in San Diego County, Encinitas to Oceanside. The contractor was Griffith Company, the resident engineer, T. W. Voss, and his street assistant, I. W. Littlefield. The average stability for the State was 2950 pounds as compared to 3026 pounds in 1933.

The smoothest surface finish was obtained on Contract 67VC12 in Los Angeles County, West Channel Road to California Avenue, being 10.0 inches per mile. The contractor was Oswald Brothers, the resident engineer, E. L. Seitz and his street assistant, A. W. Carr. The State average was 21.4 inches per mile, compared to 14.9 inches in 1933.

## Construction Methods and Design

Considerable mileage of the 1934 construction was resurfacing within municipalities. This type of work was new to the organization and much of it was hand spread, which was not conducive to smooth-riding work. On the hand-raked sections a 16-foot float was used identical with the float used to finish Portland cement concrete, which was a decided improvement. On the later work, machine finishing of the main traffic lanes was accomplished, with hand raking of the gutter strips.

District VII developed a method of grouting between the header and the existing base on Contract 67VC3, W. J. Calvin resident engineer, with a lean dry mortar that sets up sufficiently in four hours time to carry the

weight of the finishing machine without displacement. This was a decided improvement in maintaining a uniform cross-section in resurfacing by machine methods.

### Mixture Design.

Sands and fillers are subject to approval by our testing and research laboratory prior to use on the basis of stability in the Hubbard-Field machine, and the results of this test also furnish the field engineers with the laboratory recommendation of the proper amount of asphalt to be used with the particular material involved.

A very interesting section of work was completed in 1934 in the city of Santa Barbara under Contracts 65VC5 and 65VC6, in which a lean mixture of Portland cement concrete base was surfaced with a natural asphalt sand mix. The asphalt sand was obtained from a deposit on the beach line near Carpinteria. It was excavated with a power shovel and thrown into an immense stockpile to cure, which process equalizes the asphalt content.

### HEATED IN DRYER

During mixing operations the asphalt sand is heated in a special type of dryer, elevated to a hopper above the weigh box on a conventional asphalt paving plant, weighed out with the heated aggregate and cold filler and mixed in the pug mill. Crushed porous sandstone was used for coarse aggregate and limestone dust for filler. The sand portion of the mixture consisted of the aggregate in the natural asphalt.

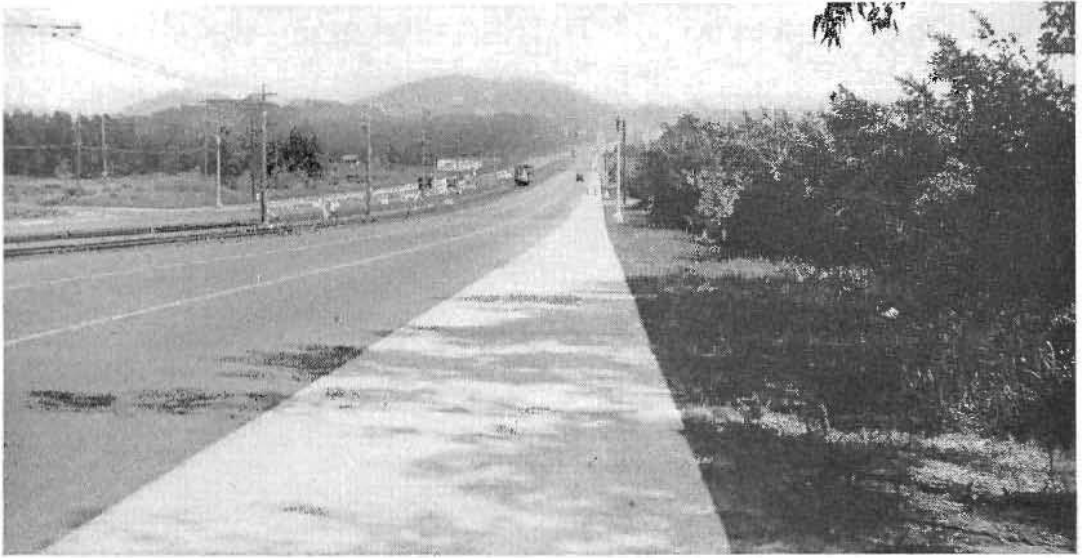
The grading of the mixture was very similar to Type "B" asphaltic concrete. As the character of the mix more nearly resembled an oil mix, stabilities were recorded on the plastometer. The riding qualities obtained on this work were very satisfactory.

## OILED ROCK SURFACING

The plant mix type again predominated in 1934, 83.2 miles having been constructed, as against 41.9 miles of road mix.

The record for smoothness for plant mix, 8.2 inches per mile, was obtained on Contract 59VC2 in Inyo County, Dougherty's Corner to Birchim Canyon; the contractor was Basich Brothers and the resident engineer,





**SLOAT BOULEVARD, San Francisco County, with 40-foot asphalt concrete pavement and 16-foot portland cement concrete widening.**



**JUNIPERA SERRA HIGHWAY in San Mateo County with 40-foot pavement of asphalt concrete.**

A. C. Briney. The State average was 26.4 inches compared to 23.5 inches in 1933.

For the road mix type, the smoothest job was Contract 69VC1, with 6.5 inches per mile, in Mono County, between 2 miles north of Leevining and Mono Inn; the contractor was Isbell Construction Co. and the resident engineer, M. W. Ellis. The State average was 27.3 inches as compared to 34.4 inches in 1933.

#### SEVENTY PER CENT CUT-BACK ASPHALT

Approximately 70 per cent of the total mileage of plant and road mix was built of

cut-back asphalt as compared to 30 per cent with fuel oil.

In the city of Santa Cruz, a project was laid under Contract 64TC7 using 2 inches of natural rock asphalt as a surface on a 6-inch crusher run base. The rock asphalt was obtained from a deposit in the Santa Cruz Mountains, the mixture being spread with blade graders. One project was constructed during the season of emulsified retread, and one project of emulsified penetration macadam.

# Tabulation of Paving Construction Records

PORTLAND CEMENT

Location	Contractor	Resident engineer
At Red Bluff	Hein Bros. & Basalt Rock Co.	J. C. Young
Loomis to Newcastle	T. M. Morgan Co.	J. D. Greene
Through Emeryville, Oakland, Albany, El Cerrito	Peninsula Paving Co.	L. G. Marshall
College Ave.-Page Mill Road	A. J. Raisch	W. A. Rice
Lawrence Sta. Rd.-Alviso-S. Clara Rd.	Basich Brothers	W. A. Rice
Sloat Blvd., Great Highway-19th Ave.	Eaton & Smith	H. S. Payson
Pismo-San Luis Obispo (portions)	M. J. Bevanda	J. M. Hayden
Arroyo Hondo-Gaviotas Creek	Weymouth Crowell Co.	V. E. Pearson
At Elwood Crossing	United Conc. Pipe Corp.	T. F. Baun
Sumnerland-Sheffield Drive	Kovacevich & Price	W. Mathews
E. City Lim.-Los Olivos St.	J. E. Haddock	H. J. Daggart
Mission St.-Hollister Ave.	J. E. Haddock	H. J. Daggart
Oak Glenn-1 Mi. N. of Grapevine Sta.	Griffith Company	F. M. Reynolds
Santa Clara River-Castaic School	Griffith Company	E. L. Seitz
Orange Ave.-Barranca St.	Oswald Brothers	G. E. Farnsworth
Evergreen Ave.-Atlantic Blvd.	Jahn & Bressi	C. N. Ainley
State St.-Fickett St.	Byerts & Dunn	M. L. Bauder
Olive View-Tunnel Station	J. L. McClain	F. R. Pracht
4 Mi. W. of Westmoreland-Trifolium Can.	Oswald Bros.	R. C. Payne
W. City Lts. Srd-Mt. Vernon Ave.	United Conc. Pipe Corp.	C. V. Kane
Sierra Ave.-Riverside Ave.	C. O. Sparks	J. M. Hollister
Through Bloomington	Griffith Company	J. M. Hollister
		Average

\* Widening only.

\*\* Class C concrete with asphalt concrete surface.

