

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



*Scene near Crestview
on East of Sierra Highway, State Route 23.*

Official Journal of the Department of Public Works
JULY 1936

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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Highway Budget Revised for Last Half of the Biennium

By GEORGE T. McCOY, Assistant State Highway Engineer

THE close of the first half of the current budgetary biennium, composed of the 87th-88th fiscal years covering the period from July 1, 1935, to June 30, 1937, finds the Division of Highways in a more favorable financial position than was anticipated one year ago at the outset of the biennium.

Some revision of the State Highway biennial budget has been necessary because revenues from the tax on the sale of gasoline have exceeded estimates made at the time of the preparation of the budget by about 14 per cent.

For the original budget the State's share of gas tax revenue was estimated at \$46,500,000 for the biennium. From revenues received during the first half of the biennium it has become evident that the total of the State's share of the gasoline tax will amount to approximately \$53,000,000 during the biennium.

Of this \$6,500,000 increase, statutory allocations to cities will amount to approximately \$1,625,000, leaving about \$4,875,000 for State Highway work additional to the funds on which the original budget was based. In conformity with the requirements of the Breed Act, and its amendments, this amount has been segregated in the proper proportions to the forty-five northern counties and the thirteen southern counties for construction on State primary and secondary routes, and has been voted to specific construction projects by the California Highway Commission.

There was a period when it appeared doubtful that additional projects could be provided for with these funds as, at the beginning of the last session of Congress, the

President recommended that appropriation of Federal funds for the 1937 portion of Federal Aid provided under the Hayden-Cartwright Act be postponed. Such an action would have meant a loss to California of \$4,751,700 which had been included for proposed projects at the time the original State Highway budget was prepared. The appropriation was, however, passed by Congress and approved by the President on June 4, 1936.

The total regular Federal Aid accruing to California under the provisions of the Hayden-Cartwright Act, and upon which the State Highway budget was based, amounted to approximately \$9,500,000 for the biennium. This amount together with the \$15,200,000 apportioned to California from Works Program Highway Funds and Works Program Grade Crossing Funds makes a total of approximately \$24,700,000 for State Highway expenditures for the period from July 1, 1935, to June 30, 1937, for which reimbursement from the Federal Government is expected.

This total amount was allocated to major construction projects and at the present time the work

has been completed or is under way on all but a portion of the projects proposed to be financed with the aid of the funds recently appropriated by Congress.

The intensive construction program which State and Federal funds have made possible for the biennium has resulted in the necessity of an adequate cash balance for the conduct of the large number of contracts involved in the work.

On June 1, 1936, cash in the State Treasury to the credit of the State Highway Fund amounted to the sum

How California Ranks in Highway Construction Among 48 States

Type of road	Miles	Position with respect to 48 states
Total State Highway System	13,956	6
Total Improved Roads in State Highway System	12,617	6
Gravel Roads (oil treated and untreated)	5,657	4
Paved Roads	2,301	5
Bituminous Mix Surface	970	30
Oiled Earth Roads	2,473	3
Graded Roads	1,143	10
Average per Vehicle Revenue of \$23.51		46

(Continued on page 15)

New Cuesta Grade Will Eliminate 63 Curves

By
L. H. GIBSON
District Engineer

FOR the past several years, especially since the era of the fast moving automobile and heavy truck travel, the winding Cuesta Grade highway over the Santa Lucia Mountains, just north of San Luis Obispo and on the Coast Highway (U. S. 101), has presented an unwelcome interruption to the motorist traveling El Camino Real in an otherwise comfortable and easy trip.

The Santa Lucia Mountains which range northwesterly across the central coast section of the State have presented, as State history will verify, a definite problem to the varying stages of transportation from the days when the padres toiled afoot to today's modern car. The most feasible and

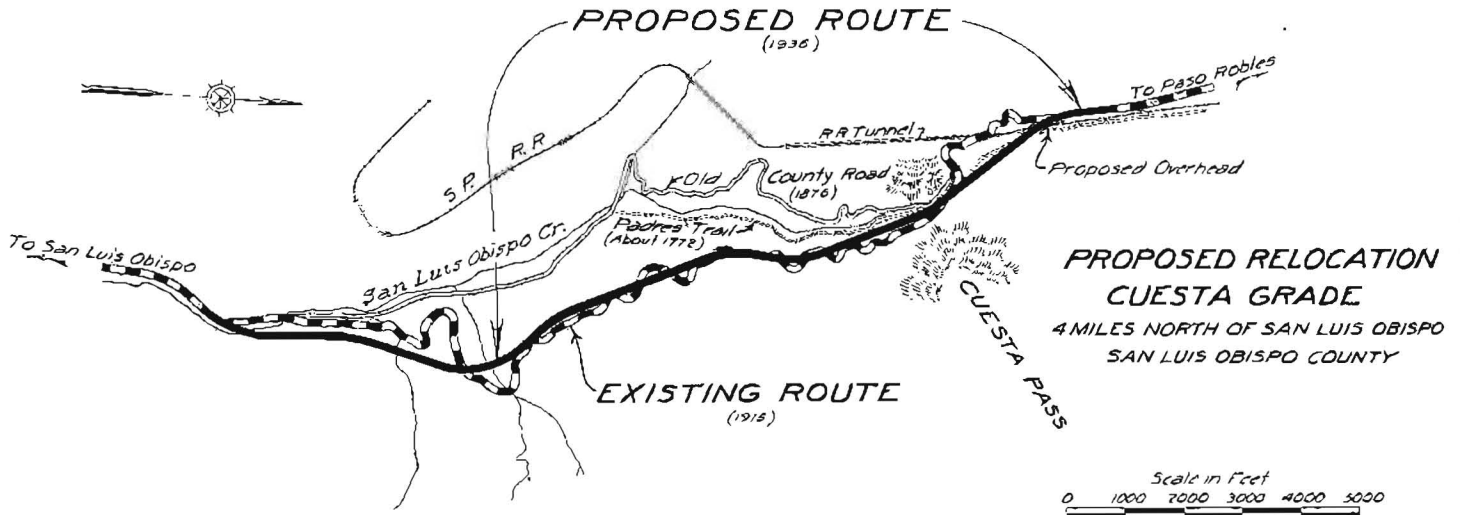
fluence in retarding the progress of the coast line of the Southern Pacific Railroad. The railroad was completed from San Francisco to Santa Margarita on the northerly side of the grade in 1889, but it was not until 1894 that the line, at great cost, was carried over the grade and down the long southerly slope to connect with the northerly end of the line from Los Angeles and Santa Barbara.

WAGON TRAIL BUILT

During the very early period the first demand for a road was felt and there still is visible in the bottom of San Luis Creek the first Cuesta Grade highway. This was merely a wagon trail, steep and rugged, but

struction of a main Coast road from San Francisco to Los Angeles was proposed, and the contract for grading to a 24-foot width and surfacing with gravel the present Cuesta Grade Highway along the easterly slope of the canyon was completed in 1915. The following year this road was oiled and remained that type until 1923 when a 21-foot width of 5'-6" P. C. C. pavement with a curb along each edge was laid.

This present road, although adequate at the time it was constructed and for sometime thereafter, is sadly lacking in present day standards to satisfy the requirements of the larger, heavier and faster traffic that has now developed. It is now the one remain-



direct route through this barrier lay northeasterly from where the city of San Luis Obispo now stands, following up from the south via San Luis Creek and thence down the northerly side into the upper reaches of the Salinas Valley.

MOUNTAINS PROVED BARRIER

It was at the southern foot of this grade that in 1772 Father Junipero Serra established Mission San Luis Obispo, the fifth of the California Missions, that it might not only serve as a school and church for the education and conversion of the Indians, but also as a resting place before starting the arduous ascent of the Cuesta Grade.

These same mountains had their in-

allowed the horse and wagon to transport supplies and gave a connection to the railroad for the early day stage coach. Old timers relate many thrilling experiences on this first road.

In 1876, the county of San Luis Obispo completed the first constructed highway over the Cuesta Grade, which was used until 1915 when the present grade was built. This county highway was a winding road with steep grades, unsurfaced and about 12 feet wide, and was constructed along the more steep and rugged westerly side of San Luis Canyon. This road is still in existence and travelable, and is sometimes driven over by local residents as a matter of diversion.

In the early California State Highway program, about 1912, the con-

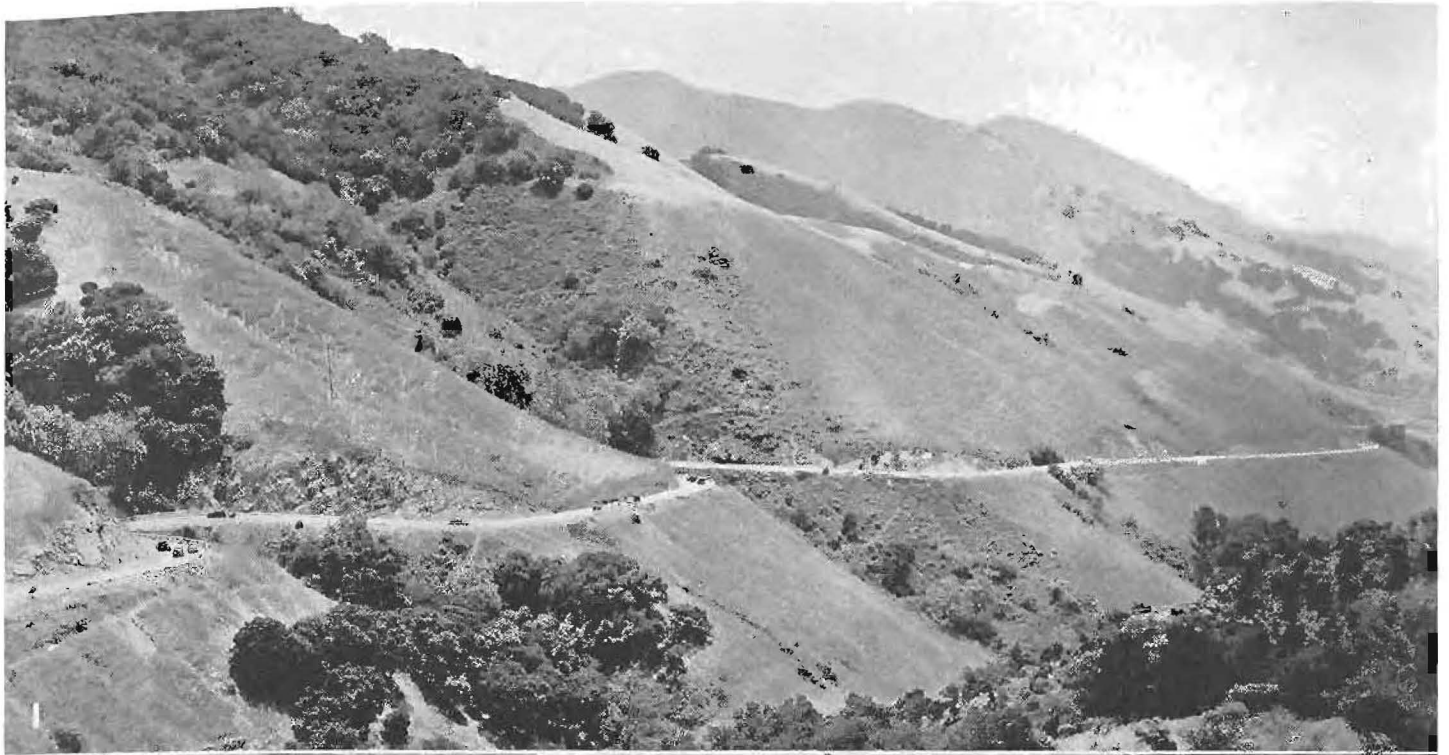
ing annoyance to the motorist using the Coast Highway, especially when he is bottled up behind slowly moving truck traffic without opportunity to pass safely because of limited sight distance.

