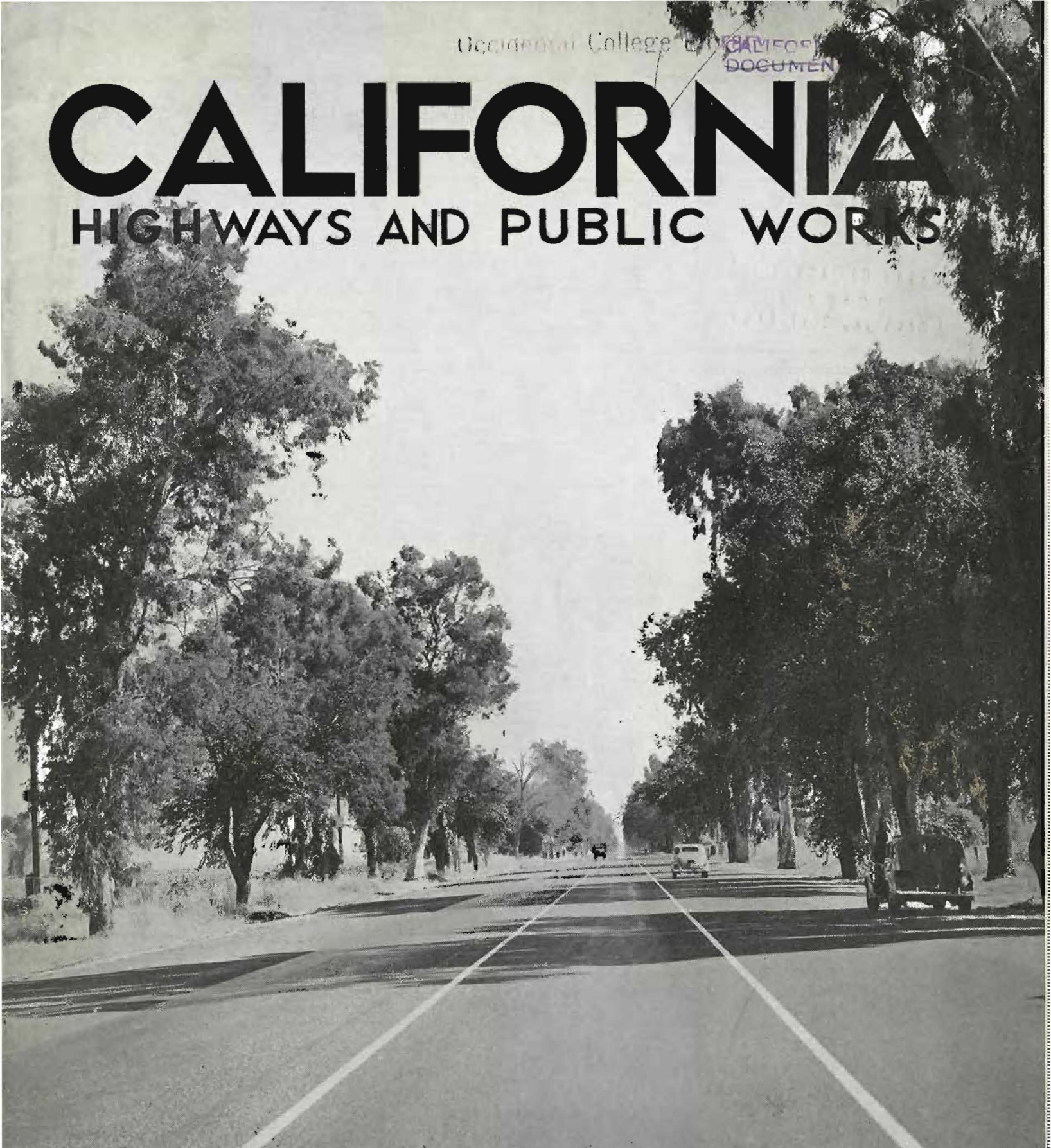
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Sylvan Stretch of New State Highway in Kern County

Official Journal of the Department of Public Works

SEPTEMBER · 1937

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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

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Safer Highways

By C. H. PURCELL, State Highway Engineer

SAFETY on our highways is the great concern of many individuals and organizations.

The road building agencies throughout the country have a large responsibility in the construction and maintenance of the highways and can contribute materially in the achievement of this desirable goal.

The United States Bureau of Public Roads, the American Association of State Highway Officials, through its committee on design and its special committee on design policy, are studying and promoting safety design and construction of our highways, to improve the standard and thus reduce the hazard to motor traffic.

PROBLEM MORE SERIOUS

The problem has become more serious because in recent years manufacturers have increased the normal speed of the vehicle, both trucks and touring cars. There has been a decided increase in the use of large busses and of trucks and trailers operating at high speed. This means increased hazards for both approaching and passing vehicles.

The present ten-foot width of lane provides insufficient clearance for this increased volume of vehicles, both large and small operating at greater speed. The timid driver hesitates to pass trucks with trailers and the wide busses on the ten-foot lane and this has a tendency to pile up cars behind him and to require a longer time limit for passing.

TEN-FOOT LANE INADEQUATE

When the faster moving vehicle overtakes the slower one, which is usually the wide type, such as truck or bus, vision is obscured and the resulting effect is that when the faster car does attempt to pass it swings out widely both for vision and clearance and usually passes beyond the edge of the pavement onto the shoulder.

The record of traffic accidents in California shows that the percentage of overtaking accidents or sideswiping, is in excess of the approaching type of accident. Evidently more clearance is needed. Experience and observation both confirm the conclusion that a ten-foot traffic lane is no longer adequate for modern high-speed traffic.

The California Division of Highways has adopted a new standard of construction for state highways which provides for an increased width of lane. The present ten-foot lane is to be widened to a basic eleven-foot width, making the two-lane roadway 22 feet wide instead of the previous 20 feet.

C. H. PURCELL

NEW WIDTH DESIGN

A standard of 11-foot width of lane for three-lane highways has also been adopted and these will be designed to provide for future expansion into four-lane divided highways with minimum loss of investment. The multiple lane highway of four lanes or more will be a divided highway providing for two roadways in each direction with a dividing or separating strip between them. The standard of construction adopted for these roads is a 12-foot width of lane for the inside lane adjacent to the dividing strip and an 11-foot width for the outside lane. The inside lane of 12-foot width will provide more freedom for the car traveling in this lane while passing and greater freedom and mobility in case of crowding. The outside lane does not require this additional width since it has a shoulder still available to maneuver upon in case of necessity.

PLAN FOR FUTURE

Only a relatively small percentage of our highways will be of the divided type. The majority of our roads will always continue to be two-lane roads since that width will accommodate the traffic requirements based on the volume and character of traffic using them. Our planning of the narrower roads now constructed must consider the ultimate development or we will be forced to waste some parts of the pavement.

To conform to this additional width of pavement on the roadway we are also increasing the width between curbs of structures such as bridges and grade separations. The additional width provided is two feet beyond the edge of the pavement lanes.

In other words a bridge on a two-lane highway having a 22-foot width of pavement will be 26 feet wide between curbs and the clearance on a structure on a divided roadway will be 27 feet between curbs for each roadway.

DEVELOPING DESIGNS

Designs have been and are being developed for this widened pavement and also for the divided type of roadway, both for new construction and

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Drilling Costs Cut by New Rig for Foundation Investigations

By O. J. PORTER, Associate Physical Testing Engineer,
Materials and Research Department

THE Equipment Department has constructed a combination foundation drilling rig from plans prepared by engineers of the Materials and Research Department, Division of Highways.

The equipment described herein was designed and built after a number of years boring experience with inadequate well drilling rigs, and construction of the outfit was resorted to only after a thorough investigation indicated that a suitable outfit was not manufactured commercially.

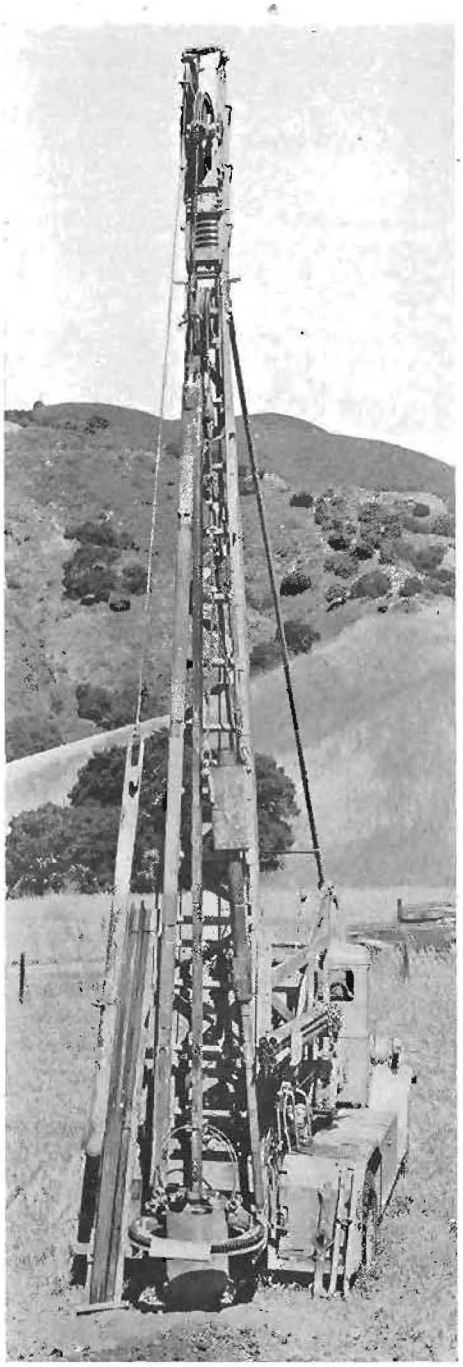
Commercial machines are usually built for only one type of drilling and the tools designed for opening a hole to water or oil bearing strata. Foundation explorations, on the other hand, must determine not only the type of material, but also its condition, in place. Special equipment and tools are, therefore, required to procure undisturbed cores for determination of moisture content, density, compressibility, and shear strength.

POWERFUL DRILL

The combination foundation exploration rig described herein was designed for churn drilling, rotary boring, and for operating the improved type soil sampler, described in "California Highways and Public Works," July, 1936.

The churn drill with a spudding beam actuates a 500-pound hammer to drive the sampler outfit and also breaks through large boulders and solid rock with regular well drilling tools. A 1500-pound string of tools with a 6-inch bit is included as regular equipment. With proper bits, eight to twelve inch holes can be opened through rock to a depth of 400 feet.

A thirty-inch rotary table is mounted on the back of the drill frame for driving a 24-inch auger bucket. Holes up to 48 inches in size may be dug with the same tool by attaching a reamer to the top of the bucket. Large diameter holes are often desired in earth and soft bedded shale formations to determine ground water conditions and the dip and nature of the strata. Undisturbed samples of large dimensions can also be obtained from any of the ground explored with such borings.



Porter rig with tools in place ready for operation

MOBILE EQUIPMENT

The rotary table is designed to operate at any speed between 5 and 50 r.p.m. and can also be used for driving Calyx type rock coring bits up to 30 inches in size. It is not contemplated that this type of drilling will normally be required and large rock core bits are not, at present, included with the tools for the outfit. The complete rotary mechanism is demountable and, when desired, can be removed from the main rig frame in thirty minutes.

DESCRIPTION OF DRILL

All drill units are mounted in a welded box-type steel frame constructed from heavy channels. This frame is attached to the truck chassis with six heavy "U" bolt clamps, but the outfit can be quickly detached and moved onto a barge for drilling over water or skidded to difficult boring locations on steep hillsides. The equipment can also be readily rigged for driving light piles in marsh lands or river-beds whenever a temporary trestle or working platform is required to reach such inaccessible locations.

INDEPENDENT POWER UNIT

The power unit is independent of the truck and consists of a Ford V-8 motor with a five-speed truck transmission mounted in a K. R. Wilson industrial conversion unit. This provides ample power and flexibility with the gear ratios to meet all operating requirements for the various types of drill tools. A heavy

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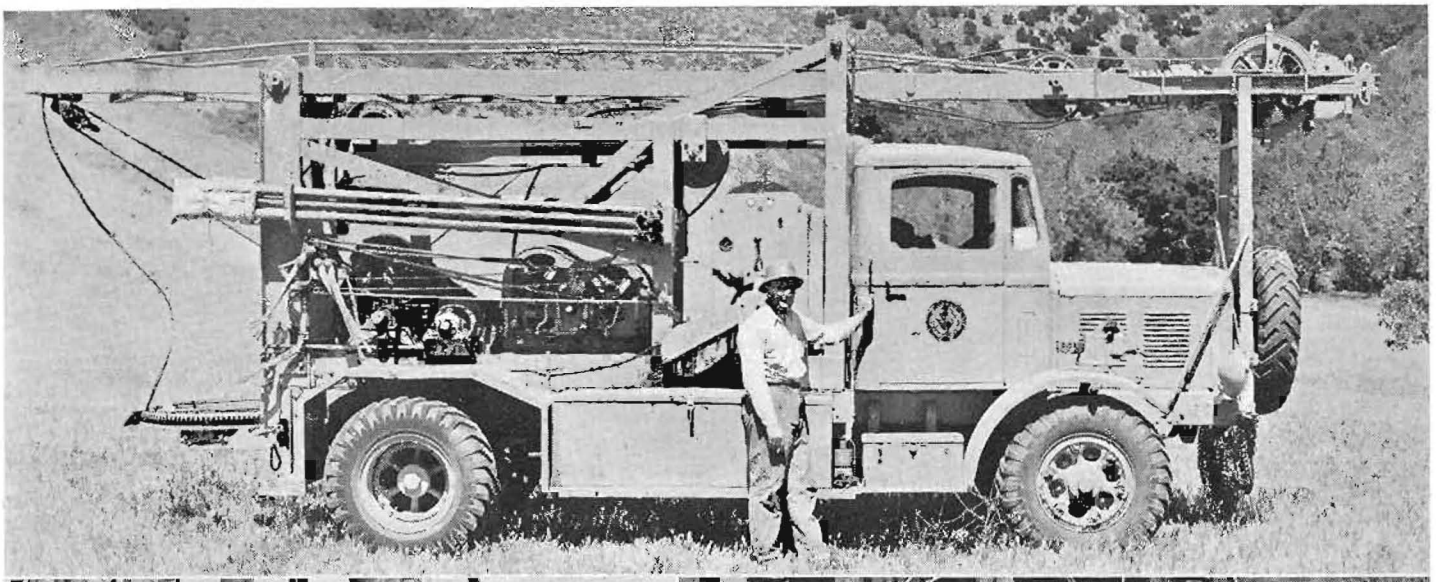
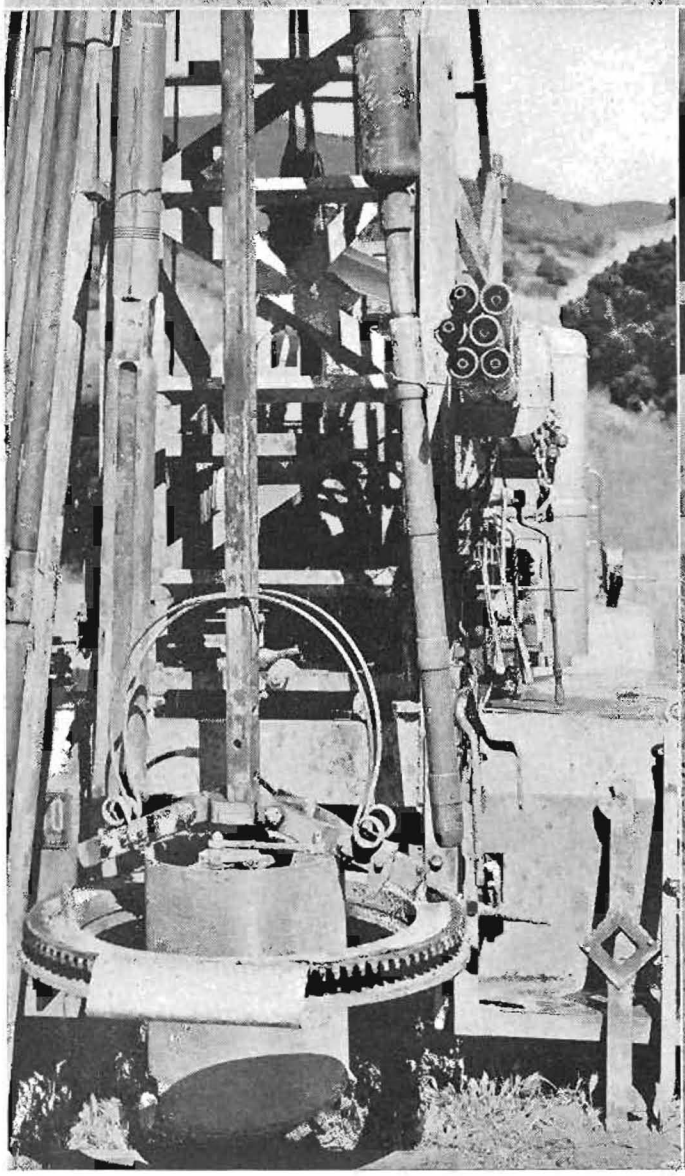




Upper—Combination foundation drilling equipment dismantled and ready for road. Lower left—Closeup view of rig showing sand bailer, extension rod for soil sampler, churn bit, rotary bucket with Kelly bar and driving yolk, and the sampler assembly. Lower right—Foundation Inspector sitting in top of 30-foot boring following inspection of the ground to bottom of an 80-foot hole.