## ASPHALT CON

Location	Contractor	Resident engineer
Yreka-1.5 Mi. Northerly	Chas. L. Harnoy	M. Frederickson
Maxwell-Delevan	Hanrahan Company	J. D. Greene
Loomis-Newcastle	T. M. Morgan Co.	J. D. Greene
Wheatland-Morrison's Crossing	A. J. Raisch	W. G. Remington
San Leandro-Oakland	Heafey-Moore Co.	F. W. Montell
Ashby Ave.-Potrero Ave.	Peninsula Paving Co.	L. G. Marshall
Through Emeryville, Oakland, Berkeley, etc.	Peninsula Paving Co.	L. G. Marshall
San Pablo-Pinole	Peninsula Paving Co.	L. G. Marshall
In Valona	Southern California Rds. Co.	L. G. Marshall
Napa St.-Water St., Sausalito	A. J. Raisch	F. W. Montell
Bayshore Blvd.-Mission St. Viaduct	Fay Improvement Co.	C. F. Price
Sloat Blvd., Great Highway-19th Ave.	Eaton and Smith	H. S. Payson
Waterloo St.-Islais Cr. Channel	Eaton and Smith	C. F. Price
Edgeman Rd.-Route 2	McDonald, Jones & King & Bonnett	H. S. Payson
At Gilroy	Union Paving Co.	A. L. Gladney
Gonzales-Chualar	A. J. Raisch	M. H. Hubbs
Olive Mill Rd.-Santa Barbara	P. J. Akmadzich	F. C. Weigel
East City Limits-Los Olivos St.	J. E. Haddock	H. J. Daggart
Mission St.-Hollister Ave.	J. E. Haddock	H. J. Daggart
California Ave.-Echo Ave., Fresno	Valley Paving Co.	F. W. Howard
Tulare St.-Stanislaus St., Fresno	Union Paving Co.	F. W. Howard
Pierce Road-Tank Farm	Union Paving Co.	H. B. LaForge
Hanford-Easterly Boundary	Southern Calif. Roads Co.	C. F. Oliphant
Plaza Garage-Goshen	Basich Brothers	J. W. Cole
Wly. Boundary-2 Mi. S. of Plaza Garage	Union Paving Co.	J. W. Cole
Garfield Blvd.-1st St., Montebello	Oswald Brothers	W. J. Calvin
Santa Clara River-Castaic School	Griffith Company	E. L. Seitz
Sunland-Tujunga	P. J. Akmadzich	M. H. Mitchell
Foothill Blvd.-Alostia Ave.	Oswald Brothers	F. A. Read
Saugus-Williams Ranch	Griffith Company	E. T. Telford
Williams Ranch-Summit	Griffith Company	E. T. Telford
Evergreen Ave.-Atlantic Blvd.	Jahn & Bressi	C. N. Ainley
West Channel Rd.-California Ave.	Oswald Brothers	E. L. Seitz
Ely. City Boundary-Pacific Ave.	Griffith Company	W. D. Eaton
Central Ave.-Alameda St.	Griffith Company	R. J. Hatfield
Sycamore St., Anaheim-Romneya Drive	Griffith Company	H. B. Lindley
Beetox-Santa Clara River	Oswald Brothers	G. E. Farnsworth
Downey-Buena Park	United Concrete Pipe Corp.	E. A. Parker
Pomona-Ontario	Griffith Company	H. O. Ragan
0.5 Mi. S. of Turlock-1 Mi. N. of Turlock	Union Paving Co.	A. K. Nulty
9th St., B St., to P St., Modesto	Heafey-Moore Co.	A. M. Nash
Sand Hills-East Highline Canal	V. R. Dennis Co.	F. R. Baker
Encinitas-Oceanside	Griffith Company	T. W. Voss
1 Mi. N. of San Ysidro-National City	V. R. Dennis Co.	R. C. Payne
Market St.-Broadway	Daly Corporation	J. M. Hodges
El Cajon-1 Mi. Easterly	V. R. Dennis Co.	J. M. Hodges
		Average

\* Plastometer tests of field mix and average specific gravity.

# for 1934 on California State Highways

## CONCRETE PAVEMENT

Street assistant	Average cu. yds. laid per 8-hour day	Average strength of concrete, 28 days, lbs. sq. in.	Average daily variation in cement, per cent	Roughness index, inches per mile	Type of finish
H. F. Caton	201.2	5,366	1.02	8.9	Mechanical
A. S. Hart	257.3	4,930	0.90	6.5	Mechanical
W. Thomas	206.5	4,168	2.60	*	Mechanical
J. F. Jorgensen	284.3	4,429	1.14	7.2	Mechanical
E. Carlstad	933.0	4,833	0.76	11.9	Mechanical
H. W. Purser	362.5	3,947	0.40	17.4	Hand work
L. D. House	293.8	4,423	0.58	9.1	Mechanical
F. C. Weigel	363.0	3,685	0.40	4.7	Mechanical
E. C. Daniel	381.5	5,190	0.50	8.8	Mechanical
F. C. Weigel	228.0	4,388	0.46	20.2	Mechanical
T. F. Baun	398.2	2,987	0.49	**	Mechanical
T. F. Baun	440.6	3,074	0.38	**	Mechanical
F. E. Baxter	448.5	4,564	0.70	7.1	Mechanical
H. D. Johnson	315.0	5,020	1.12	6.1	Mechanical
T. A. Roseberry	459.5	5,686	0.55	6.8	Mechanical
G. H. Lamb	691.7	5,371	0.34	6.2	Mechanical
G. H. Lamb	392.0	3,557	0.94	7.6	Mechanical
H. Johnson	315.6	4,726	0.99	8.8	Mechanical
G. S. Kibbey	235.0	4,309	1.10	13.8	Mechanical
J. M. Cowgill	428.6	4,209	0.81	7.1	Mechanical
B. Nelson	398.7	4,894	0.40	6.5	Mechanical
B. Nelson	314.7	4,207	0.64	6.9	Mechanical
	402.0	4,465	0.90	8.3	

## CRETE PAVEMENT

Street assistant	Average tonnage laid per day	Average stability of surface mix, in pounds	Average relative specific gravity of surface mix, per cent	Roughometer index, inches per mile	Type of finish
W. M. Douglas	938.1	3,024	94.4	19.8	Mechanical
H. A. McGagin	934.1	3,250	92.8	20.1	Mechanical
A. S. Hart	436.5	2,918	94.0	18.6	Mechanical
A. S. Hart	393.5	2,992	95.5	15.9	Mechanical
B. Van Delsam	361.7	3,130	92.8	21.9	Mechanical
W. Thomas	950.0	2,830	95.5	37.5	Mechanical
W. Thomas	935.0	2,850	95.3	31.5	Mechanical
W. Thomas	741.0	2,546	97.1	34.0	Mechanical
W. Thomas	323.6	2,900	96.7	30.0	Mechanical
B. Allison	343.0	2,800	95.6	22.9	Mechanical
D. N. Sapp	467.5	2,122	93.7	18.4	Mechanical
H. W. Purser	581.5	2,315	95.0	13.0	Mechanical
D. N. Sapp	487.3	2,825	96.3	30.2	Mechanical
J. R. Witt	553.4	2,713	92.9	13.6	Mechanical
	524.6	2,889	93.9	55.5	Hand work
E. F. Carter	624.1	2,588	96.8	15.2	Mechanical
E. F. Carter	294.6	2,828	97.4	14.1	Mechanical
E. F. Carter	304.9	*33%	2.24	16.9	Mechanical
E. F. Carter	357.6	*32%	2.13	14.3	Mechanical
C. Yost	275.0	2,756	93.7	29.6	Hand work
C. Yost	517.3	3,425	94.2	21.2	Mechanical
W. M. Nett	603.5	2,956	93.6	22.7	Mechanical
W. M. Nett	506.0	2,807	92.9	14.9	Mechanical
P. A. Boulton	546.8	2,550	95.7	18.7	Mechanical
P. A. Boulton	476.0	2,898	93.3	20.7	Mechanical
A. W. Carr	633.7	2,984	96.4	25.7	Mechanical
V. A. Miller	555.4	3,098	94.6	27.9	Mechanical
E. D. Davis	458.1	3,068	95.1	21.0	Mechanical
A. W. Carr	490.0	2,921	98.1	20.3	Mechanical
H. D. Johnson	581.2	3,030	94.3	20.6	Mechanical
P. L. Vaughan	670.5	2,900	94.5	17.0	Mechanical
R. L. Norris	355.5	3,612	99.0	23.1	Mechanical
A. W. Carr	475.4	3,101	96.1	10.0	Mechanical
V. A. Miller	562.8	2,755	91.3	10.2	Mechanical
V. A. Miller	618.3	3,467	44.9	15.6	Mechanical
R. E. Schott	542.6	2,605	93.9	23.0	Mechanical
A. W. Carr	420.9	3,458	95.7	10.6	Mechanical
K. D. Lewis	810.7	2,776	98.1	10.7	Mechanical
W. Ford	585.0	2,365	94.9	34.8	Mechanical
H. J. Webb	638.8	2,900	96.4	19.5	Mechanical
W. B. Graziani	182.1	3,626	94.9	29.0	Hand work
F. A. Pearce	534.8	2,932	94.3	31.6	Mechanical
I. W. Littlefield	925.3	3,900	92.0	17.7	Mechanical
L. E. Crayne	697.4	3,744	92.2	20.4	Mechanical
L. E. Crayne	525.5	3,270	97.9	14.7	Mechanical
L. E. Crayne	467.8	3,310	98.3	15.6	Mechanical
	594.4	2,950	95.9	21.4	