FUNDS APPROPRIATED

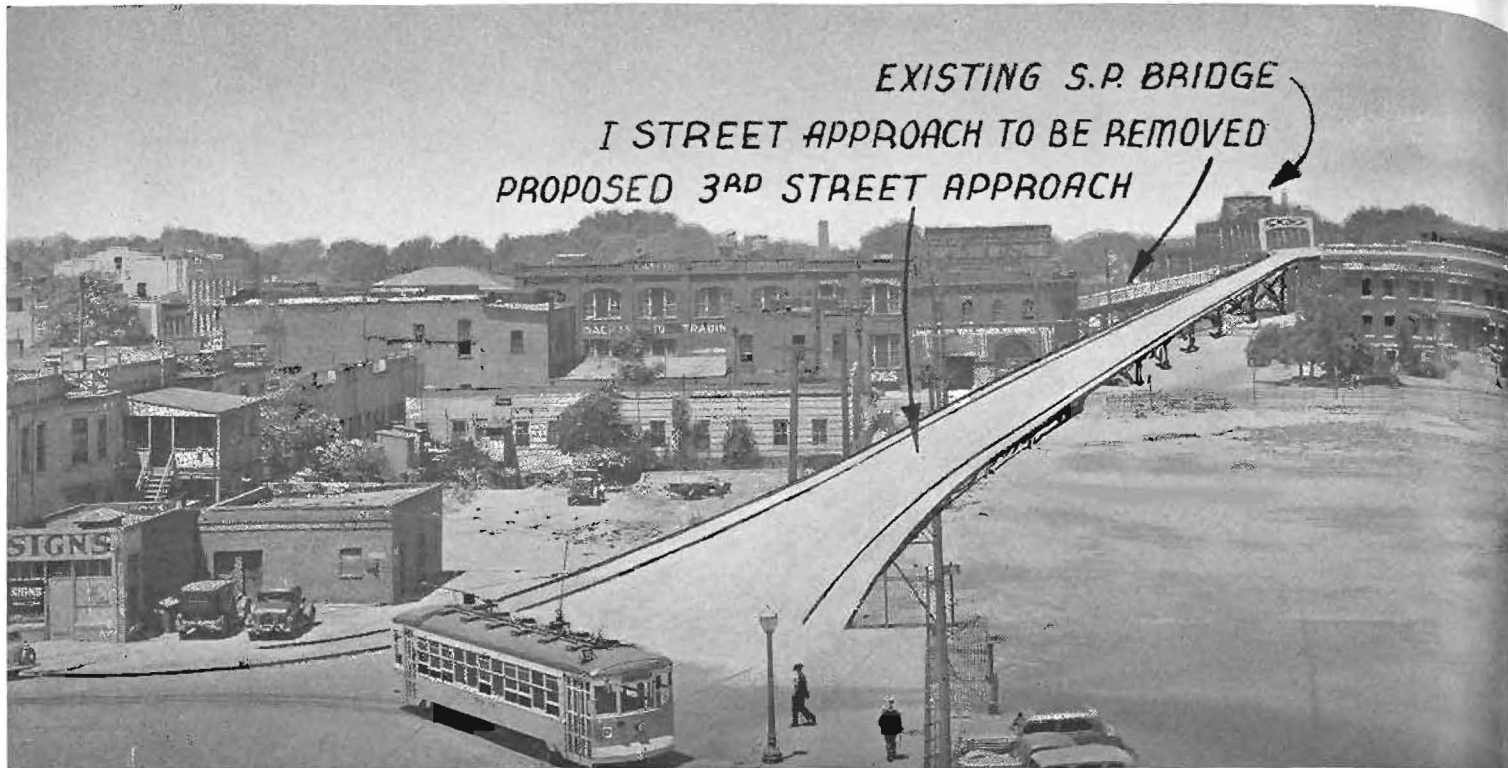
The California Highway Commission has appropriated funds to cover the cost of rebuilding the Cuesta Grade to line and grade consistent not only with the needs of today's traffic but anticipating requirements for many years to come.

Preliminary investigation and surveys have been under way for several months to determine the most feasible and economic location consistent with

(Continued on page 23)



Cuesta Grade Realignment Project. No. 1—Existing highway showing numerous sharp curves. Nos. 2-3—Traffic congestion behind slow moving vehicles. Nos. 4-5—Boring and testing to determine earth structure on new alignment.



JIBBOOM STREET GRADE SEPARATION AND BRIDGE APPROACH PROJECT IN SACRAMENTO

By Glenn L. Enke, Associate Bridge Designing Engineer

A COMBINED grade separation and bridge approach project now under construction in the city of Sacramento is another instance of the cooperation of State, city and the Federal government in providing a much needed highway improvement that in addition to enhancing transportation facilities also insures safety for motor traffic at present obliged to sort of run the gauntlet of moving trains across a dozen tracks of a busy railroad yard.

Located in an area of the city near the confluence of the Sacramento and American rivers, an historic thoroughfare now referred to as Jibboom Street extends from the close vicinity of the I Street or Southern Pacific bridge, across this triangular area to a bridge over the American River.

HISTORIC OLD STREET

The name "Jibboom Street" recalls to old Sacramentans an earlier day when Jibboom Street or Water Street, now a part of the Southern Pacific Railroad yards, fronted on the Sac-

ramento River and provided a place of business for commercial fishermen to tie up their boats and display their wares. It affords a short cut for traffic from the lower business section of the city across the main line and yard tracks of the Southern Pacific to the American River bridge connecting via the Garden Highway to Yuba City and Marysville with U. S. 99 E and via North Sacramento with the Auburn-Lake Tahoe Highway, U. S. 40.

No less than forty regular train movements occur at street grade across this yard every twenty-four hours in addition to a vastly greater amount of freight engine switching.

The Jibboom Street grade separation unit of the project which will be built by the State provides for a connection with a new approach to the I Street bridge from Third Street which will be built by the city of Sacramento.

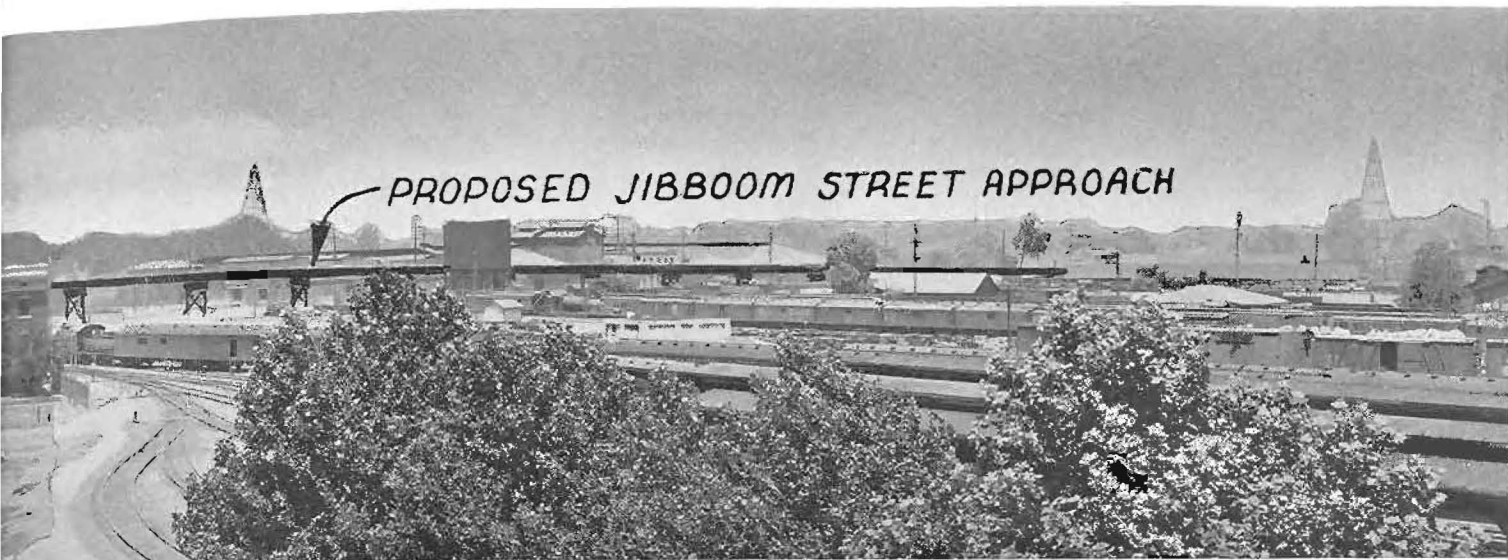
The Jibboom Street unit will be financed with U. S. Works Program Grade Crossing funds and the city

will finance the Third Street approach with a Federal loan or gas tax moneys accruing to the municipality.

Plans and specifications for both units were prepared by the State Division of Highways and the entire improvement will cost approximately \$300,000. Of this amount \$169,250 represents the total cost of the Jibboom Street unit for which the contract has already been awarded.

IMPROVES BRIDGE APPROACH

In addition to the benefits to be derived from the grade separation feature, the new combination structure will greatly improve the Sacramento entrance to the I Street bridge used jointly by the railroad and vehicular traffic, the latter being accommodated on the upper bridge deck. The existing vehicular approach from I Street is only 18 feet in width between curbs with two sharp angle turns and an abrupt change in grade at top and bottom. The new approach from Third Street will have a width of 34 feet and provide over



500 feet of sight distance to oncoming vehicles.

This approach to the I Street bridge forms a wye with the Jibboom Street unit, 24 feet in width, coming from the north parallel to the buildings of the Old Pioneer Mill. Maximum gradient is 6 per cent, no greater than the present approach. This wye is perfectly level, and of ample size to prevent traffic congestion.

PEDESTRIAN WALKS PROVIDED

Two 5-foot sidewalks are provided on the Third Street unit, one of them connecting into the present sidewalk along the south side of I Street bridge, the other continuing around and running north the full length of the Jibboom Street unit. No sidewalk will be constructed along the west side of this unit, as available side clearance between the structure and Old

Pioneer Mill is barely that required for train operation. The north side walk of the I Street bridge will be extended around the wye, ending at the head of a steel stairway leading down into the railroad yards. A series of 22 light standards will be placed throughout the structure to provide adequate illumination for night travel.

A feature of the design problem was to provide access across the railroad yard by the present road for the use of trucks stopping at Old Pioneer Mill. This road crosses under the Third Street unit at Second Street, diagonals across the railroad yard, and runs directly underneath the Jibboom Street unit for 550 feet.

RIGID FRAME CONSTRUCTION

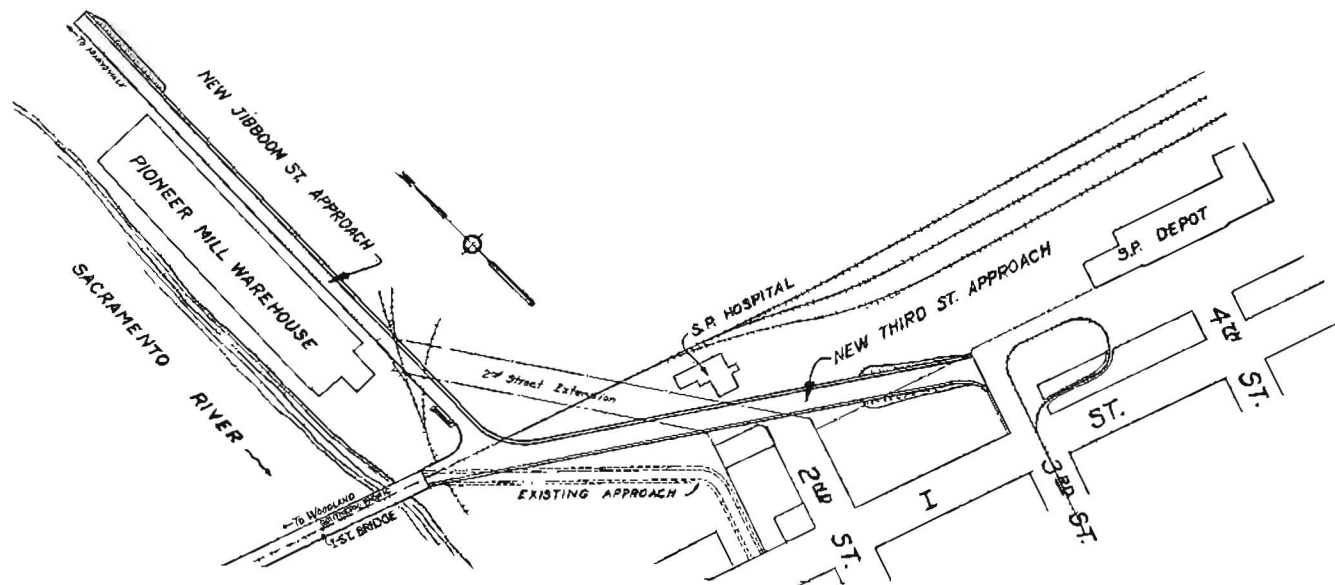
In these areas, therefore, no diagonal bracing of any kind could be

used between columns, and resort was had to what is called a "rigid frame" type of construction, wherein the columns and cross member supporting the bridge deck are rigidly fastened together and act as a unit in resisting vertical and horizontal forces. This construction was accomplished by using structural steel members resting upon concrete pedestals and timber pile foundations, and tied together underground to insure an adequate horizontal restraining force required with this type of layout. Both approach units, of steel and concrete construction throughout, are designed to resist earthquake forces.

MINIMUM OF INTERFERENCE

Underground utility lines complicated the layout problem, and in most instances practically dictated the loca-

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State-Wide Highway Planning Survey

By T. H. DENNIS, Maintenance Engineer

TO DATE in approximately forty states the Bureau of Public Roads has initiated state-wide highway planning projects. Thos. H. MacDonald, Chief of the Bureau of Public Roads, in commenting upon the necessity for such surveys, stated:

"Developments of the last year, especially the growing demand for improvement to secondary roads, have moved rapidly to the point where throughout the country it has been urgently necessary from the national point of view, that the factual material to be developed by such planning surveys be made available as promptly as possible. . . ."

In California the growth of the movement for the improvement of secondary roads is indicated in the distribution of Federal highway appropriations for the past year. Of the \$7,486,362 appropriated for the Federal grade separation program and the Federal Emergency appropriation of \$7,747,928, approximately 29 per cent has been for county roads and city streets which are not part of the primary road system of the State.

PURPOSES OF SURVEY

The results of the surveys in the various states are therefore to be employed as required to accomplish the following ends:

1. Select an integrated highway system to include all roads to be improved within the next twenty years, and indicate priority of improvement.
2. Record the present condition of all parts of the selected mileage in respect to traffic serviceability, and indicate the amount, kind, and cost of further improvement required to reach fully satisfactory serviceability.
3. Budget highway appropriations of a considerable future period, and indicate sources from which necessary funds should be and can be obtained, properly related to benefits conferred.

The California State-Wide Highway Planning Survey, which has as its aim the accomplishment of these objectives, is being financed by Federal funds approximating \$228,000. The California project as set up is somewhat less costly than the programs of other states of comparable size or road mileage. This is due in no small measure to the fact that many basic data obtained in the California Highway Transportation Survey of 1934 are being used in the present survey.

COMPRISES FOUR STUDIES

The project is divided into four studies. One study, the road inventory, has already commenced. Plans for two other studies, a traffic census and a truck and bus survey are nearing completion, while those for the fourth, a financial study, are in progress.

The road inventory is confined to public roads traversable by motor vehicles. Tentative determination of whether a road is public or private is being based upon the criteria of maintenance and use, so that there are then two general classes of roads to be considered.

- (a) Roads maintained by the public for public use; and
- (b) Roads maintained by private individuals for public use.