Another Unit of Tahoe-Ukiah Lateral Completed By State

By SCOTT H. LATHROP, Assistant Engineer

WITH the completion of construction between the Parks Bar Bridge and the Yuba-Nevada County line, another section of the Tahoe-Ukiah lateral has been brought up to present day standards of grade and alignment, enabling it to serve traffic more adequately.

This increasingly popular road extends from the Redwood Highway near Ukiah to U. S. Route 40 near Emigrant Gap. Providing as it does the most direct route between the Redwood Empire and the Lake Tahoe region, the traffic on this road is steadily increasing. In addition to the two recreational areas mentioned above, this road passes through the Clear Lake resort area in Lake County.

From Marysville to its connection with U. S. Route 40 the Tahoe-Ukiah road passes through country which is rich in historical interest, bringing to memory the "Days of '49" when "Gold!" was the magic word which brought men flocking by the thousands to the mountains of California.

EARLY MINING CAMPS

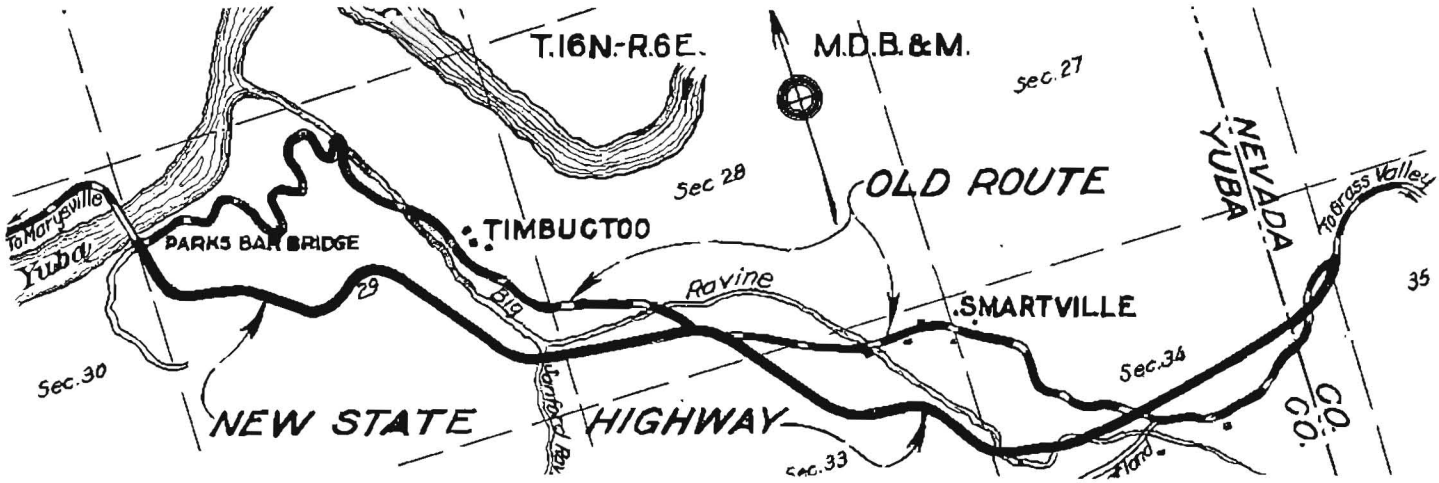
Marysville, Timbuctoo, Smartville, Rough and Ready, Grass Valley, and Nevada City are all names familiar to those interested in early California history. The gold-producing days are not all in the past either for, since the price of gold was raised, many of the old mines in this region have been reopened and gold production has increased materially. All along the Yuba River, from Parks Bar Bridge upstream, are "gold-snippers" busily panning and cradling the gravel from the river bottom for the gold which the river still brings down.

The forty-niners didn't spend much time worrying about roads and, as a result, the pack trails which later became wagon roads followed the lines of least resistance and were very likely to be replete with tortuous curves.

The section of the road between Marysville and Grass Valley, which was taken over by the State for maintenance in 1926, was developed from the old wagon road with sections where no standards of grade or alignment were observed. As a result, in many places dangerous curves and steep grades have presented constant hazards to traffic. Considerable relief has been afforded by the widening of curves and similar maintenance work, but ultimately new construction or reconstruction over the major part of the distance will be required. This is being done by stages as funds become available.

PROJECT COST $170,000

Construction of the project just completed, costing approximately $170,000, was made possible by its inclusion in the U. S. Public Works Highway Program. The newly completed unit is about 3.7 miles in length and extends from the bridge across the Yuba River at Parks Bar, which is approximately sixteen miles from Marysville, to one-quarter of a mile east of the Yuba-Nevada County line.



At this point it connects with a section of the road which was brought up to standard width, grade, and alignment in 1932.

The recently completed construction consisted of grading the roadbed, placing crusher run base, and applying a seal coat over the full width of the crusher run base. In addition to providing customary drainage facilities to care for an average annual rainfall of about 35 inches, it was necessary to provide several special structures for crossings of irrigation and mining ditches belonging to the Nevada Irrigation District.

GOLD DIGGINGS UTILIZED

Rock for the crusher run base course was crushed locally by the contractor, being secured from a hydraulic spoil bank near the center of the project. It is interesting to note

that material which was cast aside by men in the frantic search for gold is now being utilized to construct a road over which people will travel in search of intangible scenic riches.

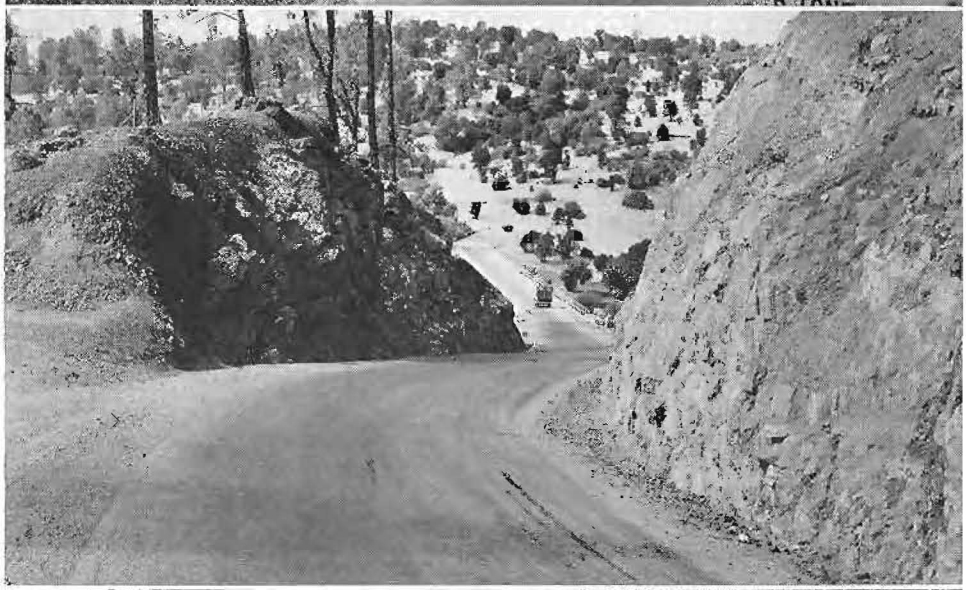
The alignment on the new construction complies with present day standards for mountain roads. The improvement in alignment over the old road is very noticeable when it is remembered that many of the old curves had radii as short as 50 feet. In addition to being very sharp, many of these curves were "blind," presenting a very definite menace to traffic. Among the worst curves to be eliminated was the right angle turn at the east approach to the Parks Bar Bridge.

MAXIMUM GRADE 7 PER CENT

The maximum grade on the new project is 7%, the total rise being approximately 700 feet in a distance of about 3.7 miles. The rise in elevation is constant throughout the project, adverse grade being required at only two locations. This is in contrast to the old grade line which contained several pieces of adverse grade of various lengths and several grades of considerably more than 7%, the steepest being one of about 15%.

The length of the improvement is 3.71 miles with a saving in distance of 0.6 of a mile over the old route.

Since the road was opened to public traffic in June many favorable comments have been received, from which it may be concluded that it is adequately serving the traffic which travels this route.



Construction of realigned highway between Parks Bar Bridge and point one-fourth mile east of Nevada County line eliminated such poor alignment as shown in upper photograph. Center—Showing how new highway approaches bridge with safe sight distance and curve. Lower—Section of newly completed highway.

Future State Highways Will Be Made Wider

(Continued from page 1)

for the adaptation of existing pavement to the ultimate design of divided roadway. In these designs provision is made for the full use of existing roadway and pavement and for the progressive development to a greater capacity leading toward the ultimate section, with a minimum loss or waste of what already has been installed.

The designs include three-lane roads using the new standard width of lane. These three-lane roads are being built to make them easily adaptable to future expansion into the divided type. This design consists of building two lanes of permanent pavement separated by an intervening lane of lighter type construction. The middle lane can then be converted into a dividing strip without appreciable loss and will serve in the meantime as a traffic lane for passing until traffic volume requires the increased capacity. This type of construction, characterized by the contrasting color of the separate lane, has a decided controlling effect on the operation of vehicles since it definitely demarks the separate lanes in which they are to travel.

MINIMUM WIDTH FOR STRIPS

A minimum width of four feet has been adopted for the separation strips on the divided roadway. This width is the least which can provide adequate clearance and safety against hazard for vehicles traveling in opposite direction. It will be applied on many of our multiple lane roads since it conserves space and can be installed in adapting existing pavement to the divided type with less loss of existing pavement. In many cases, too, it will not require additional width of right of way, which would be expensive especially where considerable improvement of adjacent property has occurred.

This minimum width of separation strip requires some positive means of

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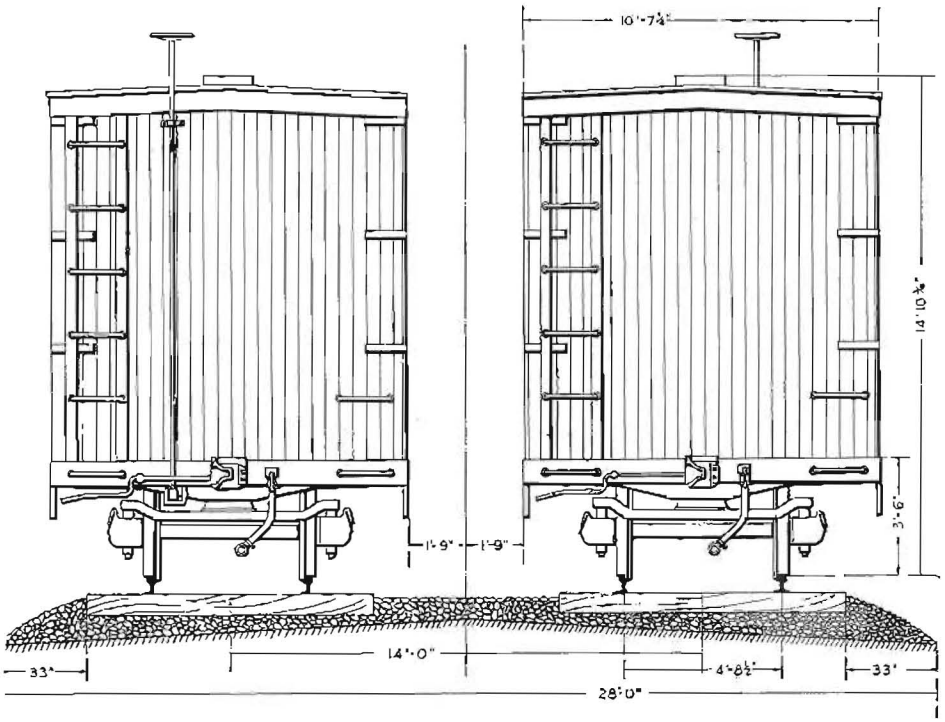


This sketch of two standard freight cars shows a clearance between cars of 3 feet, 6 inches. Even though these cars are on immovable tracks, railroads consider this clearance a necessary safety precaution.

New Foothill Boulevard Will Be Four Lanes

By E. Q. SULLIVAN
District Engineer

WORK has started on widening the Foothill Boulevard between Claremont and San Bernardino. A contract was awarded on July 9, 1937, in the amount of $369,453.10 to the United Concrete Pipe Corporation.

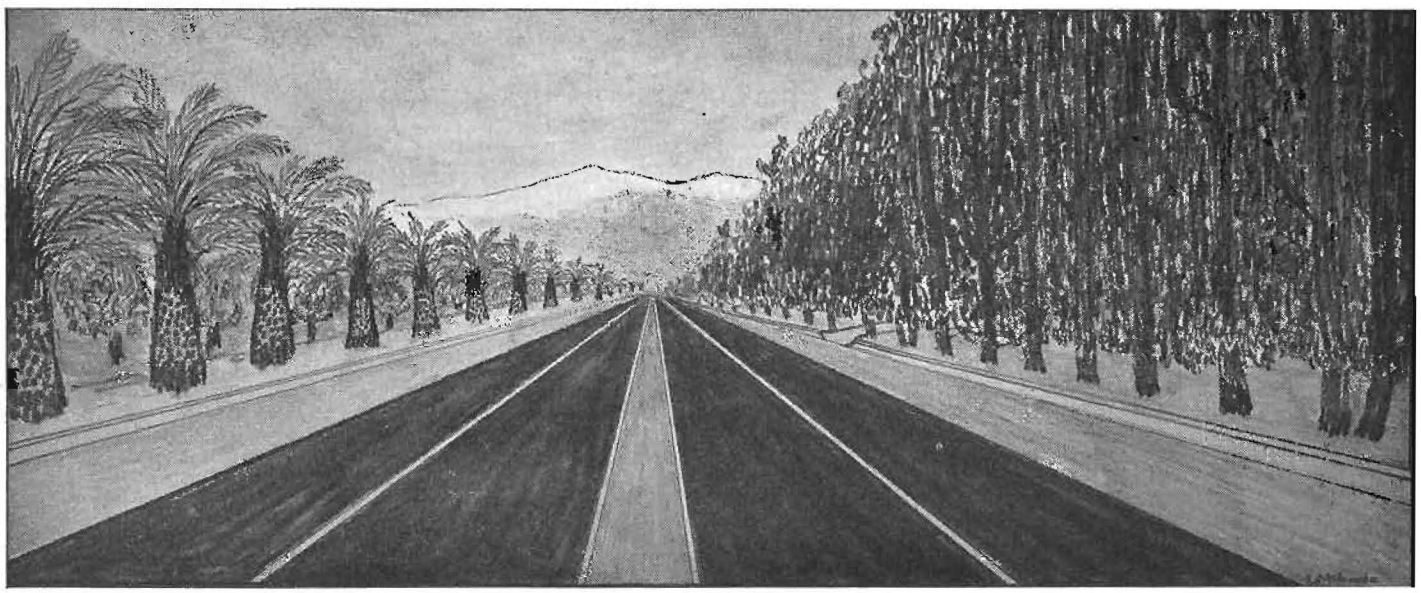
The specifications provide that traffic shall not be interrupted during the progress of the work, and the contractor is planning his operations to conform to this requirement.

Seven years ago, the original two-lane highway was widened to three lanes and it has served well until the present time. The greatly increased traffic and the high speed of modern automobiles has now made mandatory widening to four lanes. Conforming to modern practice, a center dividing space will be constructed to provide greater safety to motorists.

The Foothill Boulevard is known throughout the entire United States. Seven years ago, at the time of the widening to three lanes, articles appeared in many National magazines, with illustrations showing the rows of palms, orange trees and eucalyptus trees.

There are miles of eucalyptus trees that exceed 100 feet in height and some reach a height of 200 feet. Eucalyptus trees, palm trees, and orange trees border the highway for almost the entire length of the boulevard.

For more than sixty miles, the Foothill Boulevard follows along the base of the San Gabriel Mountains, including Mt. Lowe, Mt. Wilson, Mt. San Antonio, Mt. Cucamonga. These towering, rugged peaks rise abruptly from the valley floor to the north of the highway. For the last thirty miles, the Foothill Boulevard points directly east at Mt. San Bernardino. In driving easterly, Mt. San Bernardino is framed between the orange trees, palm trees and eucalyptus trees; and together with the San Gabriel Mountains, it is covered with snow from December until June, providing an excellent tourist attraction.