## OILED ROCK SURFACE

Location	Contractor	Resident engineer	Roughness, inches per mile
<b>PLANT MIX</b>			
Middletown-Putah Creek	Fredrickson & Watson	A. W. Root	21.6
Boulder Creek-1½ Mi. E. of Bella Vista	Fredrickson & Watson	D. J. Stout	34.3
Pine Creek Bridge approaches	A. G. Raisch	H. M. Sturgis	49.4
1 Mi. W. of Washington Rd.-½ Mi. E. of Summit	A. Teichert & Son	W. G. Remington	27.1
Drum Canal-Yuba Pass	A. Teichert & Son	W. G. Remington	26.3
At Roseville	T. M. Morgan Co.	J. G. Meyer	67.6
D St.-2d St., Marysville	Hemstreet and Bell	J. G. Meyer	29.6
Cloverdale-Hopland	Peninsula Paving Co.	H. A. Simard	24.0
Fairville-Shellville	Peninsula Paving Co.	F. W. Montell	37.1
Cabazon-Whitewater	Oswald Brothers	O. B. Brinkerhoff	50.1
Eschscholzia Ave.	George Herz & Co.	H. O. Ragan	15.9
Arrowhead Springs-San Bernardino	United Concrete Pipe Corp.	D. J. Stout	28.9
Crestview-2.2 Mi. S. of Rush Creek	Southwest Paving Co.	A. R. McCarton	30.5
Point Ranch-Dressler's Corner	Basich Brothers	F. R. Baker	14.0
Dougherty's Corner-Birchim Canyon	Basich Brothers	A. C. Briney	8.2
Across Santa Rita Slough	Valley Paving Co.	A. K. Nulty	56.5
Lodi-4.5 Mi. East	Tiffany Construction Co.	R. H. Lapp	12.9
Black Butte-Blythe	Walter Trepte	J. M. Hodges	38.5
San Diego-Point Loma	Walter Trepte	J. M. Hodges	18.2
		Average	26.4
<b>ROAD MIX</b>			
At Big Canyon	A. Teichert & Son	R. F. Buland	26.9
Carmel River-Carmel	J. L. Conner & K. Kristich	J. M. Hayden	24.3
Santa Ynez River-Santa Ynez	Macco Construction Co.	W. Mathews	31.1
1 Mi. S. of Delano-2 Mi. S.	Granite Construction Co.	C. F. Oliphant	20.5
Between Route 140 and Route 58	Geo. K. Thompson	H. B. LaForge	14.4
Wly. Boundary-0.5 Mi. E. of West Casitas	C. W. Wood	W. J. Calvin	87.5
Westerly Boundary-Camp Cajon	Sharp & Fellows	E. A. Bannister	30.4
Sherwin Hill Summit-Whiskey Canyon	Hemstreet and Bell	A. C. Briney	14.5
2 Mi. N. of Leevining-Mono Inn	Isbell Construction Co.	M. W. Ellis	6.5
Westerly Boundary-3.5 Mi. East	Von der Hellen & Pierson	L. R. Hubbard	24.8
		Average	27.3
<b>MISCELLANEOUS BITUMINOUS TREATED</b>			
N. City Limits-Ocean St., Santa Cruz	Union Paving Co. (Rock Asphalt)	A. Walsh	40.2
1 Mi. N. of Inspiration Pt.-Scotts Valley	Hanrahan Company (Bit. Mac. Asphalt)	A. Walsh	49.5
King City-2 Mi. S. of Greenfield	Jones & King (Emulsified Retroad)	J. C. Adams	46.4
In El Segundo	J. L. McClain (Emulsified Bit. Mac.)	L. R. McNeely	45.2
		Average	47.1



Los Gatos-Santa Cruz highway (State Route 5) paved with 40-foot bituminous macadam.

## 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.

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### Weeding Out Death Traps

That men have had to die and whole families to suffer merely because civilization has lacked either the time or the money or the inclination to eliminate all railroad grade crossings, has always been a little beyond the understanding of a thinking person.

After all it is mere child's play for modern engineering to route roadways over or under railroad tracks. And even if the cost were double what it actually is, it would still not be worth a single life. Life can not be reckoned in dollars.

But the end of this paradox is in sight. California has swung into action with the \$7,426,952 allotted to this State for crossing elimination. Recently President Roosevelt approved rules to govern the project. The State Highway Department is speedily selecting jobs to be done, and actual work will be under way in short order.

A boost toward prosperity this program will be also, stimulating cement, lumber, steel and other factories, and putting money in the pockets of numerous workers, 90 per cent of whom must be taken off relief rolls.

No other single works relief effort can compare with this one for appropriateness, because no other can correct such an obvious oversight of man in the matter of safeguarding life.

Now, at last, we are on the right track. Let us hope we continue so that in two, or three, or five years every last grade crossing in California will have been wiped out.

—Rosemead Review.

## New Map Shows Late Changes in U. S. and State Sign Routes

THERE have been a number of changes in the State Sign Routes since descriptions and a map showing these routes were originally published in California Highways and Public Works in August, 1934.

Several State routes have been superseded by U. S. Numbered Highways, and they, with other changes, appear on a new map of California prepared by the Division of Highways showing United States and State Numbered Highways.

The State Shield Sign Routes which have been superseded by U. S. Shield signs are as follows:

#### SHIELD SIGN CHANGES

- State Route 71—San Diego to San Bernardino.
- State Route 95—San Bernardino to Kern-Inyo Co. Line.
- State Route 7—Inyo-Kern Co. Line to California; Nevada Line north of Coleville, and California-Nevada Line near Reno Jct. to California-Oregon State Line, changed to U. S. 395.
- State Route 3—Serra to El Rio, changed to U. S. 101 Alternate.
- State Route 44—Jct. U. S. 101 near Arcata to Alturas, changed to U. S. 299.

Other changes noted on the map are as follows:

- U. S. 399 is from Ventura to Bakersfield via Wheeler Springs, Taft.
- U. S. 70 is made coincident with U. S. 60 within California.

#### U. S. 66 EXTENDED

- State Route 440, changed to 44.
- U. S. 66 extended from Sunset Boulevard in Los Angeles to Santa Monica via Santa Monica Boulevard.
- State Route 24, extended south from Sacramento to Oakland, via Isleton, Antioch, Walnut Creek.
- State Route 21 is added near Mission San Jose to Walnut Creek via Sunol, Dublin.

The placing of signs on the designated routes is proceeding as rapidly as consistent with proper logging, and economical handling of the work.

#### U. S.-CANADA BUILT 2,869,963 CARS

Total motor vehicle production for the United States and Canada during 1934 was 2,869,963 units of which 2,270,566 were passenger cars and 599,397 trucks, states a report. Total wholesale value of these vehicles including parts and tires was \$2,493,198,716.

# Methods Employed to Correct Slides on the Santa Cruz-Los Gatos Highway

SLIDES which occurred on the Santa Cruz-Los Gatos highway near Inspiration Point caused much trouble and expense to the Division of Highways maintenance forces during last winter and the spring of 1935.

During the early part of December the first signs of slide movement appeared in large cracks in the fill slopes. A crew of men were put to work at once sealing these cracks.

The enormous weight of the fill, which was some 45 feet deep at center line became saturated by heavy rains and subterranean springs and began moving slowly down the mountain side.

## BACKFILLING ACCELERATED SLIDE

The crew began backfilling the slide portion in the hope of keeping the fill from going out entirely. It soon became apparent that the additional weight only accelerated the slide movement. The road was then closed and traffic detoured over the old road above the fill.

Test holes were drilled in different locations, varying from 20 to 35 feet in depth, to locate the source of the water which was seeping into the fill. These tests proved water to be present in each of the test holes drilled.

In order to carry off this water a trench was dug on the upper side of the fill by means of a drag line. This trench was dug to a depth of 30 feet and was 150 feet in length by 12 feet in width. This trench was then backfilled with boulders of six-inch minimum diameter and the water was carried off to an adjacent ravine in which a culvert had been previously placed. A perforated metal culvert was also installed across the road just east of the fill.

## SLIDE MOVEMENT ARRESTED

These preventative measures were successful in arresting the slide movement. A temporary roadway was then constructed somewhat below grade and thirty feet wide which accommodated traffic during the vacation season. At that time, however, approximately 50 per cent of the fill had slipped a distance of some 300 feet down the mountain side.

On August 2, 1935, work was again resumed and by that time the fill had dried out with the exception of one particular spot where further moisture showed up near the toe of the fill. At this point another trench was excavated in a diagonal direction with a 50 H.P. tractor and bulldozer.

The dimensions of this trench were about 30 feet deep, 12 feet wide and 200 feet long and revealed natural solid ground which was treated with liquid asphalt to seal the bottom of the trench. The trench was then backfilled with six-inch minimum size rock, the rock being placed six feet wide, 10 feet deep and 150 feet long.

## ANOTHER SLIDE DEVELOPED

The rock was covered with a heavy mat of brush and pine boughs. The fill was then brought back to grade by use of a power shovel assisted by two five-ton trucks as well as a bulldozer. The roadway was surfaced with a seal coat on a four-inch crusher run base 40 feet wide.

The fill just east of Inspiration Point slide also caused a good deal of trouble as portions of it slid down the mountain taking with it 40 feet of 24-inch corrugated metal culvert, thereby cutting off the use of the remaining pipe.

This pipe was replaced at the same time as one at Inspiration Point. In making this replacement the original pipe was discovered 20 feet under the fill. It was then extended 120 feet and the trench backfilled with rock, which was likewise covered with a mat of brush and pine boughs.

## CALIFORNIA SECOND IN AUTOMOBILES

Motor vehicle registration in the United States last year totaled 24,933,403, an increase of 4.6 per cent over the 1933 total of 23,843,591. New York still leads all other states with 2,269,355 registered motor vehicles, while California remains a close second with a total of 2,006,255.

## ITALY FIRST IN AUTO DEATHS

Italy was first during 1934 in number of automobile deaths per 10,000 motor vehicles with an average of 54.5, states a report to the Automobile Club of Southern California. The United States was tenth on the list with an average of 12.3, while New Zealand was low with 6.6.



**BIG FILL** on the Los Gatos-Santa Cruz highway (State Route No. 5) showing where slide occurred threatening to entirely destroy the completed roadway last Spring



**LOWER SLIDE AREA** where 50 per cent of the fill slipped a distance of 300 feet down the mountain side and was stopped by trenching and backfilling with rock.

## Cities' Gas Tax Fund Pays Maintenance

(Continued from page 12)

\$15,178,965. Under the regulations governing the expenditure of these funds, not less than 25 per cent shall be applied to feeder road projects outside of municipalities and metropolitan areas not included in State highway systems or Federal Aid highway systems, and not less than 25 per cent to projects within municipalities or metropolitan areas. The remaining funds may be applied to projects on the State and Federal Aid highway systems.