In the latter category are toll roads, toll bridges, ferries, etc. Each of these general classes will in turn be further analyzed to show the interlocking interests of various governmental units in construction and maintenance.

COMPREHENSIVE ROAD INVENTORY

The road inventory will deal with the physical condition of the roads and with the development adjacent to them.

With respect to their physical condition, roads will be characterized as to alignment, gradient and drainage, the degree of improvement in road-bed and type of surfacing, width of road, and existence of sidewalks. Records will be made of structures—bridges, overpasses and underpasses—

their type, width, length, vertical clearance, and general condition.

Particular attention will be paid to railroad grade crossings. The alignment of railroad tracks and highway approach gradients will be noted. Crossings will be classified according to the sight distance available from the highway. Existing signs and other devices designed to warn highway traffic of the tracks will also be logged.

POPULATION ESTIMATES POSSIBLE

In recording the development contiguous to the roads, farm units, industrial and commercial enterprise, public utilities, residences, places of congregation, etc., will be noted. From these data it will be possible to estimate the distribution of population for comparatively small areas or mileage of road. An estimate of the seasonal population of recreational areas can be made in the same manner.

The second major study of the survey will consist of special traffic counts covering the rural roads—those roads outside of corporate areas. On the county roads counts will generally be of eight hours duration at a single station, and the vehicles will be classified as to type and hour of passing. These special counts, which will be made throughout the year, will be in addition to the counts made regularly on the State highway system.

Plans also call for the use of traffic counts which have been made by several of the counties. It is estimated that when all available data are assembled, the final results will show an average of approximately one traffic station for ten miles of county road. This average is comparable to that for the State highway system.

TRUCK AND BUS SURVEY

To supplement the traffic counts, plans are being made to conduct a truck and bus survey at a sufficient number of points to distinguish definitely the characteristic movements of freight and passengers, including rural mail and school bus movement, in various areas and roads throughout a period of a year.

It is anticipated that a year will be required to complete the field work of the planning survey. The administrative personnel for the project has been drawn from the regular staff of the Division of Highways, and as is the rule on Federal cooperative projects, all other positions are being filled through the U. S. Reemployment Service.

FEEDER-ROAD WORKERS FIND BONES OF MASTODON BURIED 200,000 YEARS AGO

EXCAVATING for a road of modern times, engineers of the State Division of Highways and contractors, engaged in building a section of the Imperial Highway Feeder Route project just south of La Habra near the Los Angeles-Orange County line recently unearthed fossils of an era of 200,000 years ago.

Bones of animals that lived in the early Pleistocene era were dug up and in accordance with standing orders of the Division of Highways in such cases were carefully collected for scientific study by the resident engineer in charge of the construction work F. R. Pracht.

The Division of Highways turned the bones over to Dr. Chester Stock, Professor of Paleontology at the California Institute of Technology, and Dr. H. Anson Wilde, Curator of Vertebrate Paleontology of the Los Angeles Museum.

BONES OF MASTODON

These scientific gentlemen gave it as their opinion that among the more important discoveries were the teeth, pelvis bone, shoulder blades and shoulder bones of a giant mastodon; the teeth, leg bones, ribs and vertebrae of an ancient species of horse; the vertebrae and other bones of a ground sloth; the hind leg of an early bison and several miscellaneous finds including sharks' teeth, bird bones, fish vertebrae and land snail shells.

Dr. Stock set the age of the bones as beginning some time in the early Pleistocene era, 200,000 years ago.

"The discovery is significant," he said, "in that some of the bones are of different ages and some may be as much older as 100,000 years than the others.

REPORTED TO ENGINEER

Men employed by Charles Reynolds, superintendent for R. E. Campbell, contractors, made the finds and Mr. Reynolds immediately reported the matter to Resident Engineer Pracht.

From notes written by Dr. Stock and compiled by Dr. Wilde the following report on the finding of the mammalian fossils has been made a matter of scientific record:

"The section of the deposits exposed by the road cuts shows



Fair P. W. A. employees exhibit Ice Age fossils including bones of mastodon and Plesippus horse excavated on highway project in Orange County.

the presence of cross-bedded sands and gravels, evidently laid down in prehistoric time in a series of stream channels.

"The fossils themselves are scattered and for the most part fragmentary. Some show greater wear than others and appear to indicate that not all the material accumulated at one time. A single tooth of a horse and several pieces of bone are water worn and have every appearance or having been transported for some distance. The tooth represents possibly the genus Plesippus, a type of horse more primitive than the living and later Ice Age species of horses, and found generally in the very early stages of the Ice Age or for that matter in the Pliocene as well.

"Geologists tell us that Pleistocene or Ice Age deposits are exposed to the north of the fossil occurrence along the southern front of the Puente Hills. It is therefore quite possible that a stream flowing southward from the Puente Hills in later Ice Age time may have eroded some of these deposits and their entombed organic remains, carrying them to the place of their present find.

"In addition to this material better preserved specimens representing horse, mastodon, ground sloth and bird (turkey) may represent primary rather than secondary accumulation and may date from a later stage of the Ice Age."

TOWER BRIDGE WINS NATIONAL AWARD

By EVERETT L. WALSH, Associate Bridge Engineer

FOR the second time in consecutive years a California bridge, designed by the State Division of Highways and built by the Department of Public Works, has won an award in the annual national competition held in New York by the American Institute of Steel Construction, Inc., for the most beautiful bridge built during the past year.

This honor was won by the Tower Bridge spanning the Sacramento River at Sacramento which was accorded second place in Group B, including bridges costing between \$250,000 and \$1,000,000. Group A included bridges costing \$1,000,000 or more, and Group C those costing less than \$250,000. A total of thirty-one bridges entered the contest.

A similar award in 1935 was won in Group C by the Eel River Bridge, a continuous steel girder structure on State Route No. 1, Redwood Highway, at Smith Point in Humboldt County.

The Tower Bridge award brings additional honor from the fact that this lift span structure entered into competition with bridges of all other types, and never before has a lift bridge been judged comparable in harmony of outline and proportion with arch and suspension bridges because the inherent graceful and symmetrical lines of the latter types have always been considered the most beautiful.

NOTED MEN ON JURY

Californians may well be proud, therefore, in having the most beautiful lift bridge in the United States. The awards were made by a jury of nationally known engineers and architects consisting of Messrs. Robert D. Kohn and Arthur Loomis Harmon, architects of New York; Professor William J. Krefeld of the College of Engineering, Columbia University; Mr. Howard C. Baird, consulting engineer of New York; and Mr. Kenneth Hayes Miller of New York, one of America's best known artists.

Records on the early Egyptian monuments prove that bridges were built during the time of Rameses II, 1350 B. C. In the days of King

Arthur and his Knights of the Round Table, movable bridges were used as a protection against attack, by having drawbridges over moats around the castles.

The earliest lift bridges in the United States were located along the Erie Canal and were constructed in 1874. As population and water borne commerce increased, it became necessary to increase the size and efficiency of movable bridges. The design of such bridges has kept pace with the development of steam, gasoline and electrical power until today we have large fast moving types of bridges which meet the needs of modern necessity.

290-FOOT LIFT SPAN

The Tower Bridge at Sacramento represents all that is modern in engineering skill and bridge design. The bridge is 737 feet long with a roadway width of 52 feet and two sidewalks four feet wide. A roadway thirteen feet wide, protected by concrete curbs, is provided for the Sacramento Northern Railroad tracks.

The bridge consists of steel spans resting on concrete piers and abutments. The center lift span is 209 feet long and is supported by towers 160 feet high. West of the lift span is one 193-foot steel truss span and four 34-foot steel girder spans. East of the lift span is one 167-foot steel truss span and one 30-foot steel girder span. The overhead clearance of the lift span provides a maximum clearance above high water of 100 feet and a vertical clearance between fenders of 172 feet.

An advantage of this type of bridge is that it is very seldom necessary to raise the lift span to its fully raised position. The majority of vessels can pass under the structure when the lift span is only partially raised and thus avoid undue delay. The bridge can be fully opened and closed in approximately one and one-half minutes. The old bridge which was replaced at this location required six minutes to open and close completely.

The lift span mechanism is operated by power transmitted to the opera-

tor's house on the lift span by submarine cables placed at a minimum depth of 10 feet below the streambed. Flexible cables with sufficient slack to provide for the continuous flow of electrical energy when the lift span is raised to its maximum height are located in the towers.

In addition to the electric motors which provide the power for lifting the bridge, there is also an auxiliary gasoline motor which operates an electric generator. In case of a power failure, or if the electrical transmission line is broken for any reason, the gasoline motor will be ready to furnish power at a moment's notice.

The old bridge was built in 1910 at the same location, at the foot of M Street. It had long been an eyesore to the people of the State who entered Sacramento from the west. M Street, the Pennsylvania Avenue of California, runs directly into the State Capitol, which is flanked by the new Capitol Extension buildings and Capitol Park. It was unimpressive, to say the least, to have such an antiquated structure as the gateway to the beautiful capitol buildings and grounds. When the need for a new bridge became an absolute necessity due to traffic requirements, popular sentiment demanded that every effort be expended to design a structure which would be unexcelled in architectural and engineering beauty and thus conform to its natural setting.

NOVEL TOWER DESIGN

Simplicity is the chief characteristic of the bridge architecture. The principal departure from ordinary practice is the plating or covering of the tower truss members by steel plates which give the appearance of simplicity in mass. The plates cover the intricate lacing and cross members and produce a modernistic straight line effect which is pleasing to the eye.

To produce the illusion of artistically adequate pier size in the substructure and continue the simple straight line effect, the fender structure protecting the main pier has been offset a considerable distance back from the channel and extended the proper distance beyond the edge of the tower. The pier itself is not visible through the fender as the fender extends above the pier and effectively conceals it, thus giving the tower an apparent support of ample size.

This treatment of the fender system was handled in this manner because the plating of the towers creates such

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Tower Bridge at Sacramento, winner of award in annual national competition for most beautiful bridges built last year.

Marlette, California's First State Highway Builder, Was Forced to Borrow Road Funds From Public

IN THESE DAYS when the people of California gladly contribute millions of dollars in gas taxes for construction and maintenance of highways, it is rather difficult to visualize the situation that confronted the State's first road builder, Surveyor General S. H. Marlette, who, in 1855, was forced to advertise in the Sacramento newspapers for a loan of \$500 to finance a survey ordered by legislative act for the Emigrant Wagon Road over the Sierra by way of Placerville to Carson Valley, Nevada.

At the first session of the legislature in 1850, before California had been admitted to the Union, a law was passed defining the duties of the Surveyor General. As a member and ex officio Chief Engineer of the Commission of Internal Improvements, he was required "to make plans and suggestions for improvements of navigation, construction of roads, railroads and canals, preservation of forests, * * * and surveys of boundaries of the State and counties."

AN AMBITIOUS PROJECT

Public agitation for a "post road, or other road, from the Sacramento Valley to the Missouri River, by way of Great Salt Lake," resulting in mass meetings of citizens in San Francisco, Sacramento, Marysville, Placerville and other places in 1854 and 1855, finally culminated in the legislature taking action.

It passed a bill creating a commission to consist of the Governor, Secretary of State and Surveyor General, which body was authorized to call for bids for the construction of a wagon road from the valley of the Sacramento over the Sierra to Carson Valley at a cost not to exceed \$105,000. Governor Bigler signed the measure April 28, 1855.

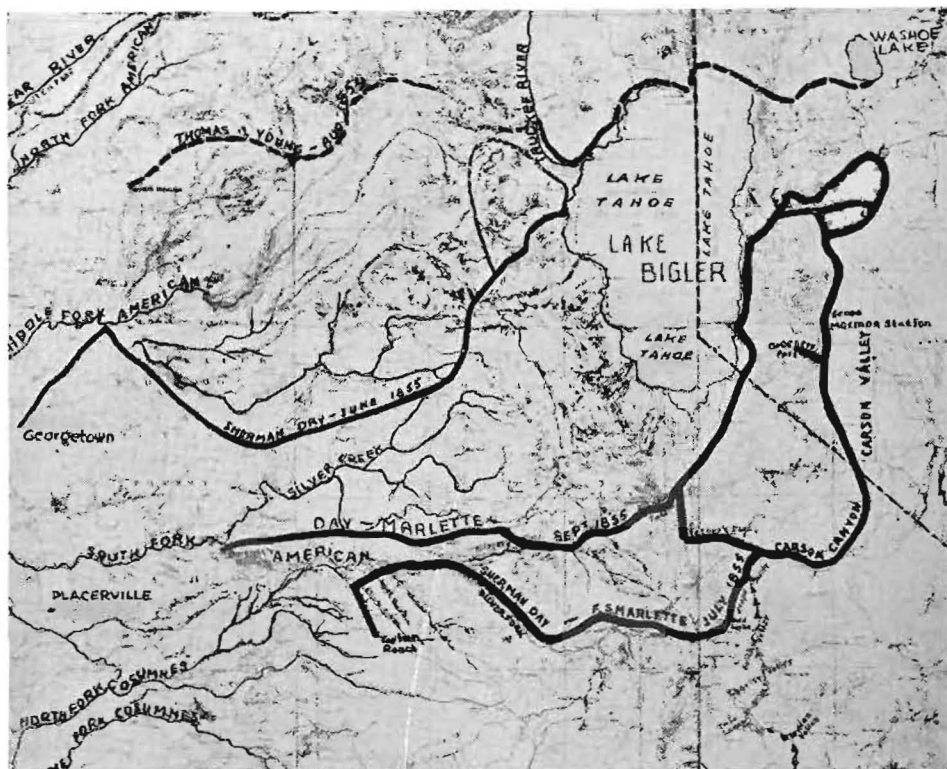
The act provided:

"The Surveyor General of the State shall cause to be surveyed a good wagon road over the Sierra Nevada Mountains at an expense not to exceed five thousand dollars; and no further liability shall be incurred for this purpose."