Upper—Foothill Boulevard west of Sierra Way. Palm trees on the left will be moved back and eucalyptus trees on right will remain undisturbed. This stretch will be widened and repaved. Lower—Artist's conception of how this section of boulevard will look after improvement.

Drivers Increasing

More than 23,000 original operators' licenses were issued in July, to applicants in California, Paul Mason, Chief of the Division of Drivers' Licenses, has reported to Governor Merriam.

"This number," Mason said, "represents twenty-nine per cent of all applications issued by the division for the month and apparently indicates that the number of persons learning to drive and the number of nonresidents entering California are steadily increasing."

Angeles Crest Highway Opens Vast Recreational Territory

By S. V. CORTELYOU, District Engineer

COMPLETION of the Crow Brothers contract for the United States Bureau of Public Roads this month, and completion simultaneously of that section constructed by the Division of Highways with prison labor, will mark the opening of vast areas of the 645,000 acres comprising the Angeles National Forest, making them easily accessible to the motoring public for the first time.

Heretofore, the only roads of a public nature to this potential recreational area, were Forest Service truck trails, twelve feet wide, constructed for fire protection measures. Approach to the mountain areas by the public on these trails could be made only from the Mojave Desert side.

Construction of mountain highways is greatly appreciated by the public for the scenic, inspirational and recreational assets, as indicated by the increase in the volume of mountain-bound traffic during the last ten years.

YEAR AHEAD OF SCHEDULE

Opening of the newly completed stretches of the Angeles Crest Highway at this time, approximately a year ahead of schedule, has been made possible through the close cooperation of the United States Bureau of Public Roads and the Division of Highways. The United States Forest Service has future plans for the development of camping facilities that will afford the residents of Southern California a vast new mountain recreational area.

From Red Box, the present terminus of the Angeles Crest Highway, so named because in past years a large red box there housed fire-fighting materials for forest rangers, the new highway proceeds north and northeasterly for a distance of 9.3 miles to Charlton Flat, reaching an elevation of 5200 feet. Red Box is also the junction point of the new high gear road bearing off southeasterly to the Mount Wilson observatory of the Carnegie Institute, famous throughout the world.

NATURAL FOREST LANDS

Charlton Flat is an area of natural forest park lands some 600 acres in extent, for which the United States Forest Service has plans to begin work within the next year on the development of the area into one of the largest and finest camp and picnic grounds in the Angeles National Forest. There are large pine trees located throughout this level terrain, grassy meadows, and several excellent springs which will be developed to provide an abundance of water.

The Angeles Crest Highway sections to be opened to the public, from Red Box through Charlton Flats, and extending in a general northeasterly direction to Chilao, where they will dead-end at the Newcomb Ranch, were surveyed and the location made by the United States Bureau of Public Roads in 1934-35. The standards of construction on the newly finished sections are the same as those of the high gear Angeles Crest Highway between La Canada and Red Box.

SPIRAL CURVES USED

An engineering feature of the new construction is the use of spiral curves instead of simple curves. All sections of the highway are graded to a uniform roadway width of 30 feet. Maximum grade is held at 6 per cent, compensated for curvature. Cut slopes are 3/4:1, excepting in the heavier rock sections where slopes are steepened to 1/2:1.

That portion of the highway 2.92 miles in length, completed by the Division of Highways with prison labor, involves the heaviest grading of the newly completed sections of Angeles Crest Highway. Cuts measured on center line run as deep as 140 feet, and in one side hill cut the distance from roadway to top of cut is 240 feet. The total yardage moved in construction of the 2.92 miles was 1,002,000 cubic yards, the work being completed at a total cost of $450,000 or an average of $154,000 per mile. Approximately 90 per cent of the excavated material was rock, requiring heavy shooting.

EMBANKMENTS EXTRA WIDE

Embankments were constructed by the end dump method and built out to extra width. As the natural repose of the embankment material is approximately 1.3 to 1, the fill slopes were flattened out to secure added stability to a 1½ to 1 slope by employing a double drum hoist operated along the roadway shoulder section connected with a "dead man" at the toe of fill operating a ½ cubic yard scraper bucket. Rapid progress was made with this method resulting in a fill slope uniform in appearance, with all loose rocks moved, and affording an excellent surface for the erosion control to be applied.

Erosion control treatment has been carried on throughout the entire project and on this job it consists of longitudinal wattling of stakes and brush to mechanically anchor the fill surface. This surface, so treated, is then planted with cereal grains, followed by a covering of bedding straw, the latter serving as protection for the seeds against washing out by the winter rains.

EROSION CONTROL

This erosion control method has been developed during the past several years by the California Forest & Ranger Experimental Station, conducted by the United States Bureau of Public Roads, and has proven most successful under a variety of conditions.

Construction work has been carried out progressively since completion in 134 of the Angeles Crest Highway as far as Red Box. The Thompson Construction Company, Guy F. Atkinson, and Crow Bros., have each under-

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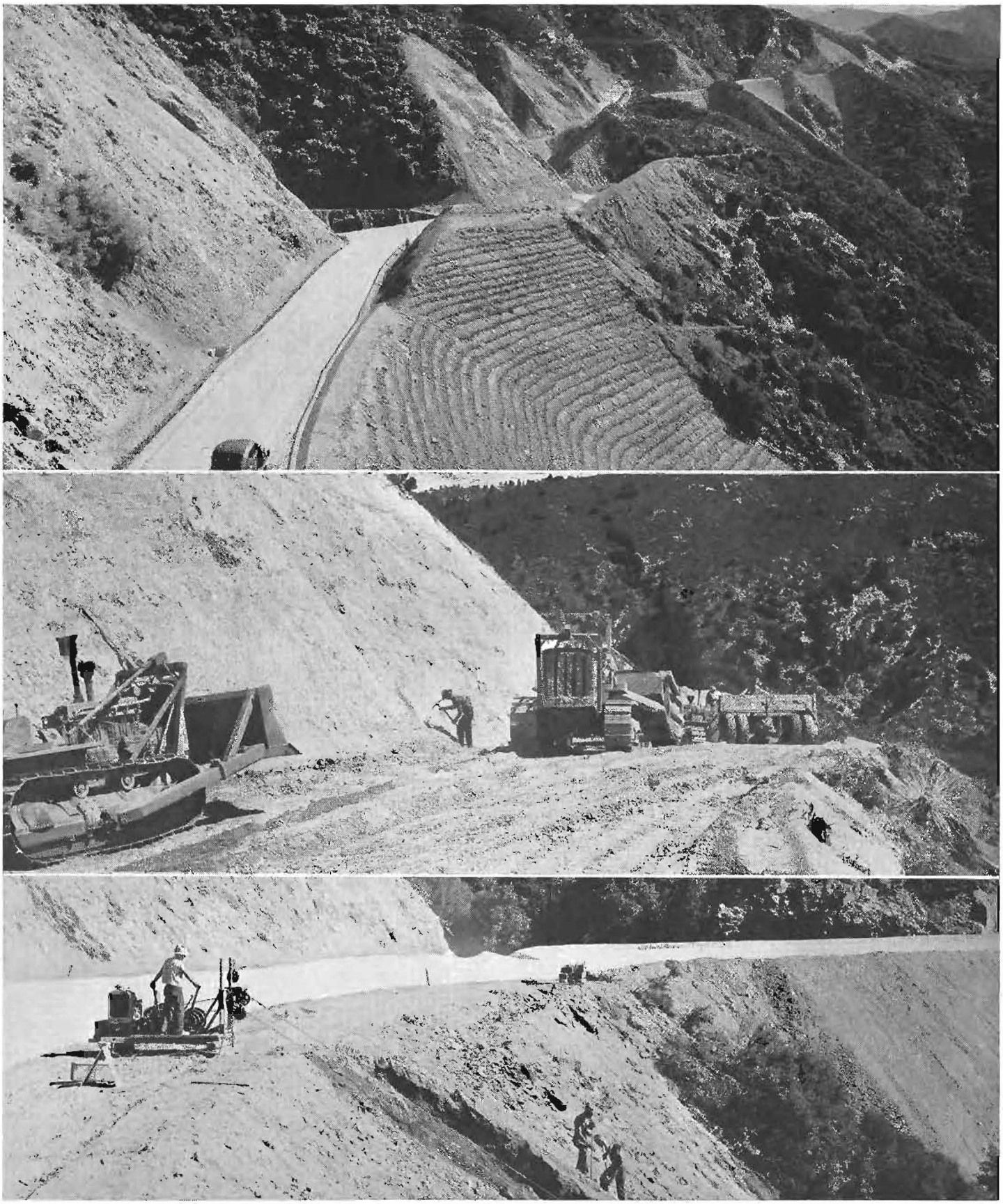

Scenes on Angeles Crest Highway. Upper—Section of new highway showing erosion control treatment applied to fill slopes. Center—Typical grading operations on highway near Chilao, ten miles northeast of Red Box. Lower—Illustrating method of flattening fill slopes prior to applying erosion control treatment.

State Highway Commission Observes 25th Anniversary

By T. E. STANTON, Materials and Research Engineer

SITTING for the first time in its spacious board room in the new Public Works Building in Sacramento on July 2, the California Highway Commission celebrated the twenty-fifth anniversary of its existence as a State agency.

The year 1937 marks the twenty-fifth anniversary of active construction and development of the California State highway system. It was early in 1912 that the first California Highway Commission, composed of Burton A. Towne, Chairman, N. D. Darlington and the late Charles D. Blaney, acting under authority of the First Highway Bond Act of 1909 set up the organization and began the active work of surveys preparatory to construction on the State system as provided under the bond act.

Highway development has made rapid advances during the quarter century and the evolution of road construction practice for motor transportation to modern high standards presents a most interesting story. Of equal interest is the growth of public interest and concern for highway matters to the present universal realization that adequate road facilities are of utmost personal importance.

FIRST HIGHWAY STEP IN 1895

First definite action toward a State highway system in California was taken in 1895 when, by act of the legislature, the State Bureau of Highways was created to acquire and construct State roads. Under authority of this legislative action the Governor appointed R. C. Irvine of Sacramento, Marsden Manson of San Francisco, and J. L. Maude of Riverside to serve as members of the Bureau.

With a buckboard and team Irvine and Maude drove over 7000 miles into every county of the State, traveling along the coast, through valleys, mountains, and desert. As a result of this reconnaissance a report and map of a proposed and recommended State highway system was submitted to the Governor on November 25, 1896.

It is of interest to note that the system then proposed was in its main features the foundation of the State highway system as it exists today.

FIRM FOUNDATION

The 1897 legislature dissolved the Bureau of Highways and created a Department of Highways to which Marsden Manson, J. R. Price, and W. L. Ashe were appointed to serve as commissioners for a period of two years. The members of this new department bent their efforts in exhaustive studies of road construction practices and economics.

Mr. Manson made a tour of Europe to observe construction methods followed in England, France, Germany, Russia and other countries. Their findings on drainage, roadbed and pavement construction were based on fundamental engineering principles so that in its early beginnings highway development in California was placed upon a firm foundation.

As the result of the work of these pioneers of modern road construction, an amendment to the California State Constitution was adopted on November 4, 1902, giving the legislature power to establish a system of State highways and to pass all laws necessary for highway construction and maintenance.

GOOD ROADS SENTIMENT

In 1907 the Department of Engineering was established but, because of the lack of funds, any material progress in road construction by this department was prevented.

During these preliminary years favorable public sentiment for "good roads" was spreading throughout the nation and with the rapid rise in manufacture and sale of motor cars during the first decade of the century this sentiment crystallized into action.

At the general election in 1910 the voters of California gave their approval to an act passed by the 1909 legislature for the issuance of State bonds amounting to $18,000,000 for the purpose of acquiring and constructing a State highway system.

FIRST BOND ISSUE

The act of 1909 providing for the first bond issue made possible the real beginning of a unified system of State highways and with the appointment of three members to the first California Highway Commission, under authority of legislation enacted in 1911, the nucleus of a State organization provided with authority and funds for construction of such a system began to function.

The act specified the routes to be included in the system should constitute a continuous and connected network of highways with arterials running north and south traversing the Sacramento and San Joaquin Valleys and along the coast, together with lateral roads, so that the several county seats, centers of population, and main transcontinental routes entering California would be joined by State highways.

The three members of California's first Highway Commission, Mr. Towne, Mr. Darlington and Mr. Blaney assumed their responsibilities without hesitation and together with Austin B. Fletcher, whom Governor Hiram Johnson appointed to the post of first State Highway Engineer, began the task of establishing a department to develop the system as dictated by the bond act. The State was divided into seven districts and an experienced engineering staff organized to carry on the work.

FIRST EARTH TURNED

The commission and Mr. Fletcher toured the State from the Oregon line to the Mexican border, traveling some 6,800 miles and making an intensive study of the highway needs of the State as a whole. Upon the basis of

Members first State Highway Commission appointed August 9, 1911. Left to right—Burton A. Towne, chairman; Chas. D. Blaney, N. D. Darlington.

Present Highway Commission: Julian D. Roussel, secretary; Wm. T. Hart, Paul G. Jasper, Harry A. Hopkins, chairman; H. R. Judah and Philip A. Stanton.

geographical controls and the stipulations of the bond act, improvement projects were selected and surveys begun in preparation for construction.

In less than one year after the beginning of work more than 1,000 miles of State highway had been surveyed and on August 7, 1912, Mr. Towne turned the first shovel of earth on California State Highway Contract No. 1, to start construction of an asphalt concrete pavement on a section of the Coast Route between South San Francisco and Burlingame, in San Mateo County. Since that date, highway construction, reconstruction, improvement and maintenance have been continuous upon the State system.

The efforts of the first highway commission laid a firm foundation for highway improvement and development and succeeding commissioners have held to the high standards of public service which these pioneers in the highway field inaugurated.

PUBLIC DEMAND INCREASES

Rapid expansion of the automobile industry and the great increase in the use of motor cars and trucks created an insistent and active public demand for increased highways, which necessitated additional funds for the work.

In 1913, the State legislature passed an act requiring registration of all motor vehicles which provided for the equal division of the net revenue from the registration fees between the State and the counties and stipulated that the State's share be devoted to maintenance of highways.

At the 1916 election the voters ratified the Highway Act of 1915 providing $15,000,000 for continuation of the work being performed with funds provided by the first bond act.

As the work proceeded and cars on the highways increased in numbers it became evident that required facilities would necessitate still further funds and at a special election on July 1, 1919, a third bond issue of $40,000,000 was ratified by Californians.

It likewise became evident that future financing of State highway construction by issuance of bonds would create a burden which was too great for the State to bear and in the biennial report of the Highway Commission for 1919-1920 recommendation was made for the imposition of a gasoline tax, the proceeds of which should be devoted solely to highway purposes.

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Shade Trees Are Preserved Along Realigned Road

By R. M. GILLIS, District Engineer

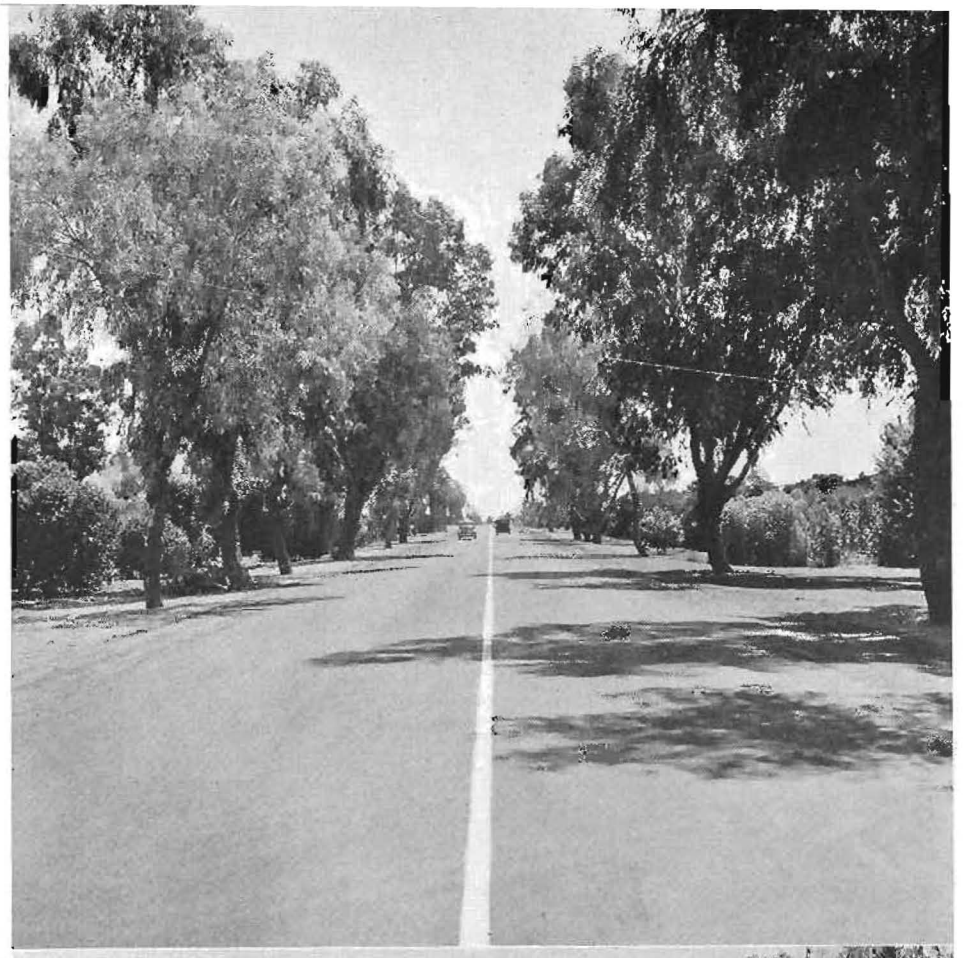
ELIMINATION of four railroad grade crossings, the saving of over one mile in distance and construction designed to preserve shade and ornamental trees along the realigned highway featured the improvement of State Route 129 in Tulare County extending from the town of Strathmore through Lindsay to Cairns Corner.