### COMPLETE PROGRAM PRESENTED

A program has been prepared by the Highway Commission and submitted to the U. S. Bureau of Public Roads, programming the funds as follows:

State highways -----	\$3,000,000
Within municipalities and metropolitan areas -----	2,371,595
Feeder roads -----	2,321,024
<hr/>	
Total highways -----	\$7,692,619
Grade crossings -----	7,486,346
<hr/>	
Total -----	\$15,178,965

Funds budgeted by the Highway Commission for construction projects within cities amounting to \$1,315,880 and Federal Relief appropriation funds programmed for expenditure in metropolitan areas, amounting to \$2,371,555, make a total of \$3,690,000 for the biennium, or an average annual amount of \$1,845,000.

The latter amount, added to the two one-quarter cent allocations of \$6,000,000, will make an annual expenditure of State and Federal funds within cities for street and highway purposes equal to 65 per cent of the total expenditures by municipalities for the same purpose in 1934.

When the new laws passed by the last legislature went into effect on September 15th, it became necessary for the Highway Commission to revise its budget and to take some five million dollars out of proposed highway projects to provide the additional one-quarter cent allocation to cities.

### MAINTENANCE BURDEN SHIFTED

In revising the budget the Commission was faced with the necessity of eliminating all appropriations for expenditures within cities from budgeted funds, and limiting such expenditure, to be defrayed from the one-quarter cent allocation for State highways within municipalities due to the necessity of financing Federal Aid projects under the provisions of the Federal Emergency Relief Appropriation Act of 1935.

It likewise became necessary that the cost of maintaining portions of the State highway routes within cities formerly maintained at State expense now be defrayed from the one-quarter cent for State highways. This has been a severe blow to some cities with a large mileage of State highways carrying heavy traffic, and where the State has formerly carried the greater burden of maintenance and improvement.

Due to the limited funds available to the Commission, all future expenditures on State highways within cities will have to come out of the one-quarter cent for State highways, except for those projects in the present budget.

### ONLY \$6,000,000 LEFT

In the current budget the amount programmed for construction projects, both in rural areas and within municipalities, totals \$21,500,000. Of this amount \$9,500,000 represents Federal Aid authorized by the Hayden-Cartwright Act, leaving only \$12,000,000 of State revenue available for construction work for the biennium, or at the rate of \$6,000,000 per year.

The present large mileage of State highways in California, about 14,000 miles, requires a huge outlay each year for maintenance and upkeep. A large mileage of poorly improved secondary highways was legislated into the system two years ago. When these highways were proposed for admittance to the State system we were assured by the various sponsors that no capital expenditure for improvement would be necessary. The true condition of these roads, however, told a different story. We found that, because of improper location, with inadequate, and in many cases no surfacing, these roads require considerable improvement. We found that hundreds of bridges on these routes were in a condition compelling immediate repair, reinforcing and in too many cases almost complete reconstruction, to make them safe for State highway traffic.

### IMPROVEMENTS IMPERATIVE

The heavily traveled main trunk highways are burdened with an increasing volume of traffic that, aside from outgrowing the pavement, is creating hazardous conditions in many locations which must be given attention despite the cost. In many locations the cost of maintenance could be reduced materially by improvement or reconstruction, but funds for such expenditures are not available and it is necessary to continue from year to year the outlay of a large amount for maintenance in order to provide traffic with the service to which it is entitled, even though maintenance costs pass the limits of economic tolerance.

With the present revenue proving inadequate, any further reduction would result in serious consequences and would impair the efficiency of the service rendered to transportation by the State highway system.

From this you can fully appreciate the problem we are facing of financing the improvement and maintenance of State highways. One solution is to increase efficiency in administering the funds.

### ONE SOLUTION OF PROBLEM

A vast improvement along these lines can be accomplished by the elimination of overlapping duties and duplication of effort. The unified highway plan as presented to the last legislature was

(Continued on next page)



## Lighting of Streets Held An Obligation Of Local Community

(Continued from preceding page)

developed to increase efficiency in the expenditure of highway money.

A number of inquiries have been received in regard to the use of gas tax funds for street illumination. Apparently these inquiries were inspired by newspaper publicity relating to the use of gas tax funds for street lighting at the time Senate Bill 822 was signed by the Governor, which created an erroneous impression upon the readers. The act permits the use of the gas tax fund only for such illumination as in the judgment of the department is required for the safety of persons using the streets, roads, highways or bridges in question.

The policy adopted with respect to illumination of State highways is that street lighting is considered an obligation of the local community and that gas tax funds may be used only for lighting tunnels, bridges, subways, viaducts or hazardous locations of a corresponding nature. On the other hand, Senate Bill 561 specifically prohibits the expenditure of the one-quarter cent allocation for street lighting within cities.

### THROUGH TRAFFIC STREETS

One of the provisions of the act is that the city and the department agree upon the streets of major importance within the city other than State highways upon which the additional one-quarter cent shall be expended. This provision is considered to mean that the city will select certain streets qualified as being of major importance and that such streets or system of streets will be submitted to the department for approval.

It may be well to state here that the qualifications of a street as one of major importance will be determined by a consideration of the through traffic. It is not expected that a system of streets of major importance when adopted will be eternal. But so long as the law requires that streets of major importance shall be the only ones upon which one-quarter cent funds may be expended, it is expected that expenditures will be made accordingly.

When it may become expedient or desirable that the system of streets of major importance be changed, you may be assured that we will be quick to sanction, if not the first to suggest, a change in the major streets plan. It is recognized that in some of the smaller cities practically all of the through streets are designated State highway routes, and in such cases those streets which are of greatest local importance will be approved as qualified under the law.

### PREFER CITIES BE JUDGES

There is a provision in the act to require that expenditure of the one-quarter cent for streets be delegated to a city if the department is satisfied that the city is qualified to do such work in what the act terms "an efficient and economic manner." Although the act imposes the obligation of determining the qualifications of a city upon the department, we expect the legislative body of each city to give us their fullest cooperation and we prefer that the cities be the judge of this question.

## Gas Tax Diversions Breeding Revolt in Ranks of Motorists

By CHARLES M. UPHAM, Engineer-Director,  
American Road Builders Association

THE declared intention of gasoline taxes and motor vehicle license fees was to provide funds for highway and street improvement. These taxes and fees actually are a "ticket" or toll on motorists for their use of highways, and are recognized as fair when they are applied to highway improvement.

Instead of collecting from motor vehicle operators on a basis of so much a mile, Federal and State governments levy gasoline taxes, etc., because they are more convenient to collect.

Motor vehicle owners and operators voiced no serious objection to paying these taxes and fees as long as they were used for highways and street construction and maintenance.

### DIVERSION CAUSES REVOLT

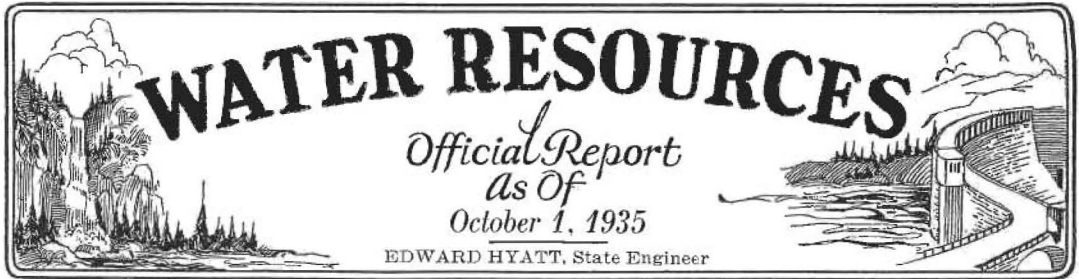
But diversion of these funds to other purposes—no matter how worthy the cause or how great the need—is causing motorists to revolt against the taxes and fees, and unless diversion is stopped the highway program will be thrown for a sixteen year loss—right back where it was when the first gasoline tax was levied in 1919.

Every major undertaking breeds its apostles of doom, and the highway program is no exception. From certain sources you hear the cry that there must be a holiday in highway improvement, that the cost of continuing the program is too great, that the taxpayers must have a rest, etc., etc.

### LABOR GETS MOST

The answer to that is: Highways and streets are not paved with dollars. They are improved with materials—and labor. The highway dollar does not go out of circulation. It simply changes hands, provides new wealth and permanent benefits. From 80 to 90 per cent of every dollar spent for highway construction goes to labor, labor employed directly on the job, or employed in providing machinery, materials and transportation.

I am willing to embrace the proposition that the officials of a city are sufficiently earnest to judge the city's capacity in this respect. I sincerely trust that the cities will take advantage of the provision for delegation of expenditures.



Approval by President Roosevelt of an allotment of \$20,000,000 to the Bureau of Reclamation, Interior Department, for construction of the first units of the Central Valley project in California was announced September 12th by the Federal Division of Applications and Information.

Study of plans for irrigation district projects, including the All-American Canal power project of the Imperial District; progress of reclamation and flood control work; applications for construction and repairs of dams and other activities of the Division of Water Resources are detailed in the following monthly report of the State Engineer:

#### IRRIGATION DISTRICTS

Several days were spent in a field investigation of the Pacheco Pass Water District, located in San Benito and Santa Clara counties, in connection with reports to the California Districts Securities Commission on the feasibility of the irrigation works proposed by the district and the appraisal of the values of the lands included within the district.