NO FUNDS PROVIDED

Through an oversight, the legislature failed to appropriate any money for a survey of proposed routes.

Poor Marlette was left with a sur-



Old map showing Marlette and Day surveys made in 1855 for the Emigrant Wagon Road linking Sacramento, Placerville and Carson Valley, Nevada. The road was completed in 1858.

vey on his hands and no money with which to make it.

In desperation he called upon public spirited citizens for help. He wrote in one of his official reports:

"On the 17th of August, 1855, finding it impossible to comply with the requirements of the Wagon Road Act, in a mode commensurate with the importance of the same, in the vain hope of obtaining assistance from some ardent friend of the road, the following advertisement was inserted in Sacramento papers:

"Wanted immediately, on the credit of the State, \$500 to enable the undersigned to complete the explorations for the Emigrant Wagon Road. Any gentleman who is willing to advance the above named sum and will signify the same, will be called upon immediately by the undersigned.

S. H. Marlette
Surveyor General."

"Two gentlemen," General Marlette recorded, "called to inquire what security could be given for the above named amount, to which I replied: 'The justice and liberality of the next legislature'."

The Surveyor General then appealed to the people of Sacramento, El Dorado and Calaveras counties for subscriptions to make a survey and funds were raised for the purpose. Marlette commissioned State Senator Sherman Day, a well known engineer, to locate a route for the Emigrant Road over the Sierra to Carson Valley and Day began his task on June 11, 1855.

He completed a preliminary survey and returned to Sacramento whereupon Marlette set out with him to make a second survey. Day favored a route which today is the course of the State highway from Sacramento through Placerville to Lake Tahoe (then called Bigler Lake), thence into Carson Valley, Nevada. Later, General Marlette directed George H. Goddard, grandfather of Al Goddard of

Sacramento, to make a third investigation.

With the information gathered by his engineers, Marlette and the Wagon Road Commissioners advertised for bids for the work of building the road and a contract was awarded to L. B. Leach of Stockton. Subsequently it was found that Leach was a fictitious person and the charge was made that enemies of the proposed road had connived to submit an exceptionally low bid in order to delay construction.

DECLARED UNCONSTITUTIONAL

Meanwhile, the State Controller refused to audit accounts under the Wagon Road Act and Marlette and those who had contributed money for the surveys were out of pocket. Their claims remained unpaid until April 30, 1857. The Controller later was sustained, the Supreme Court in December, 1856, declaring the Wagon Road Act unconstitutional.

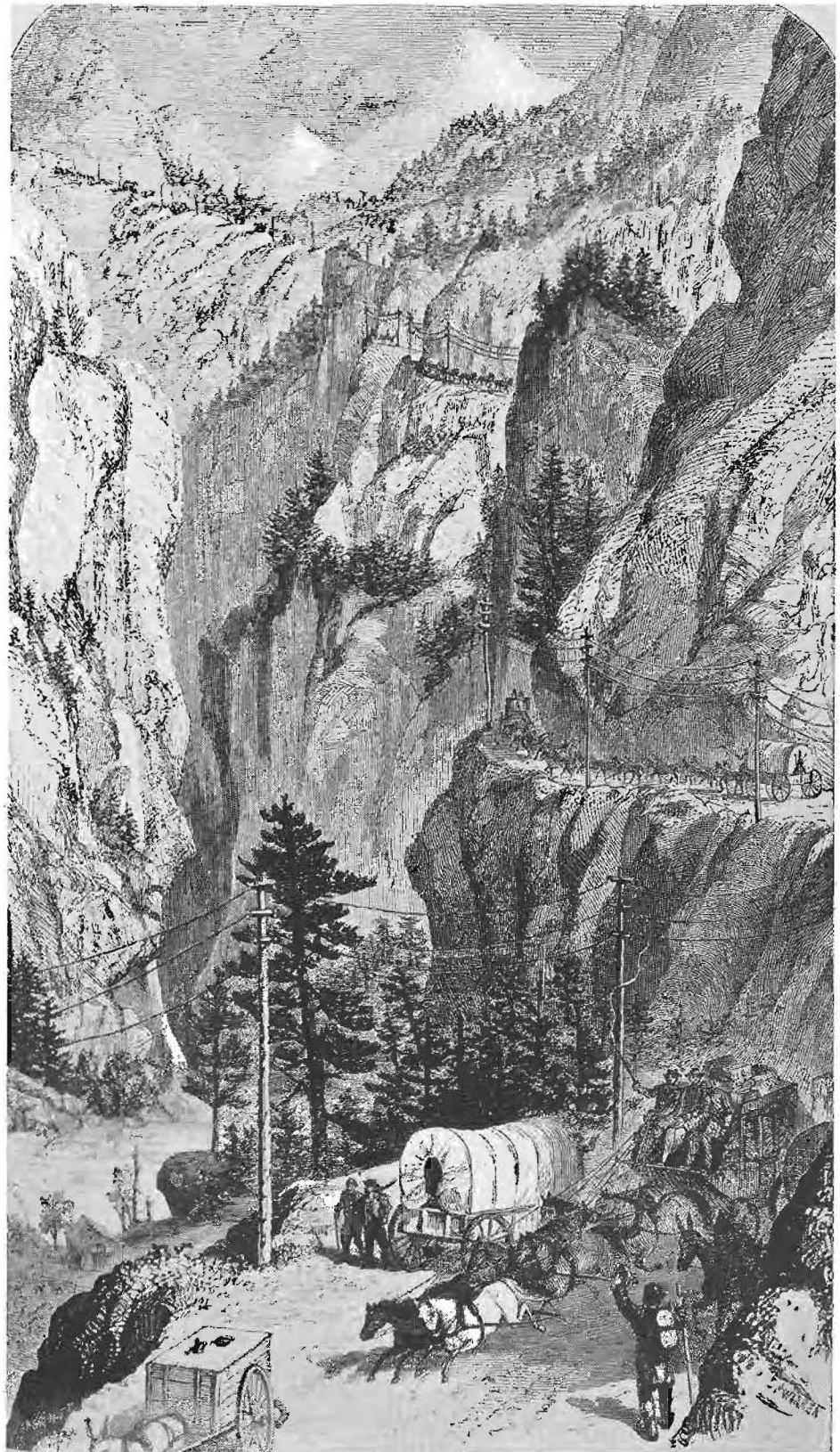
With the legality of the statute questioned, the citizens of Placerville in June, 1856, voted \$5,500 for a road from there to Carson Valley over the Day-Marlette route. In February, 1857, President Pierce approved a congressional appropriation of \$300,000 for a wagon road from Fort Kearney, via South Pass of the Rocky Mountains and Great Salt Lake Valley to the eastern boundary of California, near Honey Lake.

Immediately, Californians set to work to raise funds for a road over the Sierra to meet the projected Federal road at Honey Lake. On May 11, 1857, representatives of Sacramento, El Dorado and Yolo counties met in Sacramento. Twenty thousand dollars were subscribed by Sacramento, an equal amount by El Dorado and ten thousand dollars by Yolo. The Day route was approved.

Finally, in November, 1858, the road linking Sacramento and Placerville with Carson Valley was completed.

Lack of legislative support for the Emigrant Road and opposition by interests involved in building the first transcontinental railroad resulted in the road being taken over by private capital following the discovery of great silver deposits in Nevada and the excessive traffic from Sacramento over the Sierra to the Comstock and other Nevada mines. The route became a toll road and paid huge dividends to its operators.

Years later, in 1895, when the legislature created the State Bureau of



Old woodcut picture of the Emigrant Wagon Toll Road in 1865 from Albert D. Richardson's book "Beyond the Mississippi," published in 1867, illustrating his description of a trip in a six horse coach from Lake Tahoe to Placerville.

Highways, the old pioneer toll road, known as the Lake Tahoe Wagon Road, was taken over by the State,

thus becoming the starting point of the vast California highway system of today.

IMPROVED TYPE OF SOIL SAMPLER for Exploration and Sampling Operations

By THOMAS E.
STANTON, Jr.
Materials and Research Engineer,
Division of Highways

THE soil sampler described herein was developed over a period of six years, starting in 1930, by engineers of the Materials and Research Department of the California Division of Highways. It was designed to avoid the delay and expense incidental to driving and cleaning out a well casing before taking samples, and has been successfully used in its present form for obtaining undisturbed soil samples to depths of over 250 feet under a wide range of conditions.

Two hundred thirty-two holes aggregating over 13,000 lineal feet of cores have been cut with the 2-inch sampler since 1933 in connection with foundation investigations for the San Francisco-Oakland Bay Bridge and other highway, bridge, and grade separation projects.

The equipment was developed not only to reduce the cost of deep sampling, but also to obtain samples in an undisturbed state so as to accurately determine foundation conditions, including moisture content, density, and consolidation. In clay and cemented material samples have been taken to depths of approximately 150 feet below the bottom of a cased or open hole, thereby greatly reducing the total drilling expense. Practically continuous 2-inch diameter core samples have frequently been taken to depths of 100 to 200 feet at a total cost of less than \$1 per foot, including rental of equipment and all operating expenses.

CONVENTIONAL SAMPLERS SLOW

All grades of foundation material have been sampled, the equipment being suitable for use in formations of hardness ranging up to "soft" rock. The sampler unit has been driven as much as two or three feet into bedrock where the material consisted of partially disintegrated sandstone or shale.

Soil samplers used on the preliminary investigation of the San Francisco-Oakland Bay Bridge foundation material¹ required casing to just above the elevation at which a sample was desired. After cleaning the casing, samples were obtained to a depth of 18 inches below the bottom of the cased hole. The casing was then driven to the next depth to be sampled, the hole again cleaned, and

samples taken as before. Great care and slow methods were required in driving and cleaning the casing so as not to disturb the material immediately below the bottom of the hole.

Conventional equipment² usually included a vent hole with either a flap or ball valve action at the top of the sampler section. Sand and silt particles frequently lodged in the valve preventing a satisfactory seal against suction, thus resulting in the loss of the sample.

CASING COST SAVED

Prior to and during the period the original borings for the Bay Bridge were under way, the Materials and Research Department was working on the development of a sampler designed to eliminate unsatisfactory and expensive operation features of the conventional type of equipment. The new sampling device developed as a result of these studies is a decided improvement over the old type.

A clean open hole is not required and the use of casing is not essential for holes up to 100 feet unless free flowing sand or gravel is encountered. Casing is required only when skin friction becomes too great to permit ready driving and pulling of the sampler.

On the foundation study recently completed for the proposed San Francisco Interurban Bay Bridge Terminal and Viaduct construction, 70 to 90 feet of casing was used to seal off an overlying strata of free flowing eolian and marine sands. Boring and sampling operations were then satisfactorily continued through marine clay and clayey sand to bedrock at depths up to 220 feet without further casing, at a saving of one-third to one-half the cost under previous methods.

DESCRIPTION OF SAMPLER

The sampler unit, shown in illustrations on adjoining page, consists of a cutting point, sampler sections, couplings, 2-inch brass tube sample retainers, and a plug, screw, and nut assembly. The cutting point is constructed of tool steel and its outer shape conforms in general with that found by Veihmeyer and Beckett³ to be suitable for securing undisturbed samples of agricultural soils.

The sampler sections, couplings,

and the cutting point are bored on the inside to receive the brass tube sample retainers. These brass tube retainers permit ready removal of the cores from the sampler and prevent disturbance of the specimens. This part of the outfit is conventional.

The important element of the new sampler is the plug assembly. First, it plugs the sampler until the depth is reached at which samples are desired; and second, it provides a seal against suction immediately above the top of the sample.

THREAD STRESS PREVENTED

The screw shaft and nut section are provided with a fast pitch, left hand thread, the former being connected to the plug in a manner to permit swivel action.

Extension rods and all sampler sections are provided with suitable size R. H. square threads. In the couplings the ends are butted against a square shoulder in order to prevent excessive thread stress during driving.

Samples are taken by (1) driving the sampler as a plugged tube to the desired depth; (2) retracting the plug and forcing the open sampler into undisturbed material; (3) retracting the plug further to effect an air tight seal above the sample; (4) withdrawing the entire sampler unit to the surface.

DRILLING OPERATIONS EXPEDITED

A 3 to 4 foot length of soil core is normally obtained in one sampling operation. On important work one three to four foot sample is usually taken for each five feet of depth. In many cases, however, the driving record for the plugged sampler furnishes sufficient information regarding the uniformity of the material. In such cases the drilling operations are expedited by taking samples at less frequent intervals.

Two samplers complete with plug, screw, and nut assembly are usually kept on rush jobs so that drill operations will not be shut down while samples are being removed and prepared for shipment to the laboratory.

The string of 2-inch long brass tube

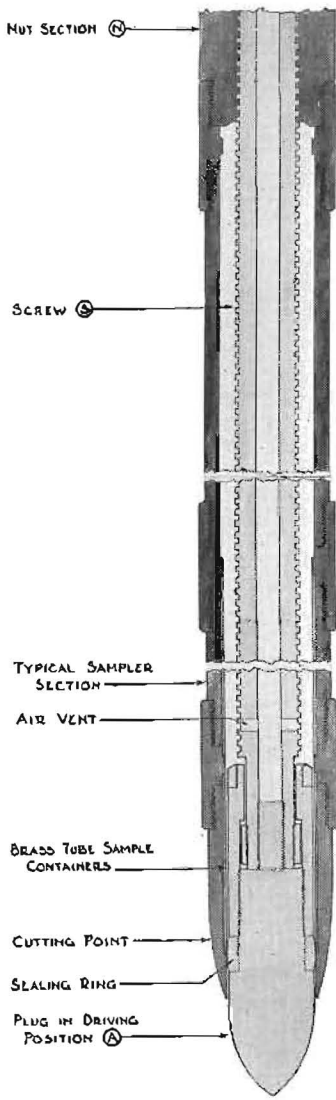
¹ (E.N.R., June 23, 1932, P. 891.)