Relocation of this road carrying over 2000 cars a day avoided two grade crossings of the Visalia Electric Railway and two crossings of the Santa Fe and, as shown in the pictures on this page, was done in such a way as not to destroy the beautiful trees lining the highway. The upper photograph is of a stretch between Exeter and Lindsay and the lower is of a section between Lindsay and Cairns Corner, both showing the preservation of shade trees.

The project completed by N. M. Ball Sons and Larson Bros. at a cost of $155,000, provides an eighty-foot right of way graded to its full width and surfaced with a twenty-foot pavement with eight-foot oil mixed shoulders on each side.

Compared with the old sixteen-foot pavement with narrow right of way and sight distance limited by orange groves at the road intersections and railroad crossings, this improvement offers a very substantial contribution to traffic safety, for the two thousand vehicles that use it daily.

Route 129 starts at Famoso, twenty miles north of Bakersfield on Route 4. It serves not only as the route from the south to the rapidly developing recreational areas of Sequoia and General Grant Parks, but also is the main traffic artery for the prosperous agricultural district through which it passes. Because it is through the center of Tulare County's rich citrus orchards, it has been appropriately given the local name of Orange Belt Highway.



Conceited Wife — Darling, doesn't my beauty seem unreal to you at times?

Husband—Yes, especially when I look at the jars on your dressing table.

34 California Counties Get Federal Aid for Local Roads

By GEORGE T. McCOY, Assistant State Highway Engineer

THIRTY-FOUR California counties are to receive direct benefits during 1937 and 1938 for construction on approximately 250 miles of county roads, estimated to cost $1,650,000. Improvements to be made under this program will be financed from Federal funds apportioned to California supplemented by county funds.

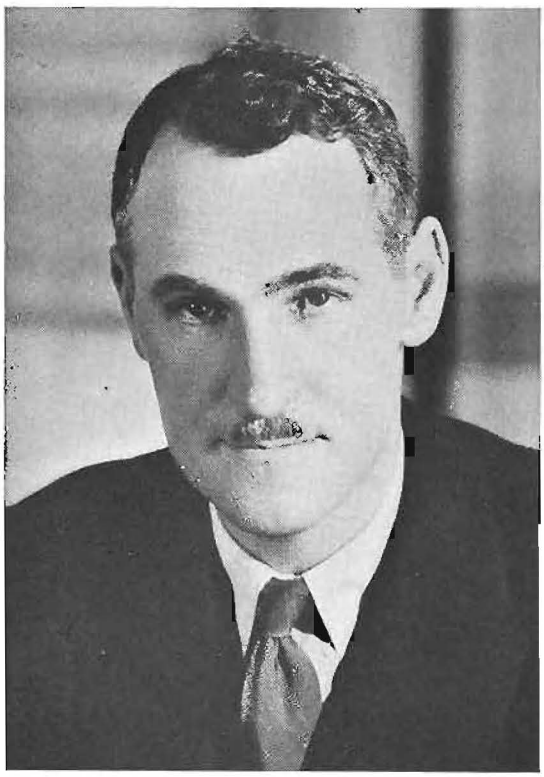
Included in the amendment by Congress of the Federal Aid Highway Act in June, 1936, was not only the continuation of regular Federal aid for State highway work in the several states, but also provision for Federal assistance in the improvement of feeder highways. The funds for this last purpose were authorized for appropriation in an amount of $25,000,000 for each of the fiscal years ending June 30, 1938, and 1939. The apportionment to the states of the 1938 funds allocated $971,644 to California.

MATCH FEDERAL FUNDS

The work will be carried on cooperatively between the counties, the State Division of Highways and the U. S. Bureau of Public Roads, with the direct supervision under the State Highway Department. The Federal funds will be matched by county money.

Rules and regulations governing the administration and expenditure of these funds which were promulgated by the United States Bureau of Public Roads early this last spring, were given intensive study by the Division of Highways before proceeding with the formation of the feeder road construction program to be financed with this Federal money. The regulations clearly indicated the intent of the government to provide improvement to so-called "farm to market" and "mine to market" roads of a distinctly rural character which feed from rural communities to an improved highway system.

Although the rules and regulations specified that the money provided by the government for this feeder road program be expended on rural highway construction in at least 50% of the counties of a State and that at least 30% of the funds be spent on projects located off the State Highway System, the California Highway Commission at its meeting on June 17, 1937, approved distribution of the apportionment to California to approximately 60% of the counties of the State and expenditure of the entire apportionment on county roads not a part of the State Highway or Federal Highway Systems.



GEORGE T. McCOY

This policy of using the entire apportionment on county roads was determined after conference with county authorities on the feasibility of such a procedure based upon tentative allocations to the various State highway districts.

On March 18 a joint meeting of County Engineers and Engineers of the Division of Highways was held in Sacramento. At this meeting the program was discussed in detail and lines of action determined. That the various counties were anxious to avail themselves of this Federal assistance for improvement to county roads was evidenced by their submission of proposed projects over-subscribing the available amount by nearly 100%.

Selection of the projects was made by the Division of Highways Engineers in cooperation with local authorities. The accompanying program of projects has been approved by the U. S. Bureau of Public Roads for expenditure from the 1938 funds; preparation of the projects is well adavnced; and advertising for bids on contracts will be under way in a week or two.

HIGHWAY PLANNING SURVEY

It is the plan of the Federal Government to establish Federal aid feeder highway systems in the various States in addition to the existing Federal Aid Primary and Secondary road systems. There is now under way in California an exhaustive highway planning survey under the direction of the U. S. Bureau of Public Roads. From the data collected in this survey it is hoped to establish the highways, satisfactory to counties, State and Federal government, for inclusion in such a Federal feeder system and to lay out a general program of systematic improvement in the order of greatest need.

(Continued on page 14)

Proposed California Federal Aid Secondary

In the administration of the Federal feeder road funds for the years ending June 30, 1938, and 1939, California has been officials, will in all probability be included in the proposed feeder road system when the planning survey is completed. Following

Road	Location
Del Norte—Talowa Creek Road	Tryon's Corners (Rte. 71) west to Lower Lake Road
Humboldt—Eight sections adj. Rte. 56	Various Roads near Ferndale
Lake—Lucerne Cut-off	Rte. 89 to Rte. 15
Mendocino—Longvale Dos Rios Feeder	South Fork Eel River
Lassen—Bieber Hackamore Road	Bieber Rte. 28 to Modoc County Line
Lassen—West Janesville (Rte. 29)	Near Wendel to near Edgemont (portions)
Plumas—Vinton-Loyalton Road	Vinton Rte. 21 to Sierra County Line
Siskiyou—East Side Scott Valley	Portions Fort Jones (Rte. 82) to Callahan
Butte—Richvale-Gridley	State Rte. 45 to Biggs
Butte—Clark Road	One to 6¼ miles S. Paradise
Glenn—Elk Creek to Willows	6.9 mi. to 10.5 mi. W. of Willows
Sacramento—Antelope	Ben Ali to 3.6 Nly. (Walerga)
Sacramento—El Centro Road	Natomas levee (near American River Mouth) to 5.6 mi. Nly.
Yolo—Elk Slough	Opposite Courtland
Yolo—Bachinnis Corner to Sacramento River Road	1.5 Mi. N. Rte. 87 W. Knights Landing to Rte. 88
Yolo—Grant Line Road	Near Esparto to near Yolo
Alameda—Mt. House Road	State Rte. 5 Nly. to S. P. R. R.
Marin—Manor-Pt. Reyes Road	Fairfax to 3.4 miles northwesterly
Napa—Silverado Trail	Portions Calistoga to near Oakville
Santa Clara—Uvas Road	N. Line Uvas Ranch to Croy Road
Monterey—Arroyo Seco	Line change 5 miles west Greenfield
San Luis Obispo—Corbit Canyon	Arroyo Grande to Rte. 147 near Edna
San Benito—King City-Bitterwater Rd.	Bitterwater (Rte. 119) to County Line
San Benito—North Pacheco School	Pacheco Creek
Santa Barbara—Guadalupe-Lompoc Road	Near Guadalupe to Casmalia
Fresno—Goodfellow Avenue	Over Kings River South Sanger (Hanke Bridge)
Kern—Weed Patch-Wheeler Ridge Road	Rte. 4 to Rte. 140
Kern—Allen Road	Rte. 58 South to Bellevue Road
Kings—Hanford-Kingsburg	Hanford North 6.5 miles toward Selma
Madera—Howard and Wilson Roads	Madera West to Firebaugh Road N. S. thereof
Madera—Washington Boulevard	Chowchilla West to Chowchilla River
Ventura—Camarillo Road	Rte. 2 near Camarillo East to near Rte. 155
Ventura—Santa Clara Avenue	Rte. 2 East of El Rio to Central Avenue
San Bernardino—Various Streets	Waterman Ave. (San Bernardino) S. Ely. to Colton Ave. (Rte. 26)
San Bernardino—Bloomington Diagonal	S. Rialto (Rte. 26) to Bloomington
San Bernardino—Cedar Avenue (Bloomington)	Colton to Slover Avenues
San Bernardino—Base line Road	Citrus to Linden Avenue
San Bernardino—Base line Road	Cactus to Meridian Avenue
Riverside—Mockingbird Canyon	South City Limits Riverside to Cajalco Rd.
Riverside—Palo Verde Road (Avenue 24)	Ripley (Rte. 146) East to Colorado River
Inyo—Trona Road	Nly. San Bernardino Co. line to Rte. 127 in Panamint Sink
Amador—Sutter Cr.-Volcano Road	Sutter Cr. (Rte. 65) to Volcano
Amador—Plymouth-Fiddletown Road	Plymouth (Rte. 65) East to Fiddletown Br.
Calaveras—Mokelumne Hill-West Point Rd.	So. Fork Mokelumne River to Herberts Ranch
Calaveras—Murphys-Sheep Ranch Road	Near Murphys (Rte. 24) N. to near Sheep Ranch
Calaveras—Eugene-Milton & Rock Cr. Rds.	South and S. E. Milton
Merced—South Planada	8 Roads near Planada
San Joaquin—Mosley Road (W. Lodi)	Terminous Rd. (Rte. 53) N. to Peltier Rd. (portion)
San Joaquin—Bacon Island Road	Middle R. Ferry to Mandeville Island Ferry
Stanislaus—Merced-Port Stockton Road	Tuolumne R., Bet. Empire (Rte. 110) & Hughson
Imperial—Westmoreland Road	New River to 2 Mi. W. Calipatria; South to 2 Mi. W. Brawley
San Diego—Valley Center to Rincon (Rte. 195) Road	Over San Luis Roy River
San Diego—Highland Avenue	S. National City across Sweetwater River
Highway Planning	

Projects To Be Financed With 1938 Funds

en granted considerable latitude in the selection of projects, which, in the opinion of State Highway Engineer and county ollowing is the program for county road building as finally approved:

Length miles	Nature of improvement	Estimated cost
2.0	Grade, Base, armor coat	$5,000
12.5	Grade, base	22,500
2.4	Grade, Bit. surfacing	10,000
	Bridge	47,000
4.1	Grade, base, bridges	10,800
3.6	Grade, base, bit. surfacing bridges	15,200
8.0	Grade, base, bit. surfacing	61,600
5.6	Bituminous surfacing	22,400
3.8	Grade, base, armor coat	26,000
5.5	Grade, base, armor coat	56,500
3.6	Base and Bit. Tr. surfacing	23,300
3.6	Grade, base, armor coat, bridge	90,000
5.6	Base, armor coat	87,000
	Bridge	9,000
3.75	Grade, base, oiling	18,000
8.5	Bit. tr. surfacing, R. C. box culvert	21,500
4.1	Grade, base, bit. surfacing	59,800
3.4	Grade, 20′ A. C.	95,700
6.6	Grade, drainage & dust oil	65,000
3.9	Grade and bit. tr. surfacing	75,000
0.4	Grade, culverts, seal coat	35,000
7.0±	Bit. tr. surfacing & armor coat	13,300
5.0	Bit. tr. surfacing & armor coat	12,000
	Bridge	8,000
8.0	Grade	70,000
	Bridge and approaches	80,000
17.4	Grade, surface, structures	33,830
2.0	Grade, oil, and bridges	10,270
6.5	Grade, A. C., oil shoulders	82,200
10.5	Grade and oil	10,500
7.0	Grade and oil	7,000
4.0	Grade and bit. tr. surfacing	25,000
1.5	Grade, bit. tr. structures	25,000
4.0	Bit. tr. surfacing	12,000
2.2	Bit. tr. surfacing	7,000
0.5	Bit. tr. surfacing	2,000
3.0	Bit. tr. surfacing	9,000
2.0	Grading, Bit. tr. surfacing	8,000
4.75	Grade, base, bit. tr. surfacing	35,000
3.5	Grade, Bit. tr. surfacing, bridges	30,000
32.0	Grade and oil	50,500
12.3	Untr. Gravel surfacing	10,420
5.5	Bit. surf. treatment	5,100
1.8	Base and surfacing	5,600
5.2	Grading	6,000
5.0	Bit. tr. surfacing	5,300
	8 bridges	32,000
4.25	Grade, base, oil, seal	38,000
5.5	Grade, base, oil, seal	28,000
	Bridge	12,000
23.6	Base, Bit. tr. surfacing	34,300
	Bridge	35,000
	Bridge	60,000
		25,128
Total		$1,683,748

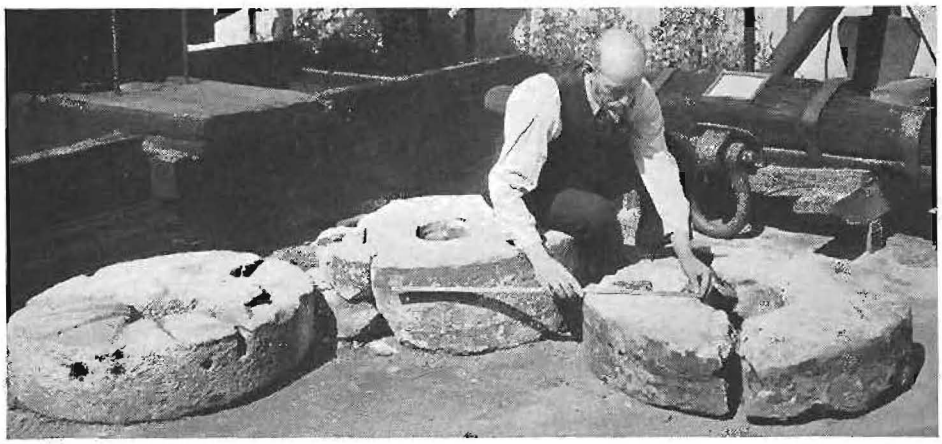
Relics of Pioneer Days Found By State Highway Engineers

By GLENN B. ASHCROFT, Senior Structural Engineer
Division of Architecture

SUTTER'S Fort Historical Museum in Sacramento has been enriched by a gift from the State Division of Highways of four old burrstones of ancient manufacture which were installed in a crude powder mill erected at Towle in Placer County in 1888.

For many years, these millstones lay on the site of the factory, which was destroyed by fire several decades ago. When the State highway between Sacramento and Truckee was rerouted in the vicinity of Towle, engineers of the Division of Highways discovered the burrstones and, their curiosity aroused, reported their find to headquarters.

I had the pleasure of delving into the history of these relics of pioneer days. Old-timers at Towle said it generally was believed the burrstones had been brought to California from France. Close examination of them shows that they are composed of a very peculiar flinty material the like of which I have never seen in any of my travels about the State, but of course this does not prove that such stone is not to be found somewhere hereabouts. It is possible the stones did come from France.



Curator H. C. Peterson of Sutter's Fort Museum assembling historic burrstones presented to him by Division of Highways.

PRESENTED TO MUSEUM

H. C. Peterson, curator of Sutter's Fort Historical Museum, was notified of the discovery of the stones and at his request the Division of Highways transported the relics to the museum.