A study and review was made of the Imperial All-American Canal power project. The project is proposed by the Imperial Irrigation District for the initial development of the power rights granted by the Federal government to the district in connection with the All-American Canal now under construction. It involves an estimated expenditure of \$10,450,000 in the development of two hydro-plants with a total installed capacity of 35,750 k.w., a Diesel stand-by plant of 15,000 k.w. capacity, and the transmission and distribution lines, substations and other necessary equipment for the distribution of electric power in Imperial and Coachella Valleys.

#### *California Districts Securities Commission.*

The commission issued orders to the Merced Irrigation District, approving the refunding procedure proposed by the district, and approving for certification by the Controller of the refunding bonds of the district.

An order was issued by the commission authorizing the calling of an election by the directors of the Pacheco Pass Water District on a bond issue in the amount of \$200,000.

#### FLOOD CONTROL AND RECLAMATION

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

At its meeting on September 18, 1935, the Reclamation Board authorized this office to undertake certain incidental construction work in connection with the building of the south levee of the American River Flood Control District from the Meister tract to Mayhew station. This consists of the installation of 12 pipes, construction of several miles of fence, and the anchorage of hop wires, at an estimated cost of \$11,000.

Work has proceeded in the construction of the new drainage pumping plants in the Sutter By-pass by Frederick W. Snook Company. The old plants have been almost entirely dismantled and the operators' cottages are well toward completion. The contract provides that a certain pump capacity will be available at each plant at all times to care for emergencies, but it is thought that most of the new pumps will be ready for service in time to care for possible heavy storms.

##### *San Joaquin River.*

Surveys have been completed and plans and specifications are being prepared for a closure of three gaps in the San Joaquin River levee of River Junction Reclamation District No. 2064, under the provisions of Chapter 365, 1935. The work will be let by contract, and requests for bids will be advertised on September 24th.

#### DAMS

Application for construction of an earthfill dam 40 feet in height with storage capacity of 46 acre-feet was made on August 19th by the city of Arcata. The storage is to be used for municipal and domestic purposes. The estimated cost of the dam is \$12,000. This application was approved by the State Engineer on September 12, 1935.

Application for construction of tailings retaining dam, 40 feet in height with storage capacity of approximately 40 acre-feet, was filed by the Lava Cap Gold Mining Corporation of Nevada City on August 31, 1935. The structure is to be an earth and rock filled crib and it is estimated to cost \$1,000.

Application was filed on September 11th for the alterations of the rockfill dam at Bowman Lake by the Nevada Irrigation District at Grass Valley, California. The work consists of the construction of a parapet wall on the crest of the dam in order to increase the freeboard on the structure.

# Dam Repairs and Construction Rushed

## *Repairs Plans Approved.*

Application was filed on August 21, 1935, by the California Edison Company for alterations to the Huntington Lake Dam No. 3. The work consists of placing a fill on the downstream face of the existing concrete gravity dam. This application was approved on September 3, 1935, by the State Engineer.

Application for repairs on the lower St. Helena Dam of the City of St. Helena, was filed on August 30, 1935. The work consists of reconstruction of a portion of the fill to prevent existing leakage. This application was approved by the State Engineer on September 10, 1935.

Construction of the San Gabriel Dam No. 1 of the Los Angeles Flood Control District has been resumed under the revised plans and specifications approved last month.

Excavation for the foundations and outlet conduit for the Grant Lake Dam of the City of Los Angeles, Bureau of Light and Power, is under way.

## *Construction Under Way.*

The Calero Dam of the Santa Clara Water Conservation District is nearing completion; the fill is very close to the crest elevation and the work of placing the concrete facing slab is under way. The other dams of the Conservation District are being rushed as much as possible in order to have them completed before the next runoff season.

Construction work at the West Valley Dam in the South Fork Irrigation District, Modoc County, has been chiefly in the excavation for the outlet conduit and the stripping of the foundations.

Work at the O'Shaughnessy Dam, which is being enlarged by the City of San Francisco, consists principally of excavation at the abutments.

The usual inspections for maintenance and operation, as well as of repair jobs under way, has been carried on in addition to the inspection of construction work.

## SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

From a minimum flow of about 3000 second-feet in August, the flow of the Sacramento River at Sacramento has increased to 3800 second-feet due to increased return flow and a reduction in diversions. The flow of the San Joaquin River near Vernalis is 1100 second-feet compared to 450 second-feet at this time a year ago.

The encroachment of salinity into the Delta has been very slight compared to the extensive encroachment of 1934. To date, salinity of 100 parts of chlorine per 100,000 parts of water has not extended above the channels surrounding lower Sherman Island.

## WATER RIGHTS

### *Supervision of Appropriations of Water.*

Twenty-nine applications to appropriate water were received during the month of August; 12 were denied

and 22 were approved. In the same period two permits were revoked and 8 passed to license.

Among the applications which were received were two of special interest filed on behalf of the North San Juan Ridge area in Nevada County. These applications were to appropriate from South Fork of Middle Yuba River for mining, irrigation and domestic purposes, one application being in the name of W. P. Clerkin of French Corral and the other being in the name of San Juan Ridge Mutual Water Users Association.

Inspections of projects in Calaveras and Mono counties were made during August, preliminary to the issuance of licenses.

## FEDERAL COOPERATION— TOPOGRAPHIC MAPPING

Level work was carried on during August in connection with the Kreyenhagen Hills and Mt. Boardman quadrangles in Fresno, Stanislaus and Santa Clara counties. Field work was resumed on the Paynes Creek quarangle in Tehama County and the Burney Creek quadrangle in Shasta County. Some office work was done on the Healdsburg quadrangle in Sonoma County. Final sheets of El Toro, Coyote Hills, Orange and Garden Grove quadrangles in Orange County are now available. These are published on a scale of 1:31,680 with 5 and 25 feet contour intervals. These are Federal-State cooperative sheets.

Final sheets of the Wilsona, Whitaker Peak and Hi Vista quadrangles situated in Los Angeles County are now available. These sheets are published on a scale of 1:24,000 with contour intervals of 5 and 25 feet. The work was done by the Topographic Branch of the U. S. Geological Survey in cooperation with Los Angeles County.

## WATER RESOURCES

### *South Coastal Basin Investigation.*

Work on the South Coastal Basin investigation has continued along routine lines.

Susan River (Lassen County)—Water distribution under the tentative schedule of allotments adopted by the water users for the 1935 season was continued throughout the month.

Water master service in the following districts was continued throughout the month: Hat Creek, Burney Creek and Cow Creek (Shasta County); Owl, Soldier, Emerson, Cedar, Deep and Mill Creek (in Surprise Valley, Modoc County); New Pine, Davis and Franklin Creek (in Goose Lake Valley, Modoc County); South Fork Pit River, Pine Creek, Hot Springs Valley, and Big Valley (Modoc and Lassen counties); Shasta River (Siskiyou County).

Automobile registration number plates of California in 1936 will be orange with black numerals and letters.

# Finishing Warped Surfaces of Asphalt Concrete Pavement at Intersections

By C. S. POPE, Construction Engineer

**I**N LINE with a suggestion to district engineers, that they give brief descriptions of particular methods or features of road construction, the following is based on notes recently presented by District Construction Engineer R. S. Badger.

Contract 66TC3, road VI-Fre-4-Fre, provided for asphalt concrete pavement on 0.46 mile of Broadway in Fresno, between Tulare Street and Stanislaus Street. The width of pavement was increased by 10 feet to a total of 62 feet, and included new curbs and gutters and drainage improvements. F. W. Howard was the resident engineer in charge of contract.

## HAND AND MACHINE COMBINATION

The outstanding feature of this work was the method by which warped surfaces of paving which occurred at intersections were worked out by a combination of a standard finishing machine supplemented by the use of hand equipment.

All the asphalt concrete on this project, except the base course and that portion laid at street intersections, was spread with spreader boxes and finished with a 30-foot mechanical finisher. The base course and street intersections were hand-raked.

Before paving was started, grades were painted on the pavement at 25-foot intervals indicating the distance from existing pavement to the new grade. The 3-foot 8-inch header was placed on its side and brought to a true grade with shims placed at 2-foot intervals, the inner edge of the header being 30 feet from the west gutter.

## BRINGING TO GRADE

Holes were drilled at intervals of 4 feet into the existing pavement at the outer edge of the plank and stakes driven into them. After the planks were brought to grade, they were securely nailed to the stakes. Planks, 3 by 8 inch, were also laid flat along the gutter to carry one side of the finishing machine, and prevent damage to the concrete gutter.

The screeds of the finishing machine were divided into three 10-foot lengths and were set to approximately fit the typical section. At the third point from the gutter there was a noticeable angle in the pavement before

rolling. To eliminate this, a three-wheel roller was passed over it twice before breaking down the asphalt concrete at the gutter, the cross-section of the completed pavement at this point having the appearance of a smooth curve.

## SCREEDS NOT CHANGED

At street intersections, the finishing machine was used to spread the asphalt concrete but the screeds were not changed to fit the changing cross-section at these places. All the intersections were warped surfaces and no two were alike, therefore it was considered impractical to change the screeds. After the finishing machine had passed over each intersection, the asphalt concrete was brought to its proper shape with a 14-foot pole push float.

On account of its weight two men were required to operate the float. Two shovelers fed material in front of the cutting edge, keeping an even roll of the mix in front of the float, similar to a standard finishing machine screed.