² (A.S.C.E., Proceedings, May, 1933, P. 804.)

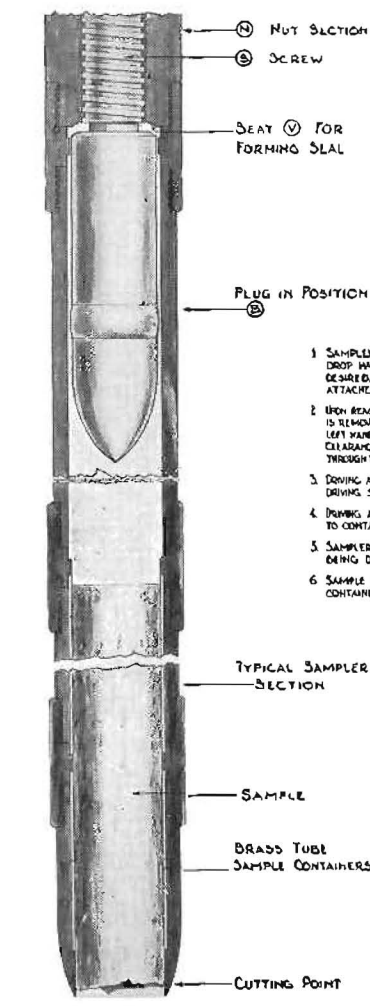
³ (Soil Science, Vol. 25, 1928, P. 147, and Vol. 27, 1929, P. 381.)

(Continued on page 20)

PORTER TYPE SOIL SAMPLER



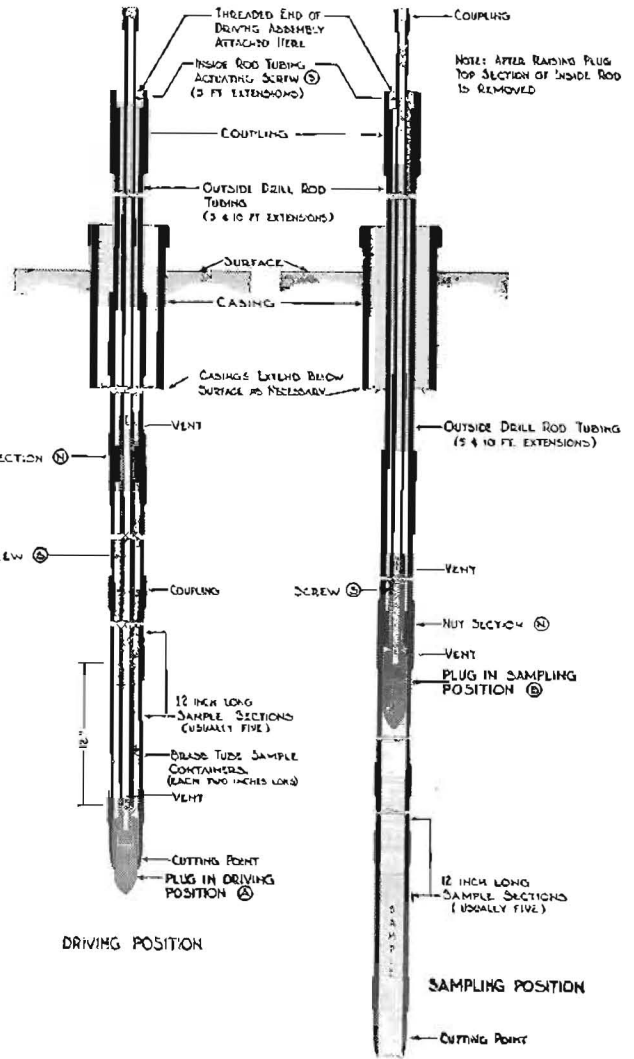
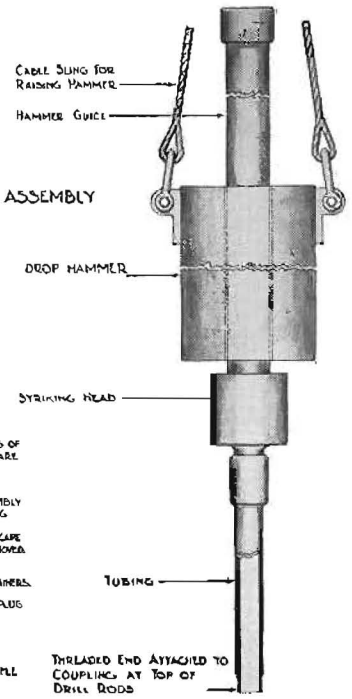
DRIVING POSITION



SAMPLING POSITION

METHOD OF OPERATION

1. SAMPLER WITH PLUG IN DRIVING POSITION (6) IS DRIVEN BY MEANS OF DROP HAMMER, DRIVING ASSEMBLY TO DEPTH AT WHICH SAMPLES ARE DESIRED. DURING DRIVING ADDITIONAL INSIDE & OUTSIDE RODS ARE ATTACHED AS REQUIRED.
2. UPON REACHING DEPTH FROM WHICH SAMPLE IS DESIRED THE DRIVING ASSEMBLY IS REMOVED & INSIDE ROD IS TURNED IN CLOCKWISE DIRECTION ACTUATING LEFT HAND SCREW (5) WHICH RAISES PLUG TO POSITION (6). CLEARANCE IS MAINTAINED IN POSITION (6) TO ALLOW AIR OR WATER TO ESCAPE THROUGH VENT HOLES DURING SAMPLING. TOP SECTION OF INSIDE ROD IS REMOVED.
3. DRIVING ASSEMBLY IS ATTACHED AT TOP AND SAMPLE CORE OBTAINED BY DRIVING SAMPLER INTO SOIL THEREBY FILLING BRASS TUBE SAMPLE CONTAINERS.
4. DRIVING ASSEMBLY IS THEN REMOVED AND INSIDE ROD TURNED RAISING PLUG TO CONTACT NUT SECTION (4) FORMING A SEAL AGAINST SUCTION.
5. SAMPLER IS THEN PULLED UP, SECTIONS OF INSIDE & OUTSIDE RODS BEING DISCONNECTED AS IT IS RAISED.
6. SAMPLE SECTIONS ARE DISMANTLED AND SPECIMENS IN THE SAMPLE CONTAINERS ARE REMOVED, WEIGHED, CAPPED, & SEALED.



DRIVING POSITION

SAMPLING POSITION

METHOD OF OPERATION.

1. SAMPLER DRIVEN TO DEPTH AT WHICH SAMPLES ARE DESIRED WITH PLUG IN POSITION (6)
2. PLUG RAISED TO POSITION (6) BY TURNING SCREW (5) ACTUATED BY INSIDE ROD FROM SURFACE
3. CORE OBTAINED BY DRIVING SAMPLER INTO SOIL THEREBY FILLING BRASS TUBE SAMPLE CONTAINERS
4. PLUG RAISED ABOVE POSITION (6) TO CONTACT SURFACE (4) IN NUT SECTION (4) TO SEAL AGAINST SUCTION
5. SAMPLER PULLED UP AND SPECIMENS REMOVED, WEIGHED, CAPPED AND SEALED

Colton Bottleneck Subway Replaced By Grade Separation on New Alignment

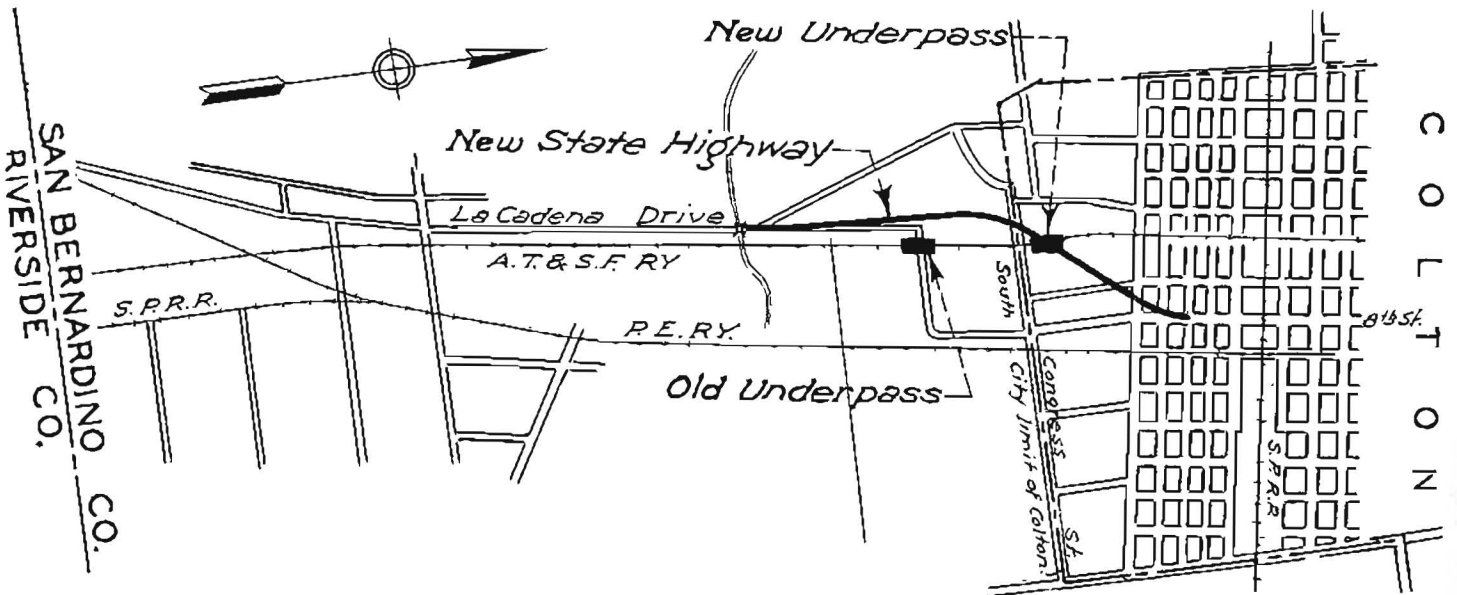
By M. A. Koontz, Asst. Bridge Designing Engineer

TO THE city of Colton in the county of San Bernardino materializes a combined Federal Aid and State Highway grade separation project: the completion of the Colton Subway on State Highway Route 43 carrying public highway traffic between San Bernardino and Riverside under the tracks of the Atchison, Topeka and Santa Fe Railway at Colton.

The new grade separation structure replaces an obsolete subway constructed in 1907 which was a hazard to the fast moving highway traffic of today. Early highway alignment standards did not consider the severe reverse curve which characterized the



Colton grade separation improvement provides adequate highway width and a pedestrian walk.



Old subway built on reverse curve alignment and too narrow for two trucks to pass.

old subway, dangerous to contemporary traffic.

With the advent of greater speeds, larger commercial carriers and a vast increase in the number of vehicles on the public highway, it became apparent that the old subway and low-standard contiguous highway alignment must be replaced.

TRAFFIC BACKUP

As early as 1924 engineering studies were made to determine an economic solution of the problem which far-sighted highway engineers anticipated would arise within the next two decades. These studies indicated that a new subway on revised alignment would provide an adequate solution of

(Continued on page 25)

Budget Revision Found Necessary

(Continued from page 1)

of \$11,008,602. This amount, however, does not represent an unexpended balance of funds over which the Division of Highways has complete control.

Included in the State Highway budget was an amount of \$5,796,875 set aside as the 1/4-cent allocation to cities for use on city streets other than State Highway routes. The expenditure of these funds is handled by the cities themselves, and on June 1 expenditures from these budgeted funds amounted to only \$1,489,976, leaving \$4,306,899 as a balance to be expended for the improvement of city streets during the remainder of the biennium.

ADEQUATE BALANCE NECESSARY

As far as State Highway funds are concerned, this latter amount may properly be deducted from the cash in the hands of the State Treasurer leaving a balance of \$6,701,703 on June 1 for the work of the Division of Highways.

This cash balance, however, is only a small percentage of the value of outstanding obligations of the Division of Highways. Funds are being expended daily on these obligations which include contracts in progress, work on surveys and plans, maintenance, right of way, etc. On June 1, the total unexpended balance of outstanding work orders amounted to \$21,302,320. With State Highway operations reaching this volume, the cash margin of \$6,701,703 is no more than adequate.

One of the important phases of efficient administration of the State Highway activities involves preparation of accurate estimates of the cost of proposed work.

SMALL SAVINGS ON CONTRACTS

On State Highway contracts awarded in the last six months, during which period the Division of Highways has had an unusually large volume of work under way, the difference between the engineers' preliminary estimates and the bids of contractors has been only eight-tenths of one per cent.

The following tabulation gives a comparison of the preliminary estimates with the contractors' pro-

posals on all major projects for which bids were opened between November 27, 1935, and June 18, 1936:

	No. of projects	Total of estimates
North	77	\$10,054,309.73
South	73	7,943,458.61
Total	150	\$17,997,768.34
Total of bids		
\$9,995,449.93	Saving	Per cent of saving
7,856,219.06	\$58,859.80	0.6
	87,239.55	1.1
\$17,851,668.99	\$146,099.35	0.8

The above tabulations, representing contract items only, give a direct comparison of the engineers' preliminary estimates with the bids of contractors; however, the amount of \$17,851,668.99 does not represent the final total cost of the work to the State as the cost of contingencies, extra work and participation items in railroad grade separation contracts, are not included in the figures given. These additional items, not included in the contracts, will bring the total cost of the 150 projects to \$20,710,225.13.

ALL FUNDS ALLOCATED

The savings thus accruing on contracts have been transferred to the reserves and reallocated by vote of the California Highway Commission to additional projects.