Four burrstones believed to have been used in a wood-pulp mill built by the Towle brothers in 1880 are thought to be buried under the highway fill at Towle and may be excavated some time in the future.

The story of the pulp mill and its successor, the old powder mill, is rather interesting.

Some sixty years ago the Towle Brothers were actively engaged in the lumber business in Placer County, with headquarters at a small town named "Towle," now merely a station stop on the Southern Pacific Railroad running from Sacramento to Truckee.

MILL ERECTED IN 1880

About the year 1880 these brothers in company with other interested parties erected a mill on the side of the canyon a short way below (southerly) and a short distance westerly from the present location of the railroad company's water tank at Towle station.

The purpose of this mill was to make crude wood-pulp to be used in the manufacture of paper, and the way it did so was substantially in this manner: A large single stone of disc form several feet in diameter and having a thickness of some two feet was mounted rigidly upon an iron shaft which was driven by a Pelton water-wheel.

The circumferential face of this stone was cut into small, transverse, parallel grooves producing a wide grinding surface quite comparable in texture to the surface of an ordinary domestic "washboard." The stone was enclosed in a metal housing into which a stream of water was fed and through an opening in which small blocks of tamarack timber were forced against the fluted face of the rapidly revolving stone and soon reduced to a form of crude pulp which passed out through another opening in the housing and thence through a set of rolls which formed it into a large sheet, or "blanket."

This blanket was then folded together, shipped to San Francisco, there put through a refining process, and eventually became the finished product (paper).

This plant, which was known in the early days as the "Pulp Mill," was operated for a period of approximately eight years, then closed down and never used again.

POWDER MILL BUILT

At this time a second mill, which was later to become known as the "Powder Mill," was erected alongside the abandoned pulp plant. Its purpose was to utilize the waste sawdust from Towle Brothers' nearby box factory, and produce a product suitable for use in the manufacture of blasting powder and dynamite.

For this process stones, essentially of the "burrstone" type as used in

flour mills at that time, were employed, and a complete assembly consisted of two such stones one of which was securely fastened into a stationary iron frame while the other one was rigidly attached to a shaft which was driven by a Pelton waterwheel. The two stones, which were mounted so that the grinding faces were parallel to and nearly in contact with each other, were enclosed in a metal housing.

Through an opening in this housing and a hole through the stationary stone at its center a worm-screw conveyor attached to the shaft carried the sawdust to the grinding surfaces where it was rapidly reduced to an almost impalpable powder and then conveyed to a blower which forced it through a silk screen having 6400 openings to the square inch. The finished product was then sacked and shipped to the powder manufacturing companies in the San Francisco Bay region.

STONES FROM FRANCE

The process generated much heat; the stones became very hot and sometimes cracked. The dust which escaped and floated about the plant was highly inflammable, and it is said that numerous fires occurred. Although the statement has not been verified, it is said that the burrstones for this mill were brought originally from France.

The "Powder Mill" continued to operate for some twelve years, until the Towle Brothers closed down their box factory which was the principal source of supply for raw material, and after that both mills remained intact until the recent "world war," when, because of increasing value of old metal, junk collectors wrecked the machinery and hauled it away. Shortly thereafter what remained of the buildings was destroyed by fire, and when still later the State highway through Towle was rerouted to its present location it cut directly through the mill site and final destruction was complete.

The only vestiges then left were the "stones" some of which were buried deep beneath the highway fill at that point and others were scattered about the neighboring hillside and half buried by debris. As if to add insult to injury some person (not known, but surmised to have been some wandering "prospector") drilled holes into such stones as were still visible and intact and broke them into pieces. Luckily he was disappointed in his quest, and it is yet possible to restore some of them to a semblance of their original condition.

COLOR FILM OF HIGHWAY GIVEN COMMENDATION

LINDSAY PUBLISHING CO.
140 East Honolulu Street
Lindsay, California
Sept. 2, 1937

Mr. C. H. Pucell,
State Highway Engineer,
Department of Public Works,
Sacramento, California.

Dear Mr. Purcell:

I am this evening forwarding to you at the above address four reels of films, "California Highways" which were shown at noon today to members of the Lindsay Kiwanis club. The pictures were shown in the Lindsay Theatre, immediately following the service club luncheon. Wives and friends of Kiwanians also were present.

Before adjourning to the theatre Mr. R. M. Gillis, district engineer, Fresno, gave a brief but informative and interesting talk on some of the problems and activities of the California Highway Department. His talk served as an excellent introduction to the picture.

The picture itself was marvelous, and all afternoon I have been receiving favorable reactions. It gets over a story that needs to be told, in a most fascinating manner. The scenes were beautiful; almost inspiring to any Californian. One man this afternoon said: "I'd be glad to pay money to see a picture like that."

The Division of Highways, Mr. Earl Lee Kelly, and you, are to be congratulated on this picture, the evidence of remarkable achievements it portrays, and the vision of the job it gives to all of us. You certainly need not be backward in presenting this film anywhere.

Sincerely,
(Signed)
FORD A. CHATTERS

Auto Traffic On Bay Bridge In August Lessens

DECREASE in number of automobiles and increase in freight poundage featured August traffic on the San Francisco-Oakland Bay Bridge, according to Director of Public Works Earl Lee Kelly. The report was compiled from figures submitted by State Highway Engineer C. H. Purcell.

A total of 853,579 vehicles crossed the structure during the 31 days of August, Mr. Kelly said. Of these, 807,670 were passenger automobiles. These figures compare to a total number of vehicles of 886,054 for July and a total number of passenger automobiles of 839,231 for that month.

"These figures do not give a full picture of August losses in vehicular traffic," Mr. Kelly said. "The seasonal curve indicates that during this month the Bay Bridge might have expected the total traffic to have approached almost one million vehicles. This amounts to an actual financial monthly loss of approximately $50,000 to the Bay Bridge due to ferry cut-rate competition."

FREIGHT INCREASE

On the other hand, the number of freight pounds amounted to 69,082,335 greater than any previous month. Trucks showed, however, a drop from 28,436 in July to 27,737 in August. There was an increase in the number of buses crossing the span, with 9,833 for August. Decreases in other types of traffic were also reported.

The total income for the month of August was $453,213.40, Mr. Kelly announced, with a daily average of 27,535 vehicles crossing the span.

COMPARATIVE FIGURES

August figures with July comparisons follow:

	Total August	Total July
Passenger Autos	807,670	839,231
Auto Trailers	2,460	2,726
Motorcycles	3,691	3,716
Tricars	780	824
Trucks	27,737	28,436
Truck Trailers	1,408	1,302
Buses	9,833	9,819
Total Vehicles	853,579	886,054
Extra Passengers	209,620	209,971
Freight Pounds	69,082,335	68,409,499

Safer State Highways Planned for Future

(Continued from page 6)

making it effective. This is accomlished by construction of curbs. A curb will prevent promiscuous use of this central strip but it should not be too high and should have a reasonable amount of slope so that it will not present an additional hazard.

CURB DESIGN

The design of the curb adopted for this purpose is 6 inches in height above the surface of the pavement with a batter of 4 inches in this 6 inch height. The installation of the curb will depend upon the width of the division strip. Where this strip is of sufficient width to permit safe operation of the vehicle, the curb can be omitted. Our studies at present indicate that with division strips of 20 feet or more in width curbs will not be necessary.

FINANCIAL PROBLEM

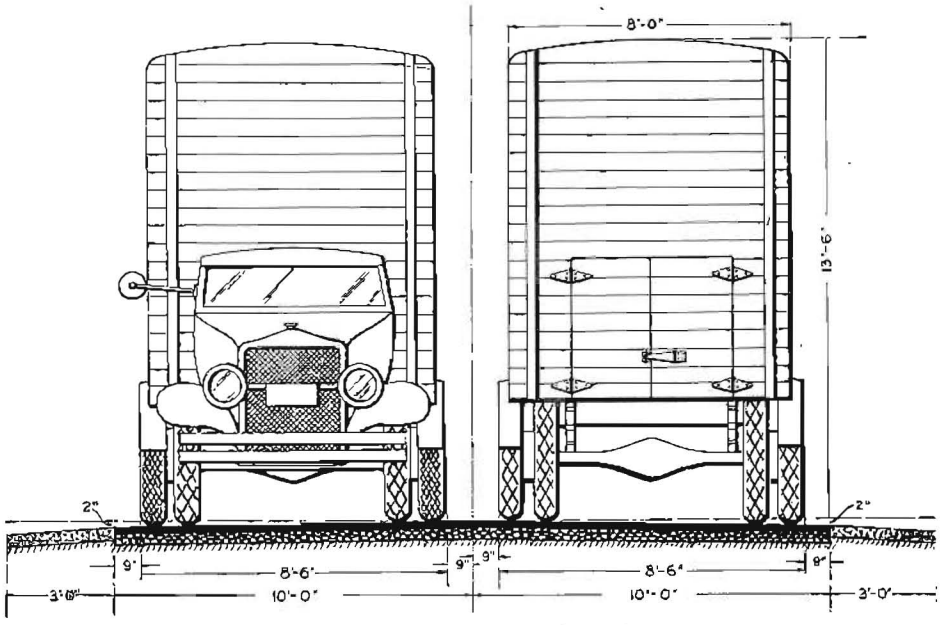
It must be recognized that adoption of higher standards of construction—the expansion of lane width, the divided type of roadway, the increased width of right of way necessary for this type of construction and the improvement of our intersections—will further complicate our already acute financial problem.

Not many of our citizens realize that California has within her borders some 2,328,000 registered motor vehicles comprising 8.3 per cent of the nation's total, while the motor vehicle and gas tax revenues available to the Division of Highways for maintenance and construction represent but 3.7 per cent of the revenues collected by the various states. The movement of vehicles on our highways is increasing rapidly and approximates now some 18,000,000,000 vehicle miles per year. This may possibly account for the fact that at each budgetary period there are presented, by interested parties, meritorious construction projects totalling some twenty times the revenues available for construction.

MUST BUILD SAFER ROADS

This is a serious problem but our mounting highway accident toll is more serious. The time has come to face this issue squarely. We must build the safest highways possible even though it be a definite curtailment in the total mileage constructed.

Granted that our divided type of highway and the wider traffic lane alone will not solve the accident problem, we still must contribute our share toward its solution. Such a policy will be economically sound from the savings on the obsolescence factor alone and will be a desirable and notable contribution to safety and planning for the future.



This sketch shows two trucks passing on 10-foot highway lanes. The clearance between them is only 1 foot, 6 inches. Each vehicle is only nine inches from the curb and the danger of sideswiping is apparent. Eleven-foot lanes will greatly minimize this danger.

Registration Increases

An increase of 7.40 per cent in the registration of automobiles in California during the first seven months of this year as compared with same period a year ago, was shown by Howard Deems, Registrar of Motor Vehicles, in his report to Governor Frank F. Merriam.

In the 1936 period 2,046,857 automobiles had received plates, Deems said, as compared with 2,198,287 this year, an increase of 151,430. Commercial vehicles with pneumatic tires increased by 15,635, motorcycles increased 1,396 and pneumatic tire trailers, 18,811. Solid tire commercial vehicles showed a decrease of 617, and solid tire trailers a drop of 597, bringing a total of fee paid registrations to 2,476,478 as against 2,290,420 of last year.

Soils Course to Be Offered By Bureau of Public Roads

A course in the surveying, sampling and testing of soils, together with the practical application of the results of the tests on soils to actual highway design, construction and maintenance problems, is offered in Washington, D.C., to highway engineers from October 4 to 16, by research engineers of the Bureau of Public Roads of the U. S. Department of Agriculture.

Instruction will be furnished by members of the staff of the bureau thoroughly familiar with the subjects they discuss. Opportunity will be afforded those attending to perform the tests and to keep complete sets of data. Wherever possible, the practical application of the test will be discussed at the time the test is demonstrated. An informal interchange of ideas will further the subject of soil science in the highway field. Highway engineers interested in taking the course should make prompt application for enrollment, giving data as to position and previous experience in soil work.

Angeles Crest Highway Opens Vast Playground

(Continued from page 8)

taken contracts, 1.4 miles, 5.0 miles, and 3.3 miles in length, respectively, and the Division of Highways constructed 2.9 miles with prison labor.

The total amount of money expended to date in bringing the graded highway from Red Box to its present terminus at Chilao is $1,100,000 for 12.6 miles, or approximately $87,000 per mile.

OIL TREATMENT NEXT

Money has been set aside by the Division of Highways sufficient to apply a penetration oil treatment to the graded roadway. It is planned to complete such oiling this fall in order to preserve the excellent surfacing material now in place and to prevent it being washed away by the winter storms. Also the new roadway will then be available to haul supplies to the Division of Highway's camp and provide an easier access to the new construction to be opened up as rapidly as funds become available.

As soon as oiling is completed—sometime next month—the highway as far as Chilao will be open to the public for the first time. No attempt will be made, however, to maintain the roadway for the use of the general public during the winter storm periods.

Angeles Crest Highway cut through decomposed granite cliffs during construction.

ROAD IS FIRE CONTROL

The new highway construction ends at the Newcomb Ranch located just beyond Chilao camp grounds. It is of interest to note that the Newcomb Ranch, 160 acres in extent, was homesteaded in 1878 by Mr. Lewis Newcomb, one of the real pioneers of Angeles Forest area, and is the only parcel of privately-owned land in this area.

Mr. Newcomb's knowledge of the back country and the trails and passes, many of which were first located and constructed by him, was recognized in 1898 when he was appointed one of the first forest rangers by the then newly organized National Timberland Reserve.

The new highway also serves as an important unit for fire control measures. Following the San Gabriel fire of 1924, which burned 50,000 acres of valuable watershed, it was recognized that a more vital system of fire protection was necessary. Inasmuch as early trails had served their day as the transporting medium of men and supplies to fires in back country, plans were formulated and money made available for the construction of a road from Mt. Wilson to the Mojave desert, bisecting the forest.

HELPS ANGELES CREST PROJECT

This first road has proven of tremendous value in the furtherance of construction and progress on the new Angeles Crest Highway, which will "carry on" in a greater way this essential service.

From the Newcomb Ranch property the Angeles Crest Highway is to be further extended to Cloudburst Summit at the elevation of 7040 feet, this section to be constructed by the Division of Highways with prison labor. The camp is now being moved to a new location within the limits of construction. Clearing operations have been under way for about one month and it is expected to have this camp in complete operation by the end of next month.

Appreciation From Reader

101 W. 13th Street,
National City, California,

John W. Howe, Editor,
California Highways and Public Works Journal,
Sacramento, California.

Dear Sir:

My issue of "California Highways and Public Works" just arrived, and in my humble way I wish to compliment you on your most excellent publication, as to complete general make-up and Table of Contents.

It seems to me that each issue is better than the last and then I don't really see how that is possible.

Your high quality paper, type and ink certainly combine to make an easy to be read paper and the cuts are par excellence. Then last, but in no way the least, is the careful editing of the reading material which is mighty near perfect English, which, by the way, would make an ideal approach for the foreign born population to read interesting facts and in so doing acquire a splendid vocabulary of modern words.

* * * * *

When I first came to California, I was deeply impressed with the excellent manner in which the roads were posted with various caution signs and it gives me great pleasure to see the daily progress that our Earl Lee Kelly is applying in keeping our California roads up to date with best improved methods.

* * * * *

Thanks again for your great efforts and trust that I am not selfish in saying: "Keep the good work going on."

Very truly,

J. W. MacCAUSLAND.

SOULÉ STEEL COMPANY

Iron and Steel Products
6200 Wilmington Avenue
Los Angeles

Editor, California Highways
and Public Works,
Box 1499,
Sacramento, California.

Dear Sir:

I congratulate you and the Department most heartily for the sterling worth of your magazine, California Highways and Public Works.

It gets better and better all the time and is one of the publications our office looks forward to receiving each month.

Very truly yours,

N. E. DAWSON.

Valuable Information

GENERAL PETROLEUM CORPORATION OF CALIFORNIA

Los Angeles, Cal.

Mr. John W. Howe,
c/o California Highways and Public Works,
P. O. Box 1499,
Sacramento, California.

Dear Sir:

Since the first of the year I have been receiving the monthly magazine of "California Highways and Public Works" and wish to take this opportunity to extend to you my thanks and appreciation for the courtesy which you or some one in your organization has shown to me in sending this magazine.

I think it is a splendid magazine and find that it contains a great deal of valuable information, particularly for my line of work.

Yours very truly,

FELIX CHAPPELLET.

Praise From Havana

MIGUEL VILLA
Ingeniero Consultor
Profesor Titular de Estructuras
Escuela de Ingenieros y Arquitectos
Universidad de la Habana

California State Department of Public Works,
Sacramento, Calif.

Gentlemen:

I have received the copy of "California Highways and Public Works" containing the history of the San Francisco-Oakland Bay Bridge, which is extremely interesting and amply covers all of the points that I intend to bring out in a forthcoming lecture that I am preparing at the present time.