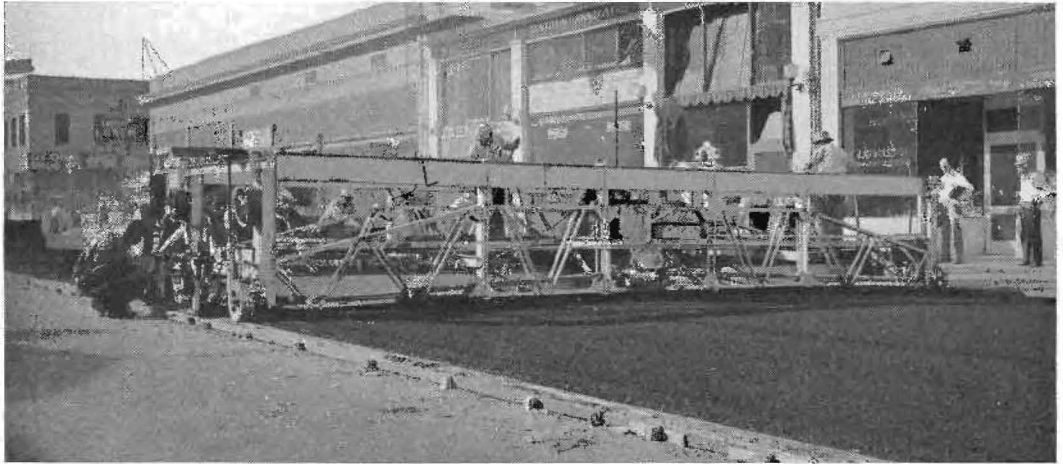
For this type "B" asphalt surface the float secured excellent results, not only over the entire intersections, but at car track crossings and at junctions, when the day's work began.

## SPOTTED WHILE HOT

After rolling the surface course sufficiently to produce a moderately smooth surface, and while the pavement was still quite hot, the smoothness of the pavement was checked with a 16-foot straight-edge. Low spots were filled and high spots were rolled down as rapidly as they were found, and by thus spotting while the pavement was still hot, it was possible to eliminate a patchy appearance. After spotting and at the proper time, the pavement was cross-rolled and bump-rolled in the usual manner.

## TRUCK TAX RETURNS SHOW INCREASE OF 14 PER CENT

The tax on the gross receipts from the operation of motor trucks for the first six months of this year amounted to \$556,505. This was 14 per cent higher than for the same period last year. This tax is assessed on the basis of 3 per cent of the gross and that return would indicate these carriers did a business in excess of \$18,500,000 during the period. It is only those who operate trucks as a business outside of the limits of municipalities, who pay the tax.



**MECHANICAL FINISHER, 30 foot wide, in operation on highway through Fresno.**



**HAND FINISHING warped intersection pavement at Fresno street with 14-foot pole push float.**



**COMPLETED JOB of asphalt concrete pavement at intersection of Fresno street and Broadway.**

## 900 Feet Clear Road Ahead Needed to Pass Car Going 40 m.p.h.

**T**HE DISTANCE required for one car to overtake and pass another has an important bearing on highway design and safety. Several hundred measurements of this distance are reported by H. C. Dickinson, chief of the division of heat and power, National Bureau of Standards, in *Highway Research Abstracts*.

The typical case of risk seems to involve one driver following another at a presumably safe distance and awaiting a clear space ahead long enough to permit overtaking safely the slower vehicle or line of vehicles. Under these conditions the maneuver of overtaking and passing consists of accelerating the rear car until it overtakes and clears the car ahead, and then returning to the right-hand traffic lane.

### SIX SECONDS TO PASS

In all the test maneuvers the rear car, traveling at the same speed as the car ahead, started to accelerate from a position about one and one-half seconds in time behind the car ahead.

The results of several hundred measurements indicate that the time required to overtake and pass another car on a substantially level road, starting from a safe distance to the rear, is nearly six seconds and is independent of the speed.

Reduced to distances, for a car to overtake and pass another traveling at 40 m.p.h. on a road where speeds of 50 m.p.h. may be expected, the driver intending to overtake must have at least 900 feet of clear road ahead if the maneuver is to be performed with safety.

### ALLOW SIX HUNDRED FIFTY FEET

In overtaking a more slowly moving vehicle—say a truck traveling at 20 m. p. h.—the safe distance is 650 feet, made up of 600 feet for the overtaking vehicle plus 50 feet for a vehicle approaching at 50 m. p. h.

For maximum speeds above 50 m. p. h., the safe distance is greater than 900 feet.

These figures bring out the importance of providing clear vision of the road for as long a distance ahead as is possible.

Pneumatic-tired trailers are popular vehicles in California, 77,982 such carriers having been registered in seven months of 1935.

## THE WHITE LINE IN THE MIDDLE OF THE ROAD IN CALIFORNIA

In California, yes California, no other state that I know of, has as many miles of the white line in the middle of the road, as our dear old California.

The white line is, and should be, our guide, by day and night, over mountains and valleys, as we travel to and fro. I have traveled many, many miles, and I never feel safe unless I am on the right side of the white line in the middle of the road I am traveling.

What a wonderful idea it was, to the one who put his thought of the white line in the middle of the road for our guide.

O! how much sorrow and grief it has already saved our loved ones, and it will still go on, if we all observe and obey "The white line in the middle of the road."

I hope and pray that all states in our dear old U. S. A. will soon pass a law that all highways wherever they are, will have to have a white line in the middle of the road like the white line in the middle of the road in our dear old California.

—Mrs. H. C. Webster  
Los Angeles

## 319,666 TRUCKS AND TRAILERS NOW USING CALIFORNIA HIGHWAYS

**T**HE fact that the percentage of trucks and trailers increased more rapidly upon our highways than the percentage of pleasure cars during the latter depression years was established by the recent extensive traffic survey of the Division of Highways.

Referring to the importance of this great and growing industry to California and the effect upon it of the transfer of jurisdiction to the State Railroad Commission by recent act of the legislature, the magazine *Western Truck Owner* says:

"It is a tremendous task and one on which depends not only the welfare of the truck operators but to a great extent the prosperity of all industry throughout the State.

"Without the motor truck the major industries of the State could not operate. Our multi-billion-dollar oil industry would be obliged to practically cease, our fruit and vegetable crops—representing more dollars to the acre than any other part of the world—could not be moved to markets.

"California, to a greater extent than any other state or country in the world, is vitally dependent upon the modern, efficient transportation afforded by its 237,556 motor trucks and 82,110 trailers.



FIVE BIG BELLS that will ring out across the bay in fog and storm to warn skippers of the location of the Bay Bridge channel piers.

## Bay Bridge Bells Will Warn Mariners

(Continued from page 8)

will be installed on the bridge piers in the ship channels of the bay to ring out warnings to navigation during foggy weather. They were cast in a South San Francisco foundry and will soon be hung in place on the pier structures.

Two of these bells weigh 3000 pounds each, have a diameter at the mouth of 52 inches, and stand approximately 40 inches high. The three smaller ones weigh 1600 pounds each, have a diameter of 40 inches and are about 30 inches high. The bells are of cast bronze and their sonorous tones will carry across a mile of water.

On dark, stormy nights and during heavy fogs their clanging chorus should be a novelty to transbay commuters. They will guide ships using the bay channels beneath the bridge.

### TWO BELLS ON ANCHORAGE

The two large bells will be placed at the east and west sides of the great Center Anchorage and the three smaller ones will be installed at Piers E-4, E-5 and E-6 of the East Bay Crossing.

It has been ascertained by members of the staff of Chief Engineer C. H. Purcell, that the largest ship afloat, the French liner *Normandie*, can pass under the bridge with ample clearance.

The *Normandie's* forward mast is 193 feet above water-line. The side spans adjacent to the Center Anchorage of the bridge in the West Bay have a maximum clearance above low water of 216 feet for a distance of 1160 feet at either side of the Anchorage.

## Snow Fighting Forces All Ready for Battle

Proud of its record last year in keeping highways open during storms that brought exceptional snowfalls, the Maintenance Department of the State Division of Highways is fully prepared to combat winter conditions in the high Sierras and other mountainous regions of the State according to Maintenance Engineer T. H. Dennis.

Exceeding in intensity and area any storm experienced since the department inaugurated the policy of keeping open all important roads, a storm starting last January 7 and continuing to January 20 tested the Highway forces to the limit.

During that storm the Maintenance Department kept 293 pieces of equipment ranging from "V" push plow motor graders to large auger-blower type rotaries at work continuously on 4500 miles of mountain roads.

U. S. Route 40, from Colfax over Donner Summit to the Nevada State Line, was the most difficult route in California to keep open, largely on account of drifting snow. On this section, ten 4-wheel-drive trucks with push-plow attachment, three auger-blower and one railroad type rotary plow were used.

All this equipment has been overhauled and repaired during the summer and the Maintenance Department is prepared for any onslaught of "King Snow" this winter.

Long stretches of snow fence have been installed at points on routes where drifting last winter was extremely serious.

Additional quarters for snow plow crews have been built at Emigrant Gap and Donner Summit by the Division of Highways. Last winter with large crews working day and night accommodations were not sufficient.

## Highways Carry Over 87% of Passenger Mile Transportation

Professor S. S. Steinberg, head of the Department of Civil Engineering, University of Maryland, and president of the Educational Division, American Road Builders' Association, said in a recent address:

"Of the many developments of the twentieth century that of highway transportation has been the most profound and far reaching in its contributions to our national life. Our highway transportation system has not only added immeasurably to the national wealth but it has enriched the lives of our people socially and culturally.

### VAST INDUSTRIAL STRUCTURE

"It has provided the foundation upon which has been erected a vast and diversified industrial structure that provides employment for both labor and capital in the manufacture, distribution and servicing of motor vehicles, in road-building and maintenance equipment, in the production and distribution of gasoline, oil and accessories, and in a variety of auxiliary services, including insurance, garages, parking facilities, roadside stands, hotels and many others.