In fact all available funds for the current biennium have been so allocated to various construction projects, and if the present rate of getting work under way continues it may be necessary to transfer to the next biennium approximately \$2,000,000 in stage construction in order to complete improvements begun during the present biennium.

QUEER STORM EFFECT

During a recent severe wind storm in Orange county at a certain location on the highway Ora-2-B near El Toro automobiles were crashing into each other and stalling due to static electricity and sand. Visibility was exceedingly poor. Superintendent Glenn H. Cheeseman reports that Foreman A. C. Humphrey learned of the situation at 2 o'clock in the morning, promptly proceeded to the scene of trouble and devoted the remainder of the night to the task of detouring traffic over another road. That was beyond the call of ordinary duty.

Downtown parking abolished in Rome:
50 B. C.

Court Disallows \$60,000 Claim

ANCIENT history was reviewed recently in the courtroom of Judge Peter J. Shields of the superior court, Sacramento County, in an action involving contractors' claims on the Shasta Canyon project in Siskiyou County. The project extended from Yreka to the confluence of the Shasta and Klamath rivers, and was finally completed in September, 1931.

Wren & Greenough, of Portland, Oregon, were the contractors on the job, and after completion claimed approximately \$60,000 in addition to the amounts paid to them. The amount claimed represented the total of 18 different items, including excavation, outside of the plans and alleged to have been wrongfully disallowed, alleged wrongful disallowance of overhaul, and many items of claimed extra work. The court, after a trial of eight days, gave judgment in favor of the State on all causes of action.

ENGINEERS' ESTIMATES FINAL

Although the court did not write a formal opinion, throughout the case the court ruled that the contractors had to plead and prove that the engineers had acted arbitrarily or capriciously in refusing to allow the contractors' claims. This ruling was made on the basis of the provisions of the contract to the effect that the engineers' estimates are final.

The preparation of the case for the State required the complete review of all details of the entire job from records of the Department of Public Works. To C. F. Waite, who was Resident Engineer on the project and who is now District Office Engineer in District VI, fell the major portion of this burden. The success of his efforts, together with those of C. S. Pope, G. R. Winslow, H. S. Comly, Ridgway Gillis, Paul F. Green, Howard Caton, A. A. Bigelow and others was demonstrated by the outcome of the suit.

Counsel appearing for the State were C. R. Montgomery and Robert E. Reed of the Legal Department of the Division of Highways.

Yes, every year is Leap Year for pedestrians.

"What makes you think he is conceited?"
"He makes people call him Colonel because he has military brushes."—*Ranger*.

MAJOR PROJECT HIGHWAY CONSTRUCTION PRO

PRIMARY NORTH

As of July

County	Route	Location	Nature of improvement	Approximate mileage	Budgeted amount
Mendocino	1	Outlet Creek to Reeves Creek	Grading and surfacing	4.5	\$196,000
Mendocino	1	Eleven Oaks to Willits	Grading, surfacing and bridge	0.8	60,000
Del Norte	71	Winton Corner to 0.7 mile south of State line	Grading and surfacing	5.1	140,000
Humboldt	1	Salmon Creek to Bucksport	Grading and surfacing	7.3	165,000
Humboldt	1	Trinidad to McNiels Ranch	Grading and surfacing	2.1	125,000
Lassen	29	Westwood to Copperville	Surfacing	6.6	110,000
Shasta	3	Sulphur Creek to Boulder Creek Hill	Grading and surfacing	1.5	132,000
Shasta	20	Near Shasta to near Redding	Grading and surfacing	5.0	220,000
Tehama	29	Route 3 to 1½ miles east of Dales	Surfacing	13.8	175,000
Butte	3	Biggs Road to Chico	Grading and surfacing	19.0	101,000
Yolo	6	M St. Subway to M St. Bridge	Paving shoulders	0.4	9,000
Glenn	7	Orland to Northerly Boundary	Grading, paving and bridge	2.0	80,000
Glenn	7	Willows to Orland (portions)	Grading and surfacing	10.0	250,000
Placer	17	Roseville to Loomis	Grading and paving	5.5	165,000
Nevada	37	Fox Farm to Summit Station	Grading and paving	3.8	145,000
Nevada	37	Sta. 123 to junction with Route 38	Surfacing	2.4	50,000
Nevada	37	Donner Grade to Sta. 123+00	Grading and surfacing	2.3	110,000
Nevada and Sierra	38	Floriston to State Line	Grading and surfacing	5.0	50,000
Yuba and Sierra	25	Nevada City to Downieville	Grading and surfacing		49,190
Solano	7	½ mile north to ¾ mile south of Vacaville	Grading and paving	2.0	135,000
Fresno	4	Biola Junction to Herndon	Grading and paving	3.4	230,000
Santa Clara	68	Santa Clara-Alviso Road to San Jose	Grading, paving, bridge	3.7	425,000
Santa Clara	2	San Jose to Coyote	Grading and surfacing	10.0	200,440
San Mateo	2	Beresford to Redwood City	Grading and paving	4.5	390,000
				Total-----	\$3,712,630

SECONDARY NORTH

Lake	15	Upper Lake to Rasmussen's Ranch and Middle Creek	Grading, surfacing and bridge	1.2	\$71,000
Lassen	73	5.3 miles east of Litchfield to Secret Valley	Grading and surfacing	13.7	103,500
Yolo	87	Woodland to Knight's Landing	Surfacing	10.8	17,000
El Dorado	38	Lower crossing Truckee River and approaches	Bridges and grading approaches		40,000
Solano	74	In Benicia	Grading and surfacing		10,000
Merced	32	Los Banos to easterly boundary (portions)	Grading, shoulders and resurfacing		210,000
San Mateo	56	Farralone City to Rockaway Beach	Grading	5.9	425,000
San Mateo	107	Manlo County Club to Woodside	Grading and surfacing		25,000
Santa Clara	Feeder Road	4th Street extension in San Jose	Grading and surfacing	1.2	81,000
				Total-----	\$982,500

PRIMARY SOUTH

Santa Barbara	2	Rincon to Carpenteria and Carpenteria Creek	Grading and paving and bridge	1.6	\$125,000
Santa Barbara	2	Sheffield Drive to Olive Mill Road	Grading and paving	1.6	110,000
San Luis Obispo	2	Cuesta Grade	Grading and paving and structures	3.5	665,000
Kern	4	Bakersfield to Arvin Road	Grading and paving	8.0	260,000
Los Angeles	2	Calabasas School to Brent's Junction	Grading and paving		161,400
Los Angeles	60	State Street; Lime Street to Stanley Avenue, Long Beach	Grading and paving	1.2	60,000
Los Angeles	2	Calabasas Northerly (portions)	Grading and paving		38,600
Los Angeles	60	N and O Streets, Wilmington Boulevard to Alameda Street, Los Angeles	Grading and paving	1.5	150,000
Los Angeles	9	Foothill Boulevard; Fenwick Street to Osborne and Tujunga Wash, Los Angeles	Grading, paving and bridge	3.0	295,000
Los Angeles	4	Marengo and Daly Streets; Cornwell Street to Main Street, Los Angeles	Grading and paving	1.1	120,000
Los Angeles	9	Azusa to San Bernardino County line	Grading and paving	12.0	220,000
Orange	60	Newport Beach to Laguna Beach	Grading and paving	10.0	165,000
Ventura	2	Across Conejo Creek	Bridge		14,375
Ventura	60	Across Big Sycamore Creek	Bridge		45,000
Ventura	60	Big Sycamore Creek line change and bridge approaches	Grading and paving	1.0	105,000
San Bernardino	58	Java grade separation approaches	Grading, surfacing and bridge	2.8	60,000
San Bernardino	58	Ludlow to 20 miles east Amboy	Grading, drainage and bridges		20,000
San Bernardino	31	Verdemont grade separation approaches	Grading and paving		20,000
San Bernardino	31	Mt. Pass to Nevada state line	Grading and surfacing	15.3	415,000
Mono	23	Conway Summit to 1 mile north Bodie Road	Grading and surfacing	4.0	182,615

PROGRAM FOR REMAINDER OF 87th-88th BIENNIUM

July 1, 1936

PRIMARY SOUTH

County	Route	Location	Nature of improvement	Approximate mileage	Budgeted amount
Inyo	23	Four miles south of Fish Springs to Tinemaha Pass	Grading and surfacing	2.5	\$34,000
San Diego	2	Approaches to Santa Margarita Creek Bridge	Grading and surfacing	0.7	48,900
San Diego	2	Del Mar to Encinitas	Grading and paving	6.3	245,000
San Diego	12	El Cajon Avenue	Paving	2.7	275,000
San Diego	2	Las Flores Underpass to San Mateo Creek	Grading, paving and structures	10.5	480,000
San Diego	2	Oceanside to Las Flores	Grading and paving	7.8	440,000
Total.....					\$4,754,890

SECONDARY SOUTH

Kern	140	Bridges and dips east of Taft	Structures		\$36,000
Kern	141	Three bridges—Oak Street Road	Bridges		20,000
Kern	138	Maricopa to Taft	Grading and surfacing	6.0	250,000
Tulare	129-134	Strathmore to Lindsay	Grading and paving	6.8	190,000
Tulare	129	Cottonwood Creek	Bridge and approaches		25,000
Los Angeles	168	Longden Avenue to Fairview Avenue	Grading and paving	1.0	70,000
Los Angeles	168	Firestone Boulevard to Telegraph Road	Grading and paving	1.8	96,500
Los Angeles	Feeder	Palos Verdes Drive to Western Avenue	Grading and surfacing	2.0	200,000
Los Angeles	Feeder	Washington Boulevard-Spence Street to Downey Road	Grading and surfacing		100,000
Los Angeles	26	Monterey Park to Pomona	Widening and paving	18.7	335,000
Los Angeles	174	Manchester Boulevard through Downey	Grading and paving		62,000
Los Angeles	166	Across San Gabriel River	Bridge		70,000
Los Angeles	172	Anaheim-Spadra Road to Route 19	Grading and surfacing	0.6	30,000
Los Angeles	167	Across Los Angeles River on Atlantic Boulevard	Bridge		186,000
Los Angeles	167	Atlantic Boulevard, Los Angeles River east of Compton, approaches	Grading and paving		85,000
Los Angeles	158	Sepulveda Boulevard, Lincoln to La Tijera	Grading and paving	1.3	70,000
Los Angeles	158	Sepulveda Boulevard-La Tijera to Centinella	Grading and paving		125,000
Los Angeles	62	Azusa to San Gabriel River	Grading and surfacing	2.0	100,000
Los Angeles	158	Sepulveda Boulevard, Centinella Boulevard to Washington Boulevard	Grading, paving and structures		210,000
Los Angeles	175	Artesia from Atlantic Boulevard to Cerritos Boulevard	Resurface shoulders and culverts	2.5	55,000
Los Angeles	77	Philadelphia Avenue to southerly boundary	Grading and surfacing	1.2	41,700
Los Angeles	61	Red Box to Mt. Islip (portions)	Grading		263,000
Los Angeles	168	Rosemead Boulevard (portions), San Gabriel to Ramona; Whittier Boulevard South and Compton Boulevard to Firestone	Oiling shoulders, grading, paving and bridge		286,500
Los Angeles-Orange	174, 178	Firestone Boulevard and Manchester Avenue, Norwalk to Miraflores and Lincoln Avenue from S. P. R. R. to west city limits	Grading, paving, drainage	11.9	242,000
Orange	183	Across Santa Ana River on Bolsa Avenue	Bridge and approaches		50,000
Orange	179	Across Santa Ana River	Bridge and approaches		48,000
Orange	176	Carolina Avenue to Yorba Linda	Grading and surfacing	3.5	130,000
Orange	175	Southeast of Placentia	Grading and paving	1.0	56,000
Orange	178	Jog at Placentia Avenue (Route 180)	Grading and surfacing		20,000
Orange	43	Jog at 17th Street and Tustin Avenue	Grading and surfacing		20,000
Ventura	138	Across San Antonio Creek	Bridge		39,000
Ventura	79	Across Todd Barranca	Bridge		18,000
Ventura	79	Across Hopper Canon Barranca	Bridge		26,000
Ventura	79	Teague-McKevitt grade crossing S. P. R. R.	Grading		10,000
Ventura	138	San Antonio Creek and Ferguson grade, line changes	Grading and surfacing	1.2	106,000
Ventura	79	Sespe Ranch to Fillmore (portions)	Grading and pavement		118,600
Ventura	153	Camarillo to Oxnard (portions)	Grading and paving		100,000
Riverside	19	Beaumont to Bad Lands	Grading and surfacing	2.3	95,000
Riverside	19	Across San Timoteo Creek	Structure		10,000
Riverside	78	Temecula Creek at M. P. 72.3	Bridge		27,000
Riverside	77	Santa Ana River and Chino Creek	Bridges and approaches		40,000
Riverside	187	Route 26 to Palm Springs and across Snow Creek	Grading, surfacing and bridge	1.5	200,000
Riverside	43	West Boundary to Prado	Grading and paving	3.9	205,000
San Bernardino	77	Chino Drainage Canal	Bridge and approaches		38,000
San Bernardino	190	Across Indian Creek	Bridge		10,000
Mono	96	Bridgeport to 3 miles east Walker Dam	Grading and surfacing		38,250
Inyo	127	6 miles west Darwin to Panamint Sink	Grading and surfacing	18.0	70,000
San Diego	77	Lake Hodges to Escondido	Grading and surfacing	3.1	94,000
San Diego	195	Cuca Grade	Grading	3.0	38,000
Imperial	187	Brawley to Calipatria (portions)	Grading and bridges		75,000
Imperial	187	Holtville to Brawley (portions)	Surfacing		104,000
Imperial	202	Midway Wells to Calexico (portions)	Grading, surfacing, and bridges		75,850
Total.....					\$5,010,400

WM. T. HART APPOINTED HIGHWAY COMMISSIONER

IN RECOGNITION of his services as a member of the State Park Commission and as a tribute to the rapid progress of San Diego County, William T. Hart of Carlsbad has been appointed to the California State Highway Commission by Governor Frank F. Merriam.