Thanking you very much for your prompt attention and courtesy in the matter, I remain,

Yours very truly,

MIGUEL VILLA,
Manzana de Gómez 334, Habana, Cuba.

Ontario, California,
August 27, 1937.

Division of Highways,
P. O. Box 1499,
Sacramento, California.

Gentlemen:

Do you ever send your magazine "California Highways and Public Works" to the eastern states?

Friends and relatives write me asking all sorts of questions about the State. So many about the San Francisco Bridge. I can not answer them. But have sent some of your magazines. They were delighted with them and loaned them to friends and relatives.

The magazine is always interesting and such beautiful pictures. It is the best advertising for California I know of. I enclose some addresses of people who would be glad to get the magazine.

Thank you.

(Signed) F. V. WOODBURY.

THE ALL-YEAR CLUB OF SOUTHERN CALIFORNIA, LTD.

Mr. John W. Howe, Editor,
California Highways and Public Works,
P. O. Box 1499,
Sacramento, California.

Dear Mr. Howe:

As a favor to the All-Year Club of Southern California, would you put our new Tourist Information Bureau, 505 West Sixth Street, Los Angeles, on your mailing list to receive California Highways and Public Works?

Our business office already is receiving such a copy but we like to keep that in our files and your magazine is the best way we know to keep the Welcomettes on duty at the Information Bureau informed of highway conditions in California.

Thank you for your trouble.

Sincerely,

(Signed) MINARD FASSETT,
Director of Publicity.

The woman who drives from the back seat is no worse than the man who cooks from the dining-room.

A boy was about to purchase a seat for a movie in the afternoon. The box-office man asked, "Why aren't you in school?"

"Oh, it's all right, sir," said the youngster earnestly, "I've got measles."

Highway Bids and Awards for August, 1937

IMPERIAL COUNTY—Between Trifolium Canal and 7 miles north of Kane Springs, 14.3 miles seal coat to be applied. District XI, Route 26, Sections B, C. A. S. Vinnell Co., Alhambra, $8.180; G. W. Ellis, North Hollywood, $9,435. Contract awarded to R. E. Hazard and Sons, San Diego, $5,990.

IMPERIAL COUNTY—Between Holtville and Brawley, about 9.4 miles, to be graded and surfaced with plant-mixed surfacing. District XI, Route 187, Section Holt., B, C. V. R. Dennis Construction Co., San Diego, $103,004; R. E. Hazard and Son, San Diego, $88,314; Griffith Co., Los Angeles, $110,108; Oswald Bros., Los Angeles, $92,537. Contract awarded to G. W. Ellis, North Hollywood, $87,460.20.

KERN COUNTY—Through Mojave, about 0.7 mile in length to be graded and surfaced with plant-mixed surfaciug. District IX, Route 23, Section A. Griffith Co., Los Angeles, $26,873; Oswald Bros., Los Angeles, $27,297; Southwest Paving Company, Roscoe, $28,491; A. S. Vinnell Co., Alhambra. $27,245; Piazza and Huntley, San Jose, $32,416; J. E. Haddock, Ltd., Pasadena, $33,428; Frank Embleton, Albany, $36,718. Contract awarded to S. A. Cummings, San Diego, $25.372.

KERN COUNTY—Between 2 miles south of Greenfield and Mountain View School, 8.0 miles to be surfaced with plant-mixed surfacing and borders to be constructed. District VI, Routes 140 and 143, Sections C, A. Griffith and Co., Los Angeles, $41,-250; Independent Construction Co., Oakland, $44,700; Union Paving Co., San Francisco. $45,630; L. A. Brisco, Arroyo Grande, $53,-482. Contract awarded to Piazza and Huntley, San Jose, $40,790.

KERN COUNTY—A reinforced concrete slab bridge across Poso Creek, about 12 miles north of Bakersfield, consisting of two 36 foot 6 inch spans and two 24-foot 6 inch spans on concrete pile bents and about 0.2 mile of roadway approaches to be graded. District VI, Route 142, Sections A, B. John Jurkovich, Fresno. $21,137; N. M. Ball Sons, Berkeley, $22,206: Rexroth and Rexroth, Bakersfield, $23,695. Contract awarded to Valley Construction Co., San Jose, $20,994.50.

LASSEN and SIERRA COUNTIES—Between Doyle and Nevada State line, about 18 miles, seal coat to be applied. District II, Route 29, Sections E, A. Fredericksen and Westbrook, Lower Lake, $24,795; Lee J. Immel, Berkeley, $25,938; J. P. Brennan, Redding. $26,213; Harms Bros., Litchfield. $26,952; A. Teichert and Son, Inc., Sacramento. $27,065; A. Soda and Son. Oakland, $28,069; George French, Jr., Stockton, $28,810; J. A. Casson, Hayward. $34.075. Contract awarded to Hayward Building Material Co., Hayward, $23,690.

LOS ANGELES COUNTY—Between West Covina and Pomona, 6.6 miles, existing roadbed to be widened, shoulders on portions. District VII, Route 26, Sections W. Cov. & C. W. E. Hall Co., Alhambra, $107.942; Heuser and Garnett, Glendale. $86.616; Daley Corp., San Diego, $110.536; Macco Construction Co., Clearwater, $86.368; A. S. Vinnell Co., Alhambra, $103,923; Geo. J. Bock Co., Los Angeles, $79,324; Griffith Co., Los Angeles, $89,423; Minnis and Moody Const., Los Angeles. $83,795; J. E. Haddock, Ltd., Pasadena, $90,450; Geo. K. Thompson & Co., La Canada, $102,264; Oswald Bros., Los Angeles. $79,569. Contract awarded to Claude Fisher Co., Ltd., Los Angeles, $67,-420.90.

LOS ANGELES COUNTY—Rosemead Boulevard, from Las Tunas Drive northerly 0.07 mile to be graded and paved with plant-mix surfacing, asphalt concrete and Portland cement concrete, and curbs, gutters, and sidewalks to be constructed. District VII, Route 168, Section C. Geo. R. Curtis Paving Co., Los Angeles, $13,258; Dimmitt and Taylor, Los Angeles, $13,853; J. E. Haddock, Ltd., Pasadena, $15,166; Griffith Co., Los Angeles, $14.650. Contract awarded to George O. Gartz, Los Angeles, $12,824.25.

MENDOCINO COUNTY—Between southerly boundary and Point Arena, about 1.2 miles, to be graded and a penetration oil treatment applied. District I, Route 56, Section A. Claude C. Wood, Stockton, $55,-224; N. M. Ball Sons, Berkeley, $38,951; Poulos and McEwen, Smith River, $48,216: Guerin Bros., San Francisco, $47,986; J. V. Galbraith and Don A. Canevari, Santa Rosa, $49,494; Young and Son Company, Ltd., Berkeley, $42,850; George Pollock Co., Sacramento, $41,677; Harold Smith, St. Helena, $48.999; Piombo Bros. & Co., San Francisco, $42,418; A. Soda and Son, Oakland, $51,956. Contract awarded to Chas. L. Harney, San Francisco, $38,579.

MODOC COUNTY—Between 2½ miles west of Cedarville to the State line, 11.8 miles to be surfaced with plant-mix surfacing. District II, Route 28, Section C. Tieslau Bros., Inc., Berkeley, $11,900; Garcia Construction Co., Irvington, $12,150; McReynolds Trucking Co., Oakland, $13,-000; Fredericksen and Westbrook, Lower Lake, $13,470; Hanrahan Co., San Francisco, $13,800; E. B. Bishop, Orland, $14,-600. Contract awarded to George French, Jr., Stockton. $11,200.

MONO COUNTY—Between Mammoth Lakes and Route 23 near Casa Diablo Hot Springs, 9.0 miles, imported surfacing material to be placed and road-mix surface treatment to be applied. District IX, Route 112, Section A. J. A. Casson, Hayward, $51,450; Basich Bros., Torrance, $55,436; Steward and Nuss, Inc., and Oldfields Trucking Co., Bakersfield, $58,952; A. S. Vinnell Co., Alhambra, $61,618; Peninsula Paving Company, San Francisco, $67,744; Isbell Construction Co., Reno, $79,575. Contract awarded to Oswald Bros., Los Angeles, $44,448.

MONTEREY COUNTY—A steel and concrete bridge across Mud Creek, about 25 miles north of San Simeon. District V, Route 56, Section A. A. Soda and Son, Oakland, $33,321. Contract awarded to E. T. Lesure, Oakland, $31,824.40.

MONTEREY COUNTY—A reinforced concrete girder bridge across Salinas River at Soledad consisting of thirteen 104-foot spans and two 89-foot spans on concrete piers and abutments on pile foundations. District V, Route 2, Section D. J. F. Knapp, Oakland, $336,424; Andy Sordal and R. R. Bishop, Long Beach, $349,116; L. E. Dixon Company, Los Angeles. $387,858; C. W. Caletti and Co., San Rafael, $362,791; Bates and Rogers Construction Co., Oakland, $388,423; John Strona, Pomona, $320,-158; D. W. Thurston. Los Angeles, $349,-633; Lindgren and Swinerton, Inc., San Francisco. $377,723. Contract awarded to Lord and Bishop, Sacramento, $310,468.

ORANGE COUNTY—About 4 miles east of Anaheim, bridge across Santa Ana River to be repaired. District VII, Route 178, Section A. J. S. Metzger and Son, Los Angeles, $13,650; Wm. R. Shriver, Los Angeles, $12,271; R. H. Travers, Los Angeles, $11,298; Sully-Miller Contracting Co., Long Beach, $15,870; C. O. Sparks and Mundo Engineering Co., Los Angeles, $11,-447; Southern California Roads Co., Los Angeles, $12,980; J. E. Haddock, Ltd., Pasadena, $13,280. Contract awarded to Harry L. Foster, San Diego, $10,488.

PLACER COUNTY—Between Auburn and Colfax, about 15.7 miles seal coat to be applied to existing pavement. District III, Route 37, Section A. B. Heafy-Moore and E. F. Hilliard, Sacramento, $11,383; Fredericksen and Westbrook, Lower Lake, $11,319; Garcia Construction Co., Irvington, $10,850; Hayward Building Material Co., Hayward, $11,602; Hemstreet and Bell, Marysville, $10.850: Louis Biasotti and Son, Stockton, $12,425; E. A. Forde, San Anselmo, $11,112. Contract awarded to Granite Construction Co., Watsonville, $10,808.

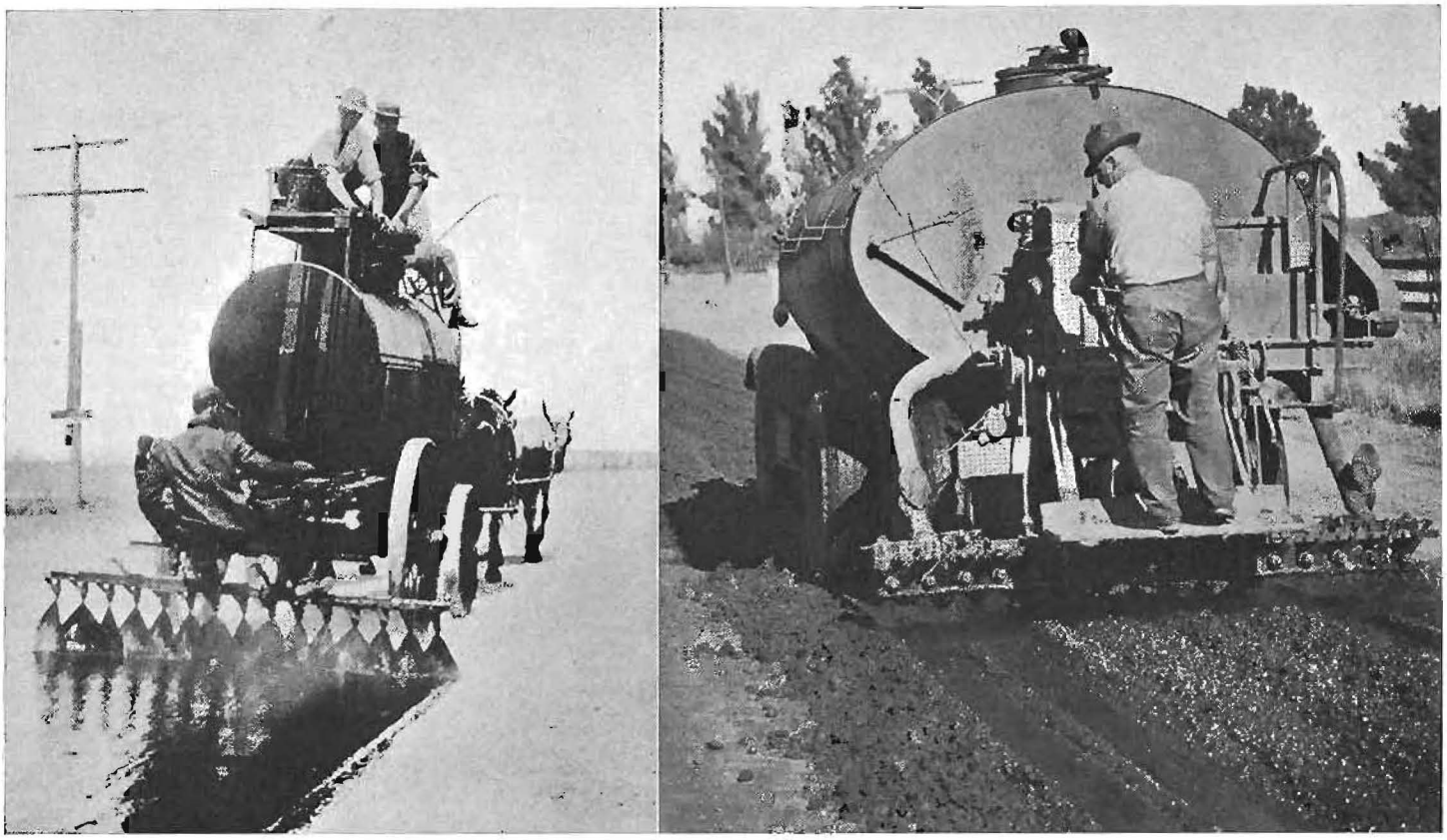
SAN BERNARDINO and RIVERSIDE COUNTIES—At various locations, about 16.9 miles, road-mix surface treatment to be applied to existing shoulders. District VIII, Routes 190 and 187, Sections C, D-D. Oilfields Trucking Co., Bakersfield, $20,220; George Herz Co., San Bernardino, $18.325; A. S. Vinnell Co., Alhambra, $19.727. Contract awarded to Oswald Bros., Los Angeles, $16,836.50.

SAN DIEGO COUNTY—Reinforced concrete girder bridge across San Onofre Creek, 17 miles north of Oceanside, six 50-foot spans on concrete piers with pile foundations to be widened. District XI, Route 2, Section D. Oscar Oberg, Los Angeles, $55,777; Metropolitan Construction Co., Los Angeles, $67,437; Claude Fisher Co. Ltd., Los Angeles, $49,445; C. O. Sparks and Mundo Engineering Co., Los Angeles, $52,281; R. R. Bishop, Long Beach, $51,615; Griffith Co., Los Angeles, $48,993; D. W. Thurston, Los Angeles, $50,316; J. E. Haddock, Ltd., Pasadena, $48,186; Carlo Bongiovanni, Los Angeles, $55,484. Contract awarded to B. G. Carroll, San Diego, $46,811.

SAN DIEGO COUNTY—Between one mile south of San Onofre and north county line about 2.6 miles to be graded, paved with Portland cement concrete and plant-mixed surfacing on crusher run base to be placed. District XI, Route 2. Section D. Daley Corp., San Diego, $109,319: David H. Ryan, San Diego, $112,693; Metropolitan Construction Co., Los Angeles, $140,358; C. Fisher Co., Ltd., Los Angeles, $112,840; E. Paul Ford. San Diego. $105,598; C. O. Sparks and Mundo Engineering Co., Los Angeles, $180,093: Oswald Bros., Los Angeles. $124,438; Griffith Co., Los Angeles, $121,889; D. W. Thurston, Los Angeles, $112,121; J. E. Haddock, Ltd., Pasadena, $122,395. Contract awarded to B. G. Carroll, San Diego, $104,466.10.

SAN DIEGO and IMPERIAL COUNTIES—Furnish and apply liquid asphalt between Julian and Kane Springs, 30.5 miles. District XI, Route 198, Sections E, F, G, A. Morgan Bros., Maywood, $5,485; Regal Oil Co., Long Beach, $5,007; Paulsen and March, Inc., Los Angeles, $6,015; Gilmore Oil Co., Los Angeles. $5,087. Contract

(Continued on page 25)



Horse-drawn equipment spreading asphaltic oil surface on concrete pavement north of Fresno in 1913. Modern asphalt spreader.