"With more than 25,000,000 motor vehicles on our highways, sufficient in number to transport our entire population at one time, the business of highway transportation becomes one of the largest in the country.

### EIGHT BILLION EXPENDITURE

"This is well borne out by some recent statistics. During 1934 the expenditure for new cars and trucks, for gasoline, oil and repair service, and for highway taxes totalled \$8,000,000,000.

"Considering total passenger miles of transportation last year, and excluding waterways, we find that highways carried more than 87 per cent, steam and electric railroads more than 12 per cent and airplanes less than one per cent. There are more than 100,000 buses operating on our highways and they carry annually 2,000,000 passengers, which is equal to one bus ride for every person in the world."

There are 35,087,698 motor vehicles in the world, according to a compilation for 1934. Of this number, 71 per cent or 24,933,403 are in the United States.



PUZZLE PHOTO—Guess the size of this timepiece that gave photographer the jitters.

## Paul Bunyan's Watch Appears on Highway

The above picture suggesting that Paul Bunyan must have passed that way and dropped his watch, approximately the size of a wash tub, in the middle of the road is the result of a freak double exposure on one negative.

The picture was taken by Assistant Office Engineer C. E. Waite of the Division of Highways, on Route 144 between Route 58 near Tehachapi and the Women's Prison. The work he was inspecting consisted of resurfacing with a road mix of natural soil and fuel oil, and Mr. Waite placed the watch on the road to give a comparison of the size and texture of the oil mixed material.

The first exposure of the negative was taken looking straight down at the road from a height of six or eight feet. Neglecting to turn the film to the next exposure a picture was taken looking down the road a considerable distance with the astonishing result of showing a small watch assuming the proportions of clocks which are seen on large city buildings. The watch actually measured one inch and three-quarters across the face.

### Annual Meeting of Research Board

The Fifteenth Annual Meeting of the Highway Research Board of the National Research Council will be held in Washington, D. C., on December 5 and 6, 1935.



# Highway Bids and Awards

for September, 1935

**BUTTE, YOLO, COLUSA and EL DORADO COUNTIES**—Between Chico and Tehama County line, But. 3D, between Davis Wye and Woodland; Yol. 7A, between Maxwell and Delevan; Col. 7C, between Placerville and R. R. Crossing; E. D. 11D, between River-ton and Kyburz; E. D. 11G, between 2.5 miles east of Lake-Col. Co. line and about 5.5 miles east Col. 15D, about 27.1 miles to be treated with Class "A," "B" and "C" Seal coats. District III, Routes 3, 7, 15, 7, 11, Sections D, A, C, D, G. Lee J. Immel, Berkeley, \$14,548; A. Teichert & Son, Inc., Sacramento, \$16,756. Contract awarded to Hayward Building Materials Co., Hayward, \$13,870.45.

**INYO COUNTY**—In Inyo County, between Panamint Sink and County Line, about 54 miles in length to be road mix surface treated. District IX, Route 127, Sections G, M, N, P. Oilfields Trucking Company, Bakersfield, \$72,040; Basich Brothers, Torrance, \$66,525; J. C. Compton, McMinnville, Ore., \$64,355. Contract awarded to C. W. Wood, Stockton, \$62,200.

**INYO COUNTY**—Road oil approximately 17.8 miles between easterly boundary of Death Valley Monument and 0.5 mile south of Death Valley Junction. District IX, Route 127, Sections L, M. Morgan Bros., Huntington Park, \$5,775; Oilfields Trucking Co., Bakersfield, \$6,037; Gilmore Oil Co., Los Angeles, \$6,370. Contract awarded to Paulsen and March, Inc., Los Angeles, \$5,565.

**KERN COUNTY**—Between 2 miles southwest of Searles and Rademacher. About 5 miles to be graded. District IX, Route 145, Section A, B. John Jurkevich, Fresno, \$13,141. Contract awarded to Basich Bros., Torrance, \$6,950.

**KERN COUNTY**—Between Johannisburg and Route 23, about 30.5 miles, road-mix surface treatment to be applied. District IX, Route 145, Sections A, B, C. J. C. Compton, McMinnville, Ore., \$26,599; Basich Bros., Torrance, \$29,918; John Juckovich, Fresno, \$30,220; Oilfields Trucking Co., & Stewart & Nuss, Inc., Bakersfield, \$30,303; Clyde W. Wood, Stockton, \$30,615; Martin Bros. Trucking Co., Long Beach, \$34,551. Contract awarded to A. S. Vinnell Co., Los Angeles, \$26,010.50.

**LOS ANGELES COUNTY**—A portion of a timber bridge across Los Angeles River at Olive St., near Compton, consisting of eight 38-foot truss spans and approximately 90 feet of trestle to be reconstructed. District VII, Route 167, Section A. Robert D. Patterson, Santa Barbara, \$16,332; Parish Bros., Los Angeles, \$16,282; Lynch-Cannon Eng. Co., Los Angeles, \$16,510; D. A. Loomis, Glendale, \$15,172; R. R. Bishop, Long Beach, \$17,145; W. H. McCune, Monrovia, \$15,993; E. G. Perham, Los Angeles, \$15,555. Contract awarded to Oscar Oberg, Los Angeles, \$14,942.60.

**MARIN COUNTY**—Between Greenbrae and Alto, about 0.4 mile. Slides to be removed. District IV, Route 1, Section C, N. M. Ball Sons, Berkeley, \$15,750; Bay Shore Const. Co., Inc., San Francisco, \$16,000; A. G. Ralsch, San Francisco, \$16,375; Biasotti, Willard & Biasotti, Stockton, \$17,125; Granfield, Farrar & Carlin, San Francisco, \$17,250; James L. Conner, Monterey, \$20,375. Contract awarded to Healy Tibbits Const. Co., San Francisco, \$15,000.

**NEVADA, PLACER and BUTTE COUNTIES**—Between Nevada City and Washington Road, between Nevada, Placer County line east of Cisco and Soda Springs; between Oroville and Junction Routes 3 and 87 south of Chico, about 18.8 miles Class "A" and "B." Seal coats. District III, Routes 15, 27, 87, Sections C-F, B-B. Lee J. Immel, Berkeley, \$14,040; A. Teichert & Son, Inc., Sacramento, \$15,195. Contract awarded to Hayward Building Materials Co., Hayward, \$13,263.50.

**SACRAMENTO, PLACER, YUBA, SUTTER, BUTTE, YOLO, COLUSA, GLENN, EL DORADO and NEVADA COUNTIES**—Traffic stripe painting and spotting. District III. Various routes and sections. Raymond P. Paoli, San Francisco, \$2,611. Contract awarded to Edwin Anderson, San Francisco, \$2,509.50.

**SAN BERNARDINO COUNTY**—Big Pines Road, about six (6) miles in length to be treated with liquid asphalt. District VIII, Route 61, Section A. Paulsen & March, Inc., Los Angeles, \$1,406; Gilmore Oil Co.,

Los Angeles, \$1,403. Contract awarded to Morgan Bros., Huntington Park, \$1,203.50.

**SAN BERNARDINO COUNTY**—Between north boundary and Baker, 42.6 miles to be seal coated. Dist. VIII, Rt. 127, Secs. A, B, C, D. Geo. French, Jr., Stockton, \$72,345; C. W. Wood, Stockton, \$72,807; Geo. Herz & Co., San Bernardino, \$76,920; J. C. Compton, McMinnville, Ore., \$75,400; Oilfields Trucking Co. & Stewart & Nuss, Bakersfield, \$81,931; Oswald Bros., Los Angeles, \$83,572. Contract awarded to Basich Bros., Torrance, \$71,074.50.

**SAN BERNARDINO and KERN COUNTIES**—Between Johannisburg and Route 58, about 27.4 miles in length, road-mix surface treatment and seal coat to be applied. District VIII, Route 145, Sections D, E, A. Geo. Herz & Co., San Bernardino, \$42,882; A. S. Vinnell Co., Los Angeles, \$43,203; C. W. Wood, Stockton, \$43,272; Match Bros., Elsinore, \$43,690; J. A. Casson, Hayward, \$44,864; Oil Fields Trucking Co., & Stewart & Nuss, Inc., Bakersfield and Fresno, \$46,033; J. C. Compton, McMinnville, Ore., \$46,528; Oswald Bros., Los Angeles, \$49,245; C. F. Frederickson & Sons, Lower Lake, \$54,700. Contract awarded to Basich Bros., Torrance, \$39,581.75.

**SAN DIEGO COUNTY**—Various locations between 4 miles east of Bostonia and 2 miles east of Alpine about 2.4 miles. Place plant mix surf. const. shldr. and apply road mix surf. trmt. District XI, Route 12, Sections C and D. Daley Corp., San Diego, \$25,311; V. R. Dennis Const. Co., San Diego, \$25,035. Contract awarded to R. E. Hazard & Sons, San Diego, \$24,384.25.

**SAN JOAQUIN COUNTY**—At Fresno Ave., grade separation, City of Stockton, 200 feet of A. C. Paving & P. C. C. Curbs. District X, Route Feeder. Lord & Bishop, Sacramento, \$2,504. Contract awarded to Heafy Moore Co., Oakland, \$2,050.00.

**SAN LUIS OBISPO COUNTY**—In San Luis Obispo Co., between Estrella River and easterly boundary, about 21.2 miles in length. Seal coat to be applied. District V, Route 33, Sections B, C. L. A. Brisco, Arroyo Grande, \$16,187; Walter B. Roselip, San Luis Obispo, \$16,610. Contract awarded to E. L. Yeager, San Bernardino, \$15,416.80.