Mr. Hart has resigned as a Park Commissioner to accept his new post. His appointment gives to San Diego its first representation on the California Highway Commission.

In expressing his appreciation of the honor bestowed upon him, Mr. Hart said:

"Allocation of a Highway Commissioner to San Diego County after its long fight for membership on this board is another outstanding example of Governor Merriam's understanding of the needs and development of our county."

ACTIVE CIVIC LEADER

For thirteen years Mr. Hart has been prominently identified with development projects in the southern county and during the three years he served on the Park Commission was largely instrumental in bringing into the State Park System such beauty spots as Cuyamaca, Silver Strand, Palomar, Mission Beach, Carlsbad Beach and Borego Valley.

The new commissioner succeeds the late Charles D. Hamilton of Banning and his appointment completes the Highway Commission to its full quota of five members.

Mr. Hart is president of the Hart & McClellan South Coast Land Company, of Carlsbad and a director of the Union Title & Insurance Co. of San Diego.

Born in Prairie du Chien, Wisconsin, 63 years ago, Mr. Hart recalls the pioneer dairy business of his father, who furnished milk and cream to the boats on the Mississippi River, a big industry in those days. His family removed to New York when he was a boy and he received his education in



WM. T. HART

the public schools of that State. He began his business career with the New York Central Lines in the operating department, later becoming traveling agent.

After some years with the New York Central, Mr. Hart resigned to accept a position with a bond and guarantee company as general inspector, traveling from the Atlantic to the Pacific Coast. In 1918 he came to California and developed a fruit ranch in Tulare County and in 1922 settled in Carlsbad to become associated with the South Coast Land Co. He has been active in development work with that organization since that time.

Mr. Hart is a past president of the San Diego County Development Federation, a director of the San Diego Chamber of Commerce, a member of the California State Chamber of Commerce Highway Committee and a member of the Economic Council of Southern California.

During the period of his residence in California, Mr. Hart has been greatly interested in highway matters and his activities in development work

(Continued on page 28)

Paving Bay Bridge Marks Last Laps in Construction Work

WHEN, shortly after daybreak one bright morning last month, the first "buggy" full of cement for the suspension spans of the San Francisco-Oakland Bay Bridge was poured, it marked one of the final important laps as the great structure swings rapidly toward completion for automobile traffic about November 12, under the direction of Chief Engineer C. H. Purcell.

All steel work and all paving has been finished on the East Bay crossing of the bridge, and only the final coats of paint and odds and ends of the clean-up job remain to be accomplished on that section.

Final steel is also being erected for the West Bay crossing. Erection of the "shroud" at the giant center anchorage is among this last steel. The "shroud" will cover the eyebars and A-frame to which the cables are attached, and will complete the graceful design of the concrete monolith. The steel of the "shroud" acts also as a form for the concrete which will be poured to encase the eyebars and A-frame.

SHROUD FOR ANCHORAGE

Comprised of 1080 individual shipping pieces, the "shroud" is 170 feet long and approximately 50 feet high. In its entirety it will weigh 460 tons.

Meanwhile, work of closing the upper deck at the Yerba Buena Island anchorage is approaching completion. All paving in the tunnel has been finished, including the paving of the lower deck truck roadway.

The Administration Building on the Oakland fill has been entirely completed except for the installation of the inside trim.

In Emeryville, the side walls for the east half of the San Pablo undercrossing are fifty per cent completed.

On the San Francisco side, work on the construction of spans on each side of the Harrison Street crossing and on the south side of the Folsom Street crossing for the "off" ramp has been carried rapidly forward, while work has continued on the viaduct between Sterling Street and the San Francisco anchorage.

Many a driver who would not give an inch got six feet.



View of West Bay Crossing of San Francisco-Oakland Bay Bridge looking toward San Francisco showing paving laid on center lane.



Col. Willard Chevalier, President of the American Road Builders Association, thumbs first ride over East Bay Crossing from Chief Engineer C. H. Purcell.

IMPROVED SOIL SAMPLER FOR EXPLORATION

(Continued from page 12)

retainers, with contained sample, are pushed out of the sampler sections immediately following removal from the hole, cut into sections at the joints between retainers with a fine piano wire saw, capped and weighed. The weight of the 2-inch long cores, together with examination of the cut surface, immediately furnishes an index to the uniformity and character of the material. Specimens retained for shipment to the laboratory are at once taped, marked, and sealed with paraffin in order to prevent any change in the original condition.

SOIL SPECIMEN PREPARED

To determine the extent of disturbance, if any, during sampling, a large specimen of Class A-4 soil having a moisture content of approximately 17% was mixed with 10% flowers of sulphur and consolidated at the laboratory in alternate layers of light and dark material, 5% by weight of precipitated magnetic oxide being used for coloring. Cores were cut with the sampler with the results shown in the accompanying illustration. The specimens were hardened by heating at a low temperature and then cut so as to expose any deformation of the strata.

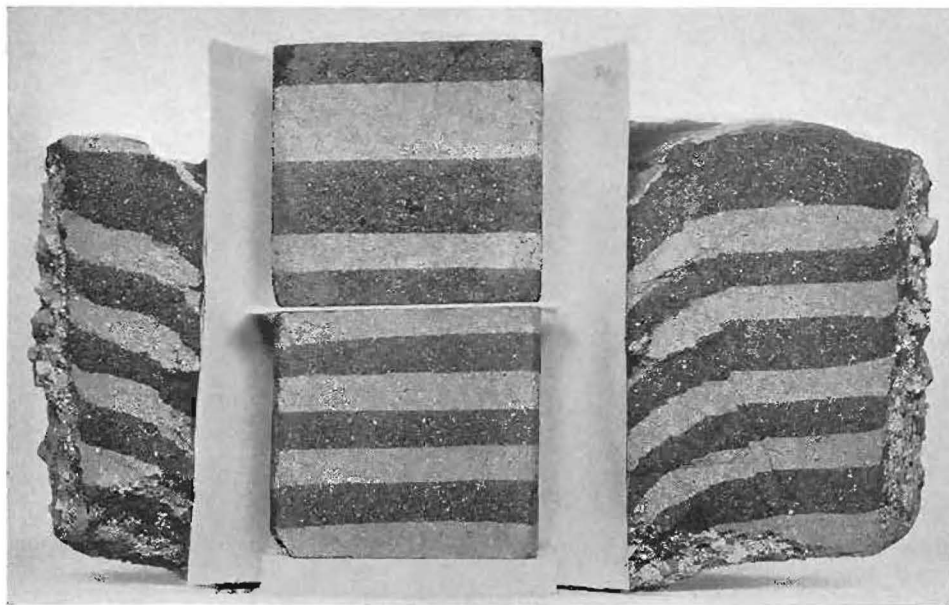
As will be noted, there was no apparent disturbance of the material in the core, whereas there is a very marked disturbance in the portion of the original sample outside of the core and adjacent to the sampling tube. The unit weight and moisture content of the 2 x 2 inch cored specimens checked within one-half of one per cent of the unit weight and moisture of the larger prepared specimen from which the core was cut.

Class A-4 soil was selected because it was the most plastic soil available which could be used without excessive shrinkage and cracking under the heating required to harden before cutting to expose the condition of the soil strata.

SIZE OF SAMPLER

Two sizes of the type of sampler described herein are now being used by the Materials and Research Department. One size, of light weight design for hand power and air hammer operation, cuts cores of approximately 1 inch diameter and is used extensively for preliminary borings ranging up to 50 feet in depth.

The sampler successfully used on



Two-inch sampler core cut from prepared block containing 17 per cent moisture shows no disturbance of soil on periphery of core but a marked disturbance outside of the sampler.

deep borings for the last three years cuts a 2-inch diameter core. The design is suitable, however, for larger diameter samples if desired. The 2 inch samples are satisfactory for testing and this size sampler is operated with power equipment at a somewhat lower cost than heavier equipment.

When the site of drilling operations is accessible to truck equipment, a churn drill is usually used, with the spudder or walking beam actuating the drop hammer. Any other standard type of power drilling equipment may be used. Borings over the bay and overflow marsh land were made from a barge equipped with a derrick, winch, and jetting facilities. In deep borings the pulling capacity from the barge was sometimes insufficient and jetting was necessary to reduce the skin friction and free the sampler.

JET FREES SAMPLER

Little difficulty has been encountered in freeing the sampler unit with a jet, consisting of lengths of the inside drill rod tubing, washed down along the outside of the sampler unit without a guide. The ground disturbed in driving the sampler is more easily jetted than the undisturbed material away from the hole, and therefore the jet usually follows down directly adjacent to the sampler. In some cases a ring is slipped over the top of the sampler unit and attached near the bottom of the jet to serve as a guide.

The 1-inch hand operated sampler designed in 1930 was perfected and used until 1933 for obtaining samples in penetrable ground to depths of 60 feet. The 2-inch size sampler was built and put into use during the first half of 1933, since which time approximately 13,000 lineal feet of 2-inch borings have been made on major projects. In addition, several thousand feet of hand borings 30 to 50 feet in depth have been made.

On the San Francisco Bay Bridge Terminal Foundation investigation, twenty-one holes were bored from 50 to 220 feet in depth. During the first part of the work the outfit was not equipped with casing or jetting equipment. An effort was made to drive through the sand strata without casing and jetting, with resultant time loss and increased cost. As soon as the first procedure was abandoned, however, and casing and jetting through an average of 80 feet of sand strata resorted to, the boring operations speeded up and the cost correspondingly fell off.

The sampler described herein was originally devised by O. J. Porter, Associate Physical Testing Engineer, in charge of aggregate and soil tests and investigational work. J. L. Beatty, Junior Testing Engineer, suggested valuable improvements and George Pomeroy, Chief Machinist of the Department, assisted Porter and Beatty in mechanically perfecting the design.



DIVISION OF WATER RESOURCES

OFFICIAL REPORT

AS OF

June 1, 1936

EDWARD HYATT, State Engineer

The organization of several new districts in the San Joaquin Valley, which plan to take water from the Central Valley Project, has been stimulated by recent congressional approval of an appropriation of \$6,900,000 for carrying the project forward during the coming year.

Petition for the formation of Orange Cove Irrigation District was presented to the board of supervisors of Fresno County and the board set June 23d as the date for further hearing on the plan.

Other new districts recently formed to purchase water from the Central Valley Project include the North Kern Water Storage District embracing an area of over 50,000 acres in Kern County and the Contra Costa County Water District which was formed at an election held May 5, 1936. Other news of various activities of the Division of Water Resources is contained in the monthly report of the State Engineer, as follows:

DISTRICT SECURITIES COMMISSION

Among the matters which came before the Commission at the regular meeting in San Francisco June 12, 1936, the following petitions were given consideration:

Upon the application of Santa Clara Valley Water Conservation District, a bond issue in the amount of \$400,000, authorized at an election held May 12, 1936, was certified as legal investment for savings banks and other specified purposes.

A refunding bond issue of South San Joaquin Irrigation District in the principal amount of \$3,978,000 was validated for certification by the State Controller.

The first refunding issue of bonds of Lindsay-Stratmore Irrigation District in the amount of \$850,000 was approved for certification.

Petition of Fair Oaks Irrigation District for approval of entrance into a contract, for drilling a test well in the town of Fair Oaks, was granted.

SUPERVISION OF DAMS

Application for the construction of the Lake Gregory dam was filed on May 21,

1936, by the Crest Forest County Water District, Crestline, California. This is to be a compacted earthfill structure 65 feet in height and storing 1900 acre feet for recreational use. The estimated cost is \$60,000. This application was approved June 18, 1936.

Application for alteration of the Lake Fordyce dam in Nevada County was filed on June 16, 1936, by the Pacific Gas and Electric Company. The work proposed includes the installation of radial gates and increasing the spillway capacity.

Application for the alteration of the Silver Lake dam in Los Angeles County was filed on June 19, 1936, by the city of Los Angeles. The work proposed includes the construction of a new outlet and tower, as well as spillway construction.

At O'Shaughnessy dam of the city of San Francisco concrete is being placed in the lower portions of the enlarged structure.

At the West Valley dam in Modoc County the fill is practically complete as well as the excavation for the spillway. Lining of the spillway will be started shortly.

No further progress has been made at the Mad River dam other than proceeding with the exploratory work.

Kent Dam No. 2 on the coast in San Mateo County has been completed.

Work is progressing satisfactorily on the Sheffield dam of the city of Santa Barbara. Concrete is being poured in a portion of the alteration work at the Lake Hodges dam in San Diego County.

Construction of Cajalco dam of the Metropolitan Water District and the San Gabriel Number 1 dam of the Los Angeles County Flood Control District is proceeding satisfactorily. At the San Gabriel dam, tests are being run on the model spillway prior to submission of the final design.

Progress is being made on the work in connection with the construction of Grant Lake and Long Valley dams of the bureau of water works and supply of the city of Los Angeles.

Work on the Arcata dam at Arcata is proceeding slowly.

The usual spring inspections to determine repairs necessary are being made as rapidly as possible in order that opportunity may be had for the completion of necessary repairs prior to the next runoff season.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

The maintenance force has been engaged during this period on miscellaneous repair and improvement work, in connection with bridges, structures and culverts. The seepage ditch culverts at Pumping Plants Nos. 1

and 2 have been lengthened, preparatory to rearranging and improving the grounds at the plants.

Pumping Plants Nos. 1, 2 and 3 on the Sutter By-pass have been completed by the California Debris Commission, although they have not yet been accepted and turned over to this department. We have moved the old operator's house from Pump 1 to Pump 3.