State Highway Commission Observes 25th Anniversary

(Continued from page 11)

It was not, however, until the 1923 session of the legislature that action was taken and approved by the Governor imposing a tax of two cents per gallon of gasoline. This law provided that one cent of the tax be used by the Division of Highways for reconstruction and maintenance of State highways and one cent be distributed among the counties for improvement to county roads.

REORGANIZATION

In 1921 the State Department of Public Works was created with the Division of Highways as a subdivision. With the advent of Governor Friend W. Richardson into office in 1923 the Highway Commission was taken out of the Department of Public Works and established as a separate State Department. Under this new Commission the mileage on the State system was redistributed and three districts added to the original seven into which the State was divided in 1911.

During the period from 1923 to 1927, while revenues from the gas tax and vehicle registrations increased rapidly and reconstruction and maintenance activities advanced, it became evident that provision must be made for financing new construction on roads which had been made State highways but for which provision had not been made under the bond acts. This very apparent need was met by the 1927 session of the State legislature by the passage of an act providing for an additional one cent tax on gasoline, the proceeds to be used exclusively for new construction projects.

In July, 1927, the Department of Public Works was reorganized and the Division of Highways recreated as a unit in that State Department, and the Division has remained in the Department of Public Works since that time.

In 1933 the legislation establishing the gasoline tax was amended to provide that an amount equal to ½-cent of the State's share of the revenue from the three cent tax should be apportioned to cities for improvement to State highway routes and city streets. This work was placed under the supervision of the Division of Highways, and in 1935 a new act provided for the allocation of an additional ½-cent to cities for use on city streets other than State highway routes and the 1933 act amended to limit the original ½-cent to State routes within cities.

Other legislation in 1933 lifted the restriction stipulating that the State's share of the 1923 gas tax could not be used for new construction and provided that all funds accruing to the State for highway purposes be placed in a single fund and allocations to construction, reconstruction and maintenance be left in the hands of the California Highway Commission in biennial budgets with the limitations that an amount equal to not more than the revenue from one cent tax per gallon of gasoline be budgeted for maintenance and that administration charges should not exceed two per cent of the revenue.

At the inception of the State highway system in 1909 the legislature provided for 3,082 miles of road. Extensions added by the second and third bond acts increased the total mileage to 5,560. Subsequent legislative additions, particularly that of 1933, have added highways to the system to the extent that there are now approximately 13,900 miles of State highways of which nearly 12,700 miles are rural roads.

The following tabulation gives the yearly mileage since 1918:

MILEAGE OF STATE HIGHWAY SYSTEM

Year	Total Mileage Improved Roads	Total System Mileage	Year	Total Mileage Improved Roads	Total System Mileage
1918	1,808	4,421	1930	4,784	6,581
1920	2,495	6,168	1931	5,574	7,332
1922	3,840	6,400	1932	5,735	7,347
1924	3,866	6,400	1933	9,782	14,006
1926	4,160	6,589	1934	9,839	14,019
1928	4,332	6,565	1935*	9,783	13,958
			1936*	10,152	13,870

* The decrease in mileage in 1935 and 1936 is due to completion of construction and rerouting of highways.

TOTAL MILEAGE OF STATE HIGHWAYS IN CALIFORNIA BY TYPES—JANUARY 1, 1936.

Type	Total Mileage
Paved	6,690
Low-cost bituminous surface	3,506
Oiled, graded or unimproved	3,674
Total	13,870

STEADY PROGRESS

During this twenty-five years, as the mileage and funds required for construction and maintenance purposes have been rapidly increasing, engineering standards and construction practice have made remarkable advances.

Alignment and grade standards of 1912 have long since become obsolete, short radius curves and rolling grade lines have given way to long sweeping curvature with constant grade. Improvements in grading machinery have made possible excavation of cuts and construction of embankments to depths and yardage which only two decades ago would have been considered highly impractical.

Width and thickness of pavements have undergone changes. Heavy trucking equipment requires heavy pavements and high speed traffic demands wide pavements, so the old sixteen-foot pavements, four inches thick, have been increased to eleven-inch pavements laid in widths from twenty to forty feet providing for multiple lanes of traffic, and now the trend is to divided highways separating traffic moving in opposite directions.

BRIDGE CONSTRUCTION

Bridge construction has undergone a similar transition, while basic designs have remained more or less the same, deck widths and strength required for increased loadings have had to be adjusted to meet the requirements of present day traffic. Construction of both rail and highway grade separations have increased to a volume nearly equal to that of bridge construction in order to provide safer facilities for travel.

The State highway organization of necessity has grown with the expansion of the system. The original seven districts have been increased to eleven and the four hundred employees of the first Highway Commission in 1912 have been replaced by the nearly 6000 individuals now in the employ of the Division of Highways. It is of interest to note that of those original 400 the names of 54 are still on the highway roll for 1937.

VITAL FEDERAL AID

In this great growth of the State highway system, one of the vital factors has been the federal aid which has been given to California during the past twenty years.

On March 16, 1917, the Governor signed an act of the California State legislature accepting the provisions of the Federal Aid Road Act of 1916. This federal act established a Federal Aid Highway System on the State systems of each State and made available federal funds for improvement to these designated highways.

In California this federal system originally included some 4,900 miles, which, when 90% had been improved, was increased to 5,600 miles. In addition thereto, California has 558 miles situated in national forests and other federal reservations giving a total of 6,158 miles of federal roads on the State system.

LARGE INVESTMENT IN ROADS

Since 1917 regular federal aid funds have been allotted to California amounting to approximately $61,000,000. In addition to these funds federal allocations have been made in the amount of $52,143,000 from the various relief appropriations of Congress for work on the State highway system and feeder roads.

Beginning with the $18,000,000 bond issue of 1909, the people of California, and the Federal Government have provided for the construction and maintenance of State highways through the various sources of revenue which have been described with the result that California has become one of the leaders, not only in the United States but in the world, in the development of high standards of highway design, construction and improvement. The total income of the Division of Highways from 1912 to June 30, 1937, has amounted to $497,030,000, from which expenditures on the State highway system have been made in the sum of $492,746,000.

This capital investment by California is one of the State's greatest assets and has been an important means in much of the development of both the economic and cultural life of her citizens during the past twenty-five years.

Members of California Highway Commission From August 2, 1911, to September 1, 1937

Name	Residence	Date of Appointment	Termination of Membership
Burton A. Towne	Lodi	Aug. 2, 1911	Resigned Jan. 14, 1914
Charles D. Blaney*	Saratoga	Aug. 2, 1911	Resigned Mar. 1, 1917
N. D. Darlington	Los Angeles	Aug. 2, 1911	Resigned Jan. 8, 1923
Charles F. Stern	Eureka	Jan. 15, 1914	Resigned Dec. 21, 1918
Henry J. Widenmann*	Vallejo	Mar. 1, 1917	Died Oct. 6, 1918
Charles A. Whitmore	Visalia	Nov. 29, 1918	Resigned Jan. 8, 1923
Emmett Phillips*	Sacramento	Dec. 21, 1918	Died June 18, 1919
George C. Mansfield*	Oroville	June 24, 1919	Resigned Jan. 9, 1923
Harvey M. Toy	San Francisco	Jan. 9, 1923	Resigned Jan. 3, 1927
Louis Everding	Arcata	Jan. 9, 1923	Resigned Jan. 17, 1927
Nelson T. Edwards	Orange	Jan. 10, 1923	Resigned Jan. 3, 1927
Ralph W. Bull	Eureka	Jan. 6, 1927	Resigned Jan. 6, 1931
J. P. Baumgartner	Santa Ana	Jan. 6, 1927	Resigned Jan. 6, 1931
M. B. Harris	Fresno	April 18, 1927	Resigned Jan. 6, 1931
Joseph M. Schenck	Los Angeles	Aug. 19, 1927	Resigned Jan. 6, 1931
Fred S. Moody*	San Francisco	Aug. 19, 1927	Resigned Jan. 6, 1931
Earl Lee Kelly	Redding	Jan. 6, 1931	Resigned Oct. 18, 1932
Frank A. Tetley	Riverside	Jan. 6, 1931	Resigned July 31, 1935
Timothy A. Reardon	San Francisco	Jan. 6, 1931	Resigned May 5, 1936
Harry A. Hopkins	Taft	Jan. 6, 1931	
Philip A. Stanton	Anaheim	Jan. 6, 1931	
Dr. W. W. Barham	Yreka	Dec. 20, 1932	Resigned May 21, 1935
Ray Ingels	Ukiah	May 21, 1935	Resigned Oct. 4, 1935
C. O. Hamilton*	Banning	Aug. 1, 1935	Died April 24, 1936
H. Ray Judah	Santa Cruz	May 6, 1936	
Paul A. Jasper	Fortuna	May 6, 1936	

* Deceased

"Did you read about that movie actor's mystery marriage?"

"No, I'm too darn busy puzzling about my own."

Federal Accident Studies Planned

Various leaders in Congress are considering the idea of expanding facilities of the United States Census Bureau to collect more adequate statistics on motor accidents. Cooperation of the States would be enlisted.

The report states there is growing recognition of need for more complete facts on the number of motor vehicle deaths and injuries and data on the circumstances of accidents.

This is said to have been emphasized by the wide variance in recent estimates of the number of motor fatalities in the United States last year.

Motor vehicles in the United States last year used 535,000,000 gallons of lubricants, according to a preliminary estimate received by the Automobile Club of Southern California.

"When the judge ruled Smith had to pay alimony how did he feel about it?"

"Chagrined."

"And how did his wife feel about it?"

"She grinned."

IMPROVED SCREED ADJUSTMENTS FOR CEMENT CONCRETE FINISHING MACHINES

By H. J. DOGGART, Resident Engineer, District V

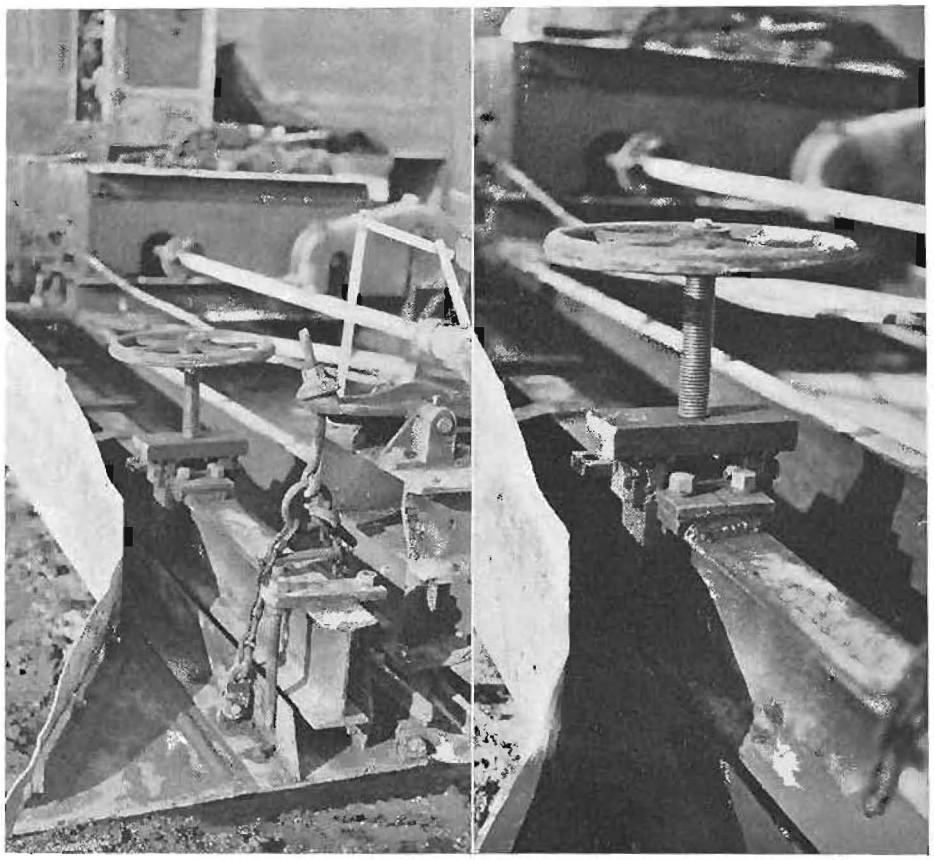
CONTRACT 85TC2, road V-Mon-2-H&I, from Bradley to six miles south of San Ardo, in Monterey County, was one of the few projects during 1936 in which Portland cement concrete pavement was specified to be laid in twenty-foot widths.

Since this project traversed a rolling, foothill territory along the Salinas River, horizontal curvature was frequent, and continual warping of pavement crown into superelevation was necessary. In order not to distort the superelevation by carrying the crowned section through the curves, it was necessary to adjust the screeds of the finishing machine as the equipment proceeded in and out of the superelevation.

The adjustment with which the available type of machine is equipped is not speedy enough for this purpose without seriously delaying the progress of the work. At the beginning of paving operations before finisher screed adjustments were made, it was necessary to shut down the mixer for a period of several hours while a pavement curve was being constructed.

The Peninsula Paving Company, Contractor, requested the Construction Department of the Division of Highways to assist in solving this difficulty. Through conference with the writer, the Contractor's General Manager, Miss A. L. Beard, and Master Mechanic O. M. Johnson, the following design was decided upon, and built under Mr. Johnson's direction:

The regular screed plate was not sufficiently rigid without the multiple points of adjustment to strengthen it, in order to insure its remaining in adjustment. To overcome this defect, two 3½-inch by 2½-inch by ⅛-inch angle irons were welded to the upper side of the screed plate longitudinally for the full length of the plate, and were cut at the two adjusting points in the center of the 21.5-foot overall length of screed. They were spaced at the proper interval to serve as guides for the 6¼-inch by 3¼-inch I-beam screed member, and prevent warping of the screed plate.



The picture on the left is a general view of the reconstructed screed; that on the right is a close-up view of screed adjusting device.

It was considered necessary to have an adjustment out near the end of the screed and a quarter point adjustment in the middle of each ten-foot section.

The screed was first so constructed, but under operating conditions, it was found that the screed plate was now sufficiently rigid, and the quarter point adjustment was unnecessary. The active adjustment consisted of a vertical 1¼-inch round bolt with 7 threads per inch, and a 12-inch wheel mounted on the top to speed up the adjustment.

The extreme end pairs of the original adjusting bolts were left in place to serve as tilting controls for the screed end shoe. The set of adjustments in the mid-point of the screed were drawn up tight and remained in the same position for any setting of the screed plate. This in effect, hinged the screed plate in the center, and permitted the plate to be crowned by turning the adjusting wheel at each end of the plate. The two-wheel adjustments replace the original 48 adjusting nuts with which each screed was originally equipped.

This method of adjustment was so successful that the finishing machine operator was able to make the proper adjustments at 20-inch intervals throughout the transition and operate the machine without any loss of time to the mixing unit or delay to the finishing operations following the machine.

Highway Bids and Awards for August, 1937

(Continued from page 21)

awarded to Square Oil Co., Inc., Los Angeles, $4,995.

SAN LUIS OBISPO and SANTA BARBARA COUNTIES—Between San Luis Obispo and Toro Creek, between Las Cruces and Lompoc, and between Lompoc and Santa Ynez, about 18.5 miles to be surfaced with plant-mixed surfacing and seal coat. District V, Routes 56 and 149, Sections D, AB, B, D. Granite Construction Co., Ltd., Watsonville, $28,796; R. E. Hazard and Sons, San Diego, $33,415. Contract awarded to L. A. Brisco, Arroyo Grande, $26,521.26.

SHASTA COUNTY—At Salt Creek about 13 miles east of Redding, remove existing timber truss and furnish and install steel plate girder. District II, Route 28, Section A. M. B. McGowan, Inc., San Francisco, $4,999; J. P. Brennan, Redding, $5,465. Contract awarded to M. A. Jenkins, Sacramento, $4,192.20.

SISKIYOU COUNTY—A reinforced concrete slab bridge across Scott River about one mile southwest of Fort Jones, consisting of four 30-foot 6-inch spans and two 23-foot spans on concrete pile bents, and approximately 0.4 mile of roadway to be graded and road-mix surfacing to be applied. District II, Route 82, Section C. Chas. Kuppinger, Lakeport, $33,698; J. P. Brennan, Redding, $35,080; W. K. Van Bokkelen, Alameda, $37,877. Contract awarded to A. Soda and Son, Oakland, $30,562.

SOLANO COUNTY—Between Carquinez Bridge and 0.9 mile north about 0.8 mile to be graded and paved with Portland cement concrete and plant-mixed surfacing. District X, Route 7, Section F. A. Teichert and Son., Inc., Sacramento, $77,184; Fredericksen and Westbrook, Lower Lake, $74,978; Bodenhamer Construction Co., Oakland, $75,948; A. G. Raisch, San Francisco, $77,187; Macco Construction Company. Clearwater, $81,517; Chas. L. Harney, San Francisco, $81,304; Louis Biasotti and Son, Stockton, $83,777; Frederickson and Watson Construction Co., Frederickson Bros., Oakland, $86,313. Contract awarded to Union Paving Co., San Francisco, $70,737.70.