**SHASTA and LASSEN COUNTIES**—Between Fall River Mills and Nubelber, about 19.7 miles, a light armor coat to be applied. District II, Route 28, Sections E, A. Contract awarded to Dunn & Baker, Klamath Falls, Ore., \$43,211.

**SONOMA COUNTY**—Furnishing and applying seal coating between Cloverdale and north boundary, 3.2 miles. Dist. IV, Rt. 1, Sec. D. Lee J. Immel, Berkeley, \$3,300; E. A. Forde, San Anselmo, \$3,232. Contract awarded to Palo Alto Road Materials Co., Palo Alto, \$3,112.50.

**SONOMA COUNTY**—Between easterly boundary and 9 miles westerly, seal coat to be applied about 9 miles. District IV, Route 8, Sections A, B. Lee J. Immel, Berkeley, \$5,735; Ransome Co., Emeryville, \$5,605; Palo Alto Road Materials Co., Ltd., Palo Alto, \$5,837; Helwig Construction Co., Sebastopol, \$6,827; A. Teichert & Son, Inc., Sacramento, \$6,865. Contract awarded to E. A. Forde, San Anselmo, \$5,485.

**SONOMA COUNTY**—Reinforced concrete girder bridge across Sonoma Creek, about 7 miles north of Sonoma; consists of three 52-foot spans on concrete piers and abutments. District IV, Section Son. Sonoma State Home. Albert H. Seimer, Frank J. Main, San Anselmo, \$16,310; N. M. Ball Sons, Berkeley, \$13,961; Renati Bros., Novato, \$14,728; M. B. McGoey, Inc., San Francisco, \$16,810; F. C. Armorsos & Sons, San Francisco, \$15,640; Lindgren & Swinerton, Inc., San Francisco, \$18,191; A. G. Ralsch, San Francisco, \$18,872; E. S. and N. S. Johnson, Pasadena, \$13,890; Harry J. Oser, San Francisco, \$16,691; A. T. Howe, Santa Rosa, \$14,375; McHugh and Heilman, San Francisco, \$15,516. Contract awarded to John Carcano, San Rafael, \$13,777.

**TEHAMA COUNTY**—Between Route 3 and 1½ miles east of Dales, 13.4 miles seal coating. Dist. II, Rt. 29, Sec. A. Hemstreet & Bell, Marysville, \$5,327; Tiffany Const. Co., San Jose, \$6,985. Contract awarded to A. Teichert & Son, Sacramento, \$5,708.25.

## Many State Highway Improvements Noted in Southern Counties

**M**OTORING has been made easier and safer through many recent improvements on State highways in Southern California, says the Automobile Club of Southern California, which itemizes the following:

Completion of the 11.3-mile State Street project between Redondo Beach and Long Beach to form a final link in a continuous, modern highway along the Southland coast.

Completion of nearly two miles of widening and reconstruction work on the State highway in Laguna Beach between Cypress Street and the south city limits, last unimproved section of the coast route from Long Beach to its junction with the original State route to San Diego at Doheny Park.

### DANGEROUS SLIDE ELIMINATED

Elimination of the steep and dangerous five-mile stretch of road passing Sulphur Slide in Santa Ana Canyon, Orange County, by construction of a 3.44-mile cut-off recently opened, extending from four-tenths of a mile east of Peralta School to Gypsum Creek.

Elimination of dangerous "Dead Man's Curve," scene of many accidents on the narrow old Ridge Route, through relocation and improvement of 5.2 miles of the highway between Fort Tejon and Grapevine Station. Five miles more of the Grapevine Canyon section of the improvement remain to be built extending between Fort Tejon and the Los Angeles County line.

Blasting of 25,000 cubic yards of ledge rock into Partington Canyon at a point 38 miles south of Carmel on the new scenic Carmel-San Simeon link of the Roosevelt Highway now under construction, which will form a rockfill roadway embankment.

Increase in number of automobile drivers in California apparently is on a par with the five-year record gain in automobile registration, Ray Ingels, Director of Department of Motor Vehicles, has informed Governor Frank F. Merriam. Recent figures showed more than 2,000,000 paid automobile registrations.

At the present time there are 9,251,000 miles of highways in the world, it is reported, with an average of 3.8 automobiles to each mile of road.

## 2,000,000 MILES OF HIGHWAYS IN U. S. STILL IN "MUD" CLASS

Figures obtained from the most reliable sources show that 42 per cent of the American farms are located on mud roads—the name applied to unimproved roads.

Of the total 3,040,000 miles of highways in the United States, only 920,000 miles have been improved, and of this only 160,000 miles have been improved with high type surfacing.

Thus, we see that more than 2,000,000 miles of highways remain untouched so far as systematic improvement goes, and a large part of this mileage receives no attention other than make-shift, community work—the kind of hand-shovel and hand-scrape work that was being done by the Pilgrim settlers in Massachusetts 300 years ago.

The drivers of 60,000 school buses that carry 2,000,000 pupils to rural schools, fully realize the need of road improvement. Farmers and others who use these roads also know the urgent necessity of "getting out of the mud."—*American Road Builder.*

## Old Timers' Honor Passes to M. E. Tozer

When the first seven division engineers of the first California Highway Commission reported for duty on January 2, 1912, and began hiring employees they gave each man appointed a card certifying to his appointment and stating his rank in the service.

In the July issue of this magazine was published a facsimile of the employment card given by the Highway Commission on August 26, 1912, to E. M. Cameron, then a transitman and now District 1 Construction Engineer, and the editor asked if any old timer in the service had a card that antedated the one possessed by Mr. Cameron.

The question was answered by M. E. Tozer, 702 West 8th Street, Santa Ana, assistant bridge construction engineer of the Division of Highways in District No. 7.

Mr. Tozer read about Mr. Cameron's card, looked through a collection of old keepsakes and found the employment card issued to him as a draftsman in Division 5 by the Highway Commission on June 24, 1912.

"My card," writes Mr. Tozer, answering the editor's query, "predates Mr. Cameron's by two months."

Registration number plate contract for 1936 indicates California expects to tag more than 1,980,000 pleasure motor vehicles in the coming year.

# STATE OF CALIFORNIA

## Department of Public Works

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

FRANK F. MERRIAM-----Governor  
 EARL LEE KELLY-----Director  
 JUSTUS F. CRAEMER-----Assistant Director  
 EDWARD J. NERON-----Deputy Director

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 TIMOTHY A. REARDON, San Francisco  
 PHILIP A. STANTON, Anaheim  
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 RAY INGELS, Ukiah  
 C. H. PURCELL, State Highway Engineer, Sacramento  
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 J. G. STANLEY, Principal Assistant Engineer  
 R. H. WILSON, Office Engineer  
 T. E. STANTON, Materials and Research Engineer  
 FRED J. GRUMM, Engineer of Surveys and Plans  
 C. S. POPE, Construction Engineer  
 T. H. DENNIS, Maintenance Engineer  
 F. W. PANHORST (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  
 J. H. SKEGGS, District IV, San Francisco  
 L. H. GIBSON, District V, San Luis Obispo  
 R. M. GILLIS, District VI, Fresno  
 S. V. CORTELYOU, District VII, Los Angeles  
 E. Q. SULLIVAN, District VIII, San Bernardino  
 S. W. LOWDEN (Acting), District IX, Bishop  
 R. E. PIERCE, District X, Stockton  
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 General Headquarters, Public Works Building,  
 Eleventh and P Streets, Sacramento, California

### DIVISION OF WATER RESOURCES

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 J. J. HALEY, Jr., Administrative Assistant  
 HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water Resources Investigation  
 R. L. JONES, Deputy in Charge Flood Control and Reclamation  
 GEORGE W. HAWLEY, Deputy in Charge Dams  
 SPENCER BURROUGHS, Attorney  
 EVERETT N. BRYAN, Hydraulic Engineer, Water Rights  
 A. N. BURCH, Irrigation Investigations  
 H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor  
 GORDON ZANDER, Adjudication, Water Distribution

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 P. T. POAGE, Assistant Chief  
 W. K. DANIELS, Administrative Assistant

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



### DIVISION OF CONTRACTS AND RIGHTS OF WAY

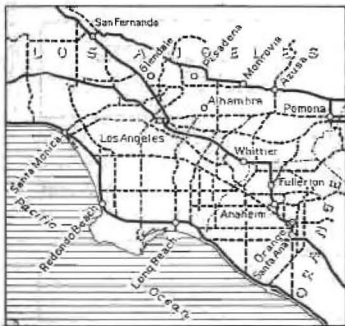
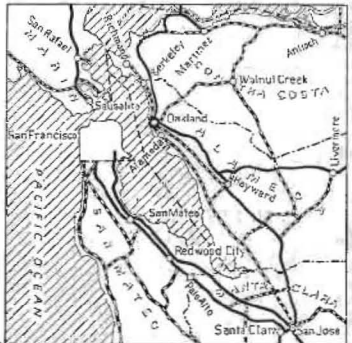
C. C. CARLETON, Chief  
 CLARENCE W. MORRIS, Attorney, San Francisco  
 FRANK B. DURKEE, General Right of Way Agent  
 C. R. MONTGOMERY, General Right of Way Agent  
 ROBERT E. REED, General Right of Way Agent

### DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

# MAP SHOWING STATE HIGHWAY SYSTEM

**LEGEND**  
 Primary Roads   
 Secondary Roads 



LOS ANGELES AND VICINITY



See Detail Map

See Detail Map