TEHAMA COUNTY—Between south boundary and Corning, about 8.9 miles, seal coat to be applied. District II, Route 7, Section A. Granite Construction Co., Watsonville, $5,518; E. A. Forde, San Anselmo, $5,564; Hayward Building Material Co., Hayward, $5,755; Lee J. Immel, Berkeley, $5,777; Tieslau Bros., Inc., Berkeley, $5,882; E. F. Hilliard, Sacramento, $6,153; N. M. Ball Sons, Berkeley, $6,627; Hemstreet and Bell, Marysville, $6,836. Contract awarded to Garcia Construction Co., Irvington, $5,358.75.

TRINITY COUNTY—Between Helena and Big Bar, about 8.5 miles in length to be surfaced with road-mix surfacing. District II, Route 20, Section E. Garcia Construction Co., Irvington, $90,080; McReynolds Trucking Co., Oakland, $9,646; Tieslau Bros., Inc., Berkeley, $9,841; Pacific Truck Service, Inc., San Jose, $10,011; George French, Jr., Stockton, $11,240; Helwig Construction Co., Sebastopol, $11,540; Lee J. Immel, Berkeley, $13,325. Contract awarded to E. E. Smith, Eureka, $8,595.

Julius: "I hear that Nero is torturing the Christians again."

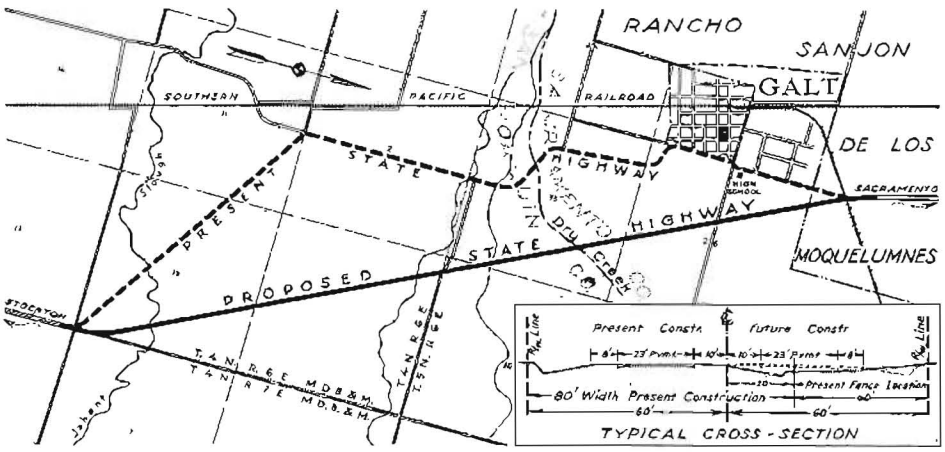
Marcus: "Yeah, someone ought to take that fiddle away from him."

Galt Highway Change Will Eliminate Hazards

By R. E. PIERCE, District Engineer

AN IMPORTANT improvement in U. S. 99, in the vicinity of Galt, Sacramento County, which has been under consideration for many years, should be under construction early this fall.

Starting just north of the Southern Pacific Railroad, Ione Branch, north of Galt, the new line will run in a straight line southeasterly to Dry Creek, the county boundary between Sacramento and San Joaquin counties; thence continuing on the same course until it connects with the present highway at Jahant Corner on Cherokee Lane. The length of the new line is 4.98 miles, making a saving in distance of 0.57 mile over the present route.



WILL ELIMINATE NINE CURVES

The new line will eliminate nine curves, ranging in radius from 368 feet to 3000 feet, having a total angle of over 371 degrees, or more than one complete circle; while the new line will have only two curves, one at each end of the change, with radii of 3000 feet and 5000 feet, and a total angle of less than 37 degrees.

Another important feature will be a new bridge over Dry Creek of adequate width. The present bridge is narrow and has been a bottle-neck for years.

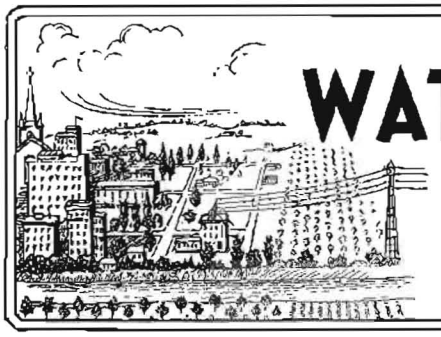
This project has been planned for an ultimate two-way divided roadway, both as to right of way and location of the two lanes. This will be accomplished by acquiring a right of way 120 feet in width and placing the two lanes, now to be constructed, on an offset, so that a 20-foot separation will be provided on the ultimate divided roadway.

DISTANCE SHORTENED

This is the first project in this district on which additional lane width over the old standard 10-foot lane will be constructed. The new pavement will consist of two 11-foot lanes.

The method of handling the right of way is slightly different. A width of 120 feet is being acquired. It is planned to place the fences so that the two lanes now being constructed will center on an 80-foot strip on the west side of the right of way, the other 40 feet being available for use by the adjacent property owner until such time as the highway is developed to its ultimate section.

This new line by shortening distance, by-passing the narrow business street in Galt, and with much improved alignment, should materially increase the capacity and safety on this road on which more than 4000 cars travel daily.



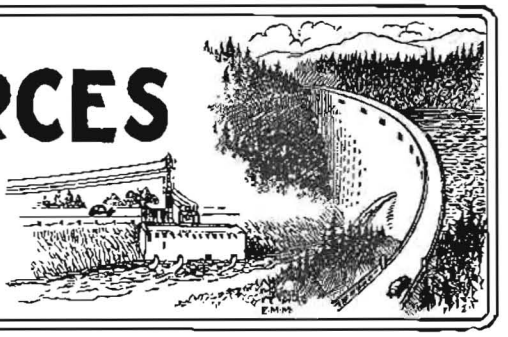
DIVISION OF WATER RESOURCES

OFFICIAL REPORT

FOR THE MONTH OF

August, 1937

EDWARD HYATT, State Engineer



The Interior Department Appropriation Bill providing $12,500,000 for construction of the Central Valley Project has been approved by the President. This appropriation will make approximately $22,500,000 available for construction during the current fiscal year as about $10,000,000 remains in unexpended funds previously appropriated.

The President has also signed the Rivers and Harbors Bill which carries an amendment officially authorizing the Central Valley Project as a Federal undertaking, and removes all legal obstacles to its consummation. With the approval of the Interior Department Bill carrying the appropriation for the project and its authorization as a Federal project in the Rivers and Harbors Bill, work will be carried out without delay.

IRRIGATION DISTRICTS

Refinancing of outstanding bonded indebtedness through loans from the Reconstruction Finance Corporation has made steady progress. By provisions of an act passed at the last Legislative session the districts are enabled to proceed with their programs by filing petitions in the Superior Courts when plans have been accepted by two-thirds of the bond holders and approved by the California Districts Securities Commission. Under this act plans of Palo Verde, El Dorado, James, Merced, Lindsay-Strathmore and Anderson-Cottonwood districts have recently been approved.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Investigation is being made as to the structure and material composing a section about 300 feet long in the south levee of the Sacramento By-pass, which shows a tendency to slide and settle when wet. It is expected that this section may have to be rebuilt with suitable material.

Relief Labor Work.

W.P.A. Project No. 6654 in Yolo County, on which men were engaged in cleaning levees and clearing brush in the Sacramento By-pass, was discontinued on August 24, 1937. It is expected that men will be available to resume this work on about October 15th.

Bank Protection Program.

The maintenance program recommended by the Chief of Engineers, included in the report of the Board of Engineers for Rivers and Harbors dated June 14, 1937, and contained in Senate Committee Document 75th Congress, "Sacramento River Flood Control Project, California," included in the Rivers and Harbors Act, HR 7051, 75th Congress, 1st Session, has been approved by the President.

This act provides for the amendment of the present project act to increase the Federal allocation to the Sacramento flood control project by $2,500,000 to be expended as the Federal participation in the maintenance of the flood control project during a five-year period, and to include a complete program for bank protection on the main Sacramento River. The State of California will contribute one-third of the total cost of bank protection and levee set-backs.

A program for bank protection has been tentatively selected to include works which will cost in all approximately $150,000, of which the State will pay $50,000. This work will include the extension of several of the units constructed during the last year, and new units to be done include those which are considered to be most urgently needed. Actual construction by the War Department is now under way on several of these units.

SACRAMENTO FLOOD CONTROL PROJECT

The Reclamation Board has requested this office to undertake the construction of an irrigation canal in the vicinity of the Colusa By-pass and the filling of the borrow pit on the Burr Mitchell property at the levee along the right bank of the Sacramento River north of Colusa. Both of these works are in connection with the acquisition of rights-of-way and flowage easements, both at an estimated cost of $37,000. Preliminary surveys have been made during this period of these projects.

SUPERVISION OF DAMS

Application was filed on August 12, 1937, by the Whiting Company, El Toro, California, for approval of the plans and specifications for the construction of Whiting Dam. This dam is to be a rolled earth fill structure 41 feet in height and storing 600 acre-feet and is estimated to cost $30,000. It is to be located on a tributary to San Diego Creek in Orange County.

Application for approval of plans for the repair and alteration of the Pilarcitos Dam was filed on July 30 1937, by the City and County of San Francisco. This application was approved on August 10, 1937.

Application was filed on August 13, 1937, by the Tuolumne Gold Dredging Corporation, La Grange, California, for the alteration of the Cardoza Dam. This application was approved on August 23, 1937.

Application was filed on August 19, 1937, by the Nevada Irrigation District, Grass Valley, for the approval of plans for the repair and alteration of the French Lake Dam.

The work at present under way at the Mad River Dam of the city of Eureka consists of pouring concrete on the left abutment sections, preparations for the pouring on the arch sections and the excavation of the stream bed upstream from the arch for the placing of impervious fill.

WATER RIGHTS

Supervision of Appropriations of Water.

Thirty-seven applications to appropriate water were received during July. Fourteen were denied and fifteen were approved. In the same period, nine permits were revoked and rights were confirmed by the issuance of licenses in twelve other cases.

That mining continues to predominate as an important activity among new appropriators is evidenced by the large applications which are filed for mining purposes and permits issued. Among the applications received during July was one for an appropriation of 150 second-feet in Humboldt and Trinity counties at a cost of $150,000. Another for an appropriation in Trinity County at a cost of $60,000 and numerous other applications for large amounts. The largest single appropriation allowed during the month was for mining purposes.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

Activities during the past month have been in the field gathering data from which to make of record the amount of water diverted from the streams in the Sacramento and San Joaquin valleys. This report will also show the amount of land irrigated, the return flow therefrom and also the flow in the valley streams. The sampling of water in the delta for salinity is being carried on at a number of stations sufficient to record the rate of advance of the salinity.

TRAFFIC CONGESTION ON ROUTE 4 IS RELIEVED

Completed by the Griffith Company of Los Angeles in July at a cost of $241,000, the additions to the old two-lane pavement for eleven and seven-tenths miles south from Grove Street in Bakersfield on Route 4 has now relieved the traffic congestion which was developing on this main artery from the San Joaquin Valley to Los Angeles. The work was financed jointly by the State and the city of Bakersfield which contributed $27,000 for the work inside the city limits.

Four paved lanes with shoulders oiled out to the curb lines are now provided inside the city; three lanes extend ten and one-half miles south from the city limits. Funds provided in the present budget will finance a contract to be let this year which will connect this improvement with the three-lane pavement from Los Angeles at Grapevine to give a minimum of three lanes for the full distance of 112 miles from Los Angeles to Bakersfield.

As shown in the upper picture, four traffic lanes are now provided from the center of Bakersfield to the south city limits.

The lower picture was taken south of Bakersfield and shows the wide traffic lanes which add to the safety in passing on this heavy freight route from the San Joaquin Valley to Los Angeles.

Cost of Drilling Cut Down By New Equipment

(Continued from page 2)

duty 110-volt, 1000-watt generator, providing lights for night operating is also built into the motor assembly.

The main hoisting unit is a 7-ton, double drum type with a three speed transmission. Both of the drums are supplied with ¾-inch steel cables, for sampling and drilling lines. A small single drum utility hoist, with nigger head attachment is mounted near the derrick for operating a sand line.

The derrick was constructed from heavy steel ship channels and designed for a thirty ton pull. A Keystone Spudding sheave assembly is welded to the top of the derrick for the spudding cable and the sand line. Two additional sheaves accommodate a heavy pulling line for sampler operations. The overall height of the derrick is 32 feet from the ground when erected, and eleven feet six inches when folded and ready for the road.

ASSEMBLY

Power from the motor and transmission assembly is carried through an extension shaft to the main drive sprocket. Through the medium of a 4-inch chain, power is then transmitted to a main countershaft mounted parallel with the engine. This shaft serves the dual purpose of driving a secondary longitudinal countershaft through mitre gears and a secondary transverse countershaft which operates the spudding pinion and utility hoist. The longitudinal shaft drives the double drum hoist and the rotary table. Double and triple tooth sprockets and chains are used throughout for transmitting the power. All shafts are mounted in self-aligning roller bearings.

The entire unit complete with drilling tools is transported on the four-wheel drive truck. This truck, equipped with tractor tread type tires and dual rear wheels, has proved its worth on steep hillside climbs and pulling over soft unstable ground.

A 2-inch, two-stage centrifugal pump mounted on a separate skid frame and powered with a 4 cylinder, 12 h.p. air cooled gasoline engine is used in conjunction with the drill outfit for dewatering holes and jetting casing when required. A 2-inch Ventura tube type hydro-jet is used in conjunction with the pump for dewatering holes and making tests of ground water flow. The latter assembly can be used to dewater a 7-inch hole to a depth of about 120 feet if the inflow does not exceed 20 gallons per minute.

SAVING IN DRILLING COSTS

Since the rig was constructed in February, 1937, it has worked very satisfactorily and proved invaluable for investigating a variety of foundation conditions. Approximately 70 holes, twenty-four inches in diameter, have been bored to depths varying between 30 and 80 feet and averaging 45 feet at costs of $0.25 to $0.75 per foot in clay and shaly clay, and between $0.50 and $1.00 per foot in soft shales and cemented sand formations.

These drilling costs are exclusive of overhead but include all labor charges and a drill rental of $2.50 per hour. Sinking of shafts in similar ground, under old methods, to depths of 20 or 30 feet often cost more than $5 to $10 per foot making such exploration too expensive for extensive use. The cost of procuring cores with the new type Porter Soil Sampler has also been reduced through the development of this special drill outfit.

General requirements for the drill and equipment were drawn by the writer. Mr. F. E. Burnside, Shop Superintendent of the Equipment Department, and Mr. C. M. Sanborn, Foundation Drilling Foreman of the Materials and Research Department, supervised the mechanical design and construction of the outfit.

Since the drill was completed, it has not been returned to the shop for alterations or repairs, and this very satisfactory operation reflects the sufficiency of the design and the excellence of the work done by the Equipment Department.

Eugene, Oregon,
August 28, 1937.

California Highway
Department.

Dear Sirs:

Last Tuesday, Aug. 24, on my way north 27 miles south of Cave City, I broke an axle of my car to which a trailer was attached. The accident happened on an incline and in a dangerous position on account of curves.

It was but a short time before your maintenance department auto came along and towed me up the mountain so that I would be off the highway, for which I was grateful. The service I received did not end there. Mr. Horace C. Nutting, your maintenance foreman, took the time and patience to find out what the trouble was so that I could advise a mechanic at Crescent City or Grant's Pass. The trouble could not be defined until Mr. Nutting took the time to locate it.

In all my travels I never met as courteous a gentleman and I want to commend him to you. I will greatly appreciate it if you will advise him of this letter, if it is not against the rules of your department.

I would like also to commend the State of California on its wonderful highways. As a visitor that has traveled practically every mile of your State, I can not but praise your splendid highways.

I have been traveling on a sightseeing vacation for three years all over the United States and I feel that I am a judge of your highways.

I am respectfully,

(Signed) WM. T. PARSONS,
508 Schwehm Building,
Atlantic City, N. J.

Automobile drivers who limit their top speed to 50 miles per hour are 72 per cent safer than the average motorist, according to a recent survey by an eastern insurance organization.

Judge—What were you doing when that joint was raided?

Locksmith—Making a bolt for the door, yer honor.

STATE OF CALIFORNIA

Department of Public Works

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

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JUSTUS F. CRAEMER.....Assistant Director

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

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C. S. POPE, Construction Engineer
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L. V. CAMPBELL, Engineer of City and Cooperative Projects
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E. R. HIGGINS, Comptroller

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R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego

SAN FRANCISCO-OAKLAND BAY BRIDGE

C. E. ANDREW, Bridge Engineer

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Port of Eureka—William Clark, Sr., Surveyor

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

MAP
SHOWING
STATE HIGHWAY SYSTEM