The heavy growth of grass and weeds has necessitated fire guards around the timber structures. Some work has been done in eradicating wild lettuce and sow thistle from the levees. Repairs have been made to the launches *Mud Hen* and *Alloth* and to the mess-house barge. This barge is now in use by the War Department on cooperative work.

Relief Labor Work

Work is being continued on the clearing of the Feather River channel above Marysville in Yuba County. The number of relief laborers available has increased from 20 to 70 during this period and it is probable that this will be further increased during the summer. New applications are being prepared to cover WPA projects to operate during the coming fall, winter and spring.

Bank Protection Program

The cooperative program for bank protection work by the State and Federal Government, approved in June, 1932, will be continued. This program was discontinued in October, 1934, and its resumption has been directed by Major General Markham, Chief of Engineers. It is expected that this will bring about the expenditure of approximately \$400,000 in bank protection work on the Sacramento River in 1936. The detailed program has been worked out by the District Engineer, U. S. Engineer's Office, in conjunction with this office, and has been submitted for approval. It is expected that active work will be commenced by July 15th.

Sacramento Flood Control Project

Three contracts, to be completed by December 31, 1936, have been let by the California Debris Commission, for the completion of levee construction on the right bank of the Sacramento River from Wohlfrom's to Princeton, on the left bank of the Sacramento River from Colusa to Moulton weir, and on the left bank of the Feather River in Reclamation District No. 784. With the completion of these levees the most critical situations in the flood project will be relieved.

This Division has now under way the work of moving houses, barns and other improvements from the levee right-of-way on the Boggs ranch opposite Colusa and the Watt ranch near Princeton. This will involve the moving of five buildings. Work on miscellaneous construction on the American River levee right-of-way has been continued during

(Continued on next page)

the period, chiefly in the construction of fences and installation of pipes.

WATER RIGHTS

Supervision of Appropriation of Water

During the month of May, 39 applications to appropriate water were received; 5 were denied and 11 were approved. During the same period 2 permits were revoked and rights were confirmed by the issuance of 14 licenses.

Mining was again the predominant activity among the new appropriators, as it was throughout the years 1933 and 1934. There is, however, a notable increase in appropriations for agricultural purposes and among them a considerable number for projects of some magnitude.

Field inspections preliminary to the issuance of permits were made in Sonoma, Mendocino, Humboldt, Trinity, Del Norte, Siskiyou, San Mateo, Santa Clara, San Joaquin, Calaveras and Sacramento counties.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Field work in connection with the cultural revision of the Hesperia, San Antonio, San Bernardino and Cucamonga sheets in San Bernardino County was completed and progress was made in connection with the office work. Progress was also made on field work in connection with the San Bernardino No. 4 Quadrangle in San Bernardino County and the Tobias Peak Quadrangle in Kern and Tulare counties. Office work was completed on the Kreyenhagen Hills Quadrangle in Fresno County and also on the Burney Quadrangle in Siskiyou County. Progress was made on the Paynes Creek Quadrangle in Tehama County.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

During the past month the office and stenographic work in connection with the report on Sacramento-San Joaquin Water Supervision for the year 1935 was completed. This is a report showing the diversions, return flow, stream flow and acreage irrigated in the Sacramento-San Joaquin territory and the encroachment and recession of salinity in the delta. The mimeographing of the report is progressing satisfactorily and it should be completed by July 10th.

Field work is in full swing and data to make a report similar to 1935 is being gathered. Three engineers are in the field, two full time and one part time.

No marked increase in the salinity in the Delta has been observed. This is due to the storm early this month which increased the flow at Sacramento from 15,000 c.f.s. on June 6th to 33,000 on June 8th. The flow at present is about 13,000 c.f.s. and will no doubt continue to decrease.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the past month normal melting of the Sierra snow pack has continued. In the absence of any unusual protracted hot spells and periods of excessive warm rainfall,

the runoff has proceeded in an orderly fashion and no floods have occurred. The bulk of the pack has now melted and snow remains only on the higher summits and in sheltered locations.

As soon as the mountain roads became passable, the snow survey equipment of the shelter houses was gathered up and collected at convenient central locations where it will remain in storage during the summer.

Work in the office was continued in bringing up to date precipitation data. Previous forecasts are being reviewed and all data gathered during past years is being analyzed with a view to more accurately evaluating the various factors affecting snow runoff. The results of such studies to date are very gratifying although in some cases the need for an expansion of snow surveys to collect more data is evident.

WATER RESOURCES

South Coastal Basin Investigation

Good progress has been made in the field and office on the South Coastal Basin Investigation during the present month. Bulletin No. 39D, giving hydrological data of the South Coastal Basin for the year 1935 has been approved by the director for release and is ready for distribution.

San Luis Rey River Investigation—San Diego County

The investigation and survey of the San Luis Rey River in San Diego County being made under the direction of this Division in cooperation with WPA, city of Oceanside, county of San Diego, and Carlsbad Mutual Water Company has been temporarily suspended owing to lack of WPA funds. This work is for the purpose of securing data and preparing plans for flood control, the rectification of the river channel, and the conservation and utilization of the waters of the San Luis Rey River. It is expected that work will be started again this month.

CENTRAL VALLEY PROJECT

With an appropriation of \$6,900,000 by congress the United States Bureau of Reclamation is exerting every effort to complete, at an early date, the preparation of plans preparatory to starting construction on the initial units of the project. While congress allocated \$8,000,000 of the appropriation to the Friant Dam, Friant-Kern Canal, and contiguous units in the San Joaquin Valley, work will proceed without interruption on the Contra Costa County Conduit and Kennett Dam with funds already provided the United States Bureau of Reclamation by the Public Works Administration.

Preliminary investigations and exploration work have been carried on during the month at Kennett and Friant dam sites, and surveys continued along the Contra Costa Conduit and the Friant-Kern Canal by the United States Bureau of Reclamation. Appraisers are working in the field evaluating land and necessary rights of way for the construction of the project. Also the Division of Highways has continued drilling operations at the proposed site of the combination highway and railroad bridge across the Pit River. The State Department of Public Works and all state agencies inter-

Good Roads Earning Substantial Profits For Highway Users

HIGHWAYS pay their way by reducing the operating costs of vehicles using them, and on heavily traveled roads they return substantial profits to the public, says the U. S. Bureau of Public Roads after a study of the mileage of vehicle travel in three states in comparison with highway expenditures. Annual payments for highways, the bureau reports, amount to slightly more than one cent per mile of vehicle travel on all highways in Michigan, Wisconsin and Minnesota, according to figures collected by this bureau of the U. S. Department of Agriculture. In Michigan and Wisconsin the payment is 1.08 cents per mile and in Minnesota 1.1 cents per mile.

Analysis of highway costs and travel on the state systems, which include federal-aid roads, of Wisconsin and Michigan shows that payments amount to .83 cent and .86 cent per mile of travel respectively. The figures for county roads are 1.23 cents in Wisconsin and 1.66 cents in Michigan.

The lower costs for main highways agree with the well established rule that large volumes of traffic make possible the construction and maintenance of high-type surfaces at a very low cost per mile of travel.

The actual saving in vehicle operating cost resulting from replacing a dirt road with a smooth, hard surface has been variously estimated and is probably not less than three cents a mile.

On this basis, says the bureau, a large mileage of highways is paying tremendous profits to highway users. Actual payment of gasoline taxes and motor vehicle fees, when distributed in proportion to travel on different roads show that many highways are earning substantial profits for the public.

In connection with the steering gear of an automobile there is one thing more dangerous than a loose bolt, and that is a tight nut.—*From Better Roads.*

The 1906 output of the automotive industry in this country was 34,000 vehicles.

ested are assisting the United States Bureau of Reclamation in every way possible in order to facilitate the early commencement of construction work on the initial units of the Central Valley Project.

NEW CUESTA GRADE WILL ABOLISH 63 CURVES

(Continued from page 2)

good practice. These studies have been quite exhaustive in their scope and include three preliminary surveys, two via the westerly slope of the canyon and one along the easterly slope on which side the present road is located.

Soil investigation crews, under the direction of the Division of Highways testing and research laboratory, are now engaged in drilling, taking soundings, samples, etc., in order that every feature of the materials to be encountered may be predetermined.

TUNNEL IS OPEN CUT

The consequent shortening of the proposed lines over that of the existing crooked course makes it necessary to cross the summit of the grade in a much deeper cut than now exists, such a situation necessarily leading to a study relative to tunnel vs. open cut construction. Present indications appear to favor the open cut. The line as at present tentatively proposed would traverse the

easterly slope, somewhat below the existing road.

A portion of the present road can be used as a detour. On the balance a detour road will have to be constructed to take care of traffic, a very necessary but costly feature.

Passing over the summit the proposed line follows down the easterly slope, crossing the Southern Pacific Railroad on an overhead structure near the northerly end of the project. This line utilizes a 7 per cent maximum grade.

TENTATIVE GRADING PLANS

Tentative grading section at the present provides for a 52-foot width in fills and 46-foot width plus 3-foot ditches in cuts. Such section allows for an ultimate 40-foot width of pavement surfacing.

Due to the magnitude of cuts and fills involved and the necessity of allowing time for their stabilization, the new surfacing will probably consist of either 30 feet or 40 feet of an

oil treated rock surfacing. This temporary surfacing will later provide a subbase for a more permanent surfacing, such as is generally used on this main-line road.

The following are the more interesting comparisons between the present road and the tentative design of the proposed improvement and very clearly indicate the decided improvement, safer and more satisfactory traffic facility which will be provided:

Feature of construction	Present	Proposed (tentative)
Total number curves.....	71	8
Total number curves, 100-ft. radius or less.....	21	0
Total number curves, 125-ft. to 250-ft. radius.....	24	0
Total number curves, 275-ft. to 500-ft. radius.....	10	0
Total number curves, 525-ft. to 1000-ft. radius.....	11	0
Total number over 1000-ft. radius.....	5	8
Total delta of curves.....	3633°	242°
Maximum grade.....	7.007%	7%
Saving in distance.....		0.73 mile

Truck Problem as England Sees It

In the matter of regulation of commercial motor vehicle transportation on public highways, California and England, although occupying widely separated portions of the globe, are confronted with strikingly similar problems.

At a recent meeting of truck operators in London, Mr. Hore-Belisha, Minister of Transport, after hearing demands of the commercial vehicle industry for improved roads and bridges and lower rates of taxation, quite emphatically advised the operators to be patient and not to raise raucous voices in protest.

Addressing a convention of the Commercial Motor Users Association and the Associated Road Operators, the Minister of Transport said:

"We shall proceed with vigour and determination to give you what you require. The amalgamation of your two important associations now enables your industry to speak with one voice. Is it going to be a raucous voice, bellowing in our ears, or is it going to be a sweet one? So far

as the Ministry of Transport is concerned it matters not. We shall proceed with the task that lies before us according to our lights and with resolution and conviction that we are doing the right thing by your industry and the nation. You can and will, I am sure, give us your help and counsel. That, I think, is the better course and the course which has helped you in the past. We shall try to provide for, and anticipate, your demands on the roads of this country."

The Minister of Transport said that highway plans already submitted call for an expenditure on a five-year program of approximately \$650,000,000 in addition to normal expenditures from the Road Fund for highway improvements amounting to \$87,500,000 annually.

California's greatest tourist summer is definitely here and the tide still rising rapidly, according to the touring bureau of the Automobile Club of Southern California.

That bureau points to the unprecedented number of information inquiries received by it in May from all parts of America, higher by about 2000 than in any other month in club history, which means thirty-six years.

Very often what father would like most to get out of his new car is the rest of the family.

Highway Chiefs to Meet in S. F.

State highway engineers from all over the United States will convene in San Francisco December 7 to 10 inclusive when the American Association of State Highway Officials holds its annual meeting there.

This was the announcement made by California State Highway Engineer C. H. Purcell, chief engineer of the San Francisco-Oakland Bay Bridge, who is also a member of the executive committee of the highway officials' association.



Mr. Purcell said that W. C. Markham, executive secretary of the Association, will arrive in San Francisco next month to complete arrangements for the convention.

Two major highway projects, the San Francisco-Oakland Bay Bridge (which will be open to automobile traffic at convention time) and the Golden Gate Bridge, were powerful factors that influenced the executive committee at its midyear meeting on June 22 to select San Francisco for the annual meeting.

In the Field With the Old Timers



Ten-team freight outfit hauling supplies for highway crews, Shasta County, 1914

CALIFORNIA HIGHWAY COMMISSION		
<small>COMMISSIONERS</small> CHAS. D. BLANEY N. D. DARLINGTON BURTON A. TOWNE, CHAIRMAN	Forum Bldg. SACRAMENTO, CALIFORNIA.	<small>HIGHWAY ENGINEER</small> AUSTIN B. FLETCHER <small>SECRETARY</small> WILSON R. ELLIS
<p><i>THIS IS TO CERTIFY that:</i> Russell H. Stalnaker of Los Angeles, Cal. was duly appointed, March 21, 1912, to be Chief of Party attached to Division II of the CALIFORNIA HIGHWAY COMMISSION, his term of office to be at the pleasure of the Commission.</p>		
 <small>HIGHWAY ENGINEER</small>		 <small>SECRETARY</small>

A NEW member of the Old Timers' Club of the Division of Highways is R. H. Stalnaker, Equipment Engineer, who is in charge of the Headquarters Shop of the Department of Public Works in Sacramento.

Mr. Stalnaker is doubly qualified for membership in the club in that he possesses two identification cards issued to employees by the first California Highway Commission. One of his prized cards certified to his appointment as Chief of Party attached to Division (now District) 11 on March 21, 1912. The second, issued one year later to the day, shows he was promoted to the post of Principal Assistant of Division 11.

"For your information," writes Mr. Stalnaker, "the title of 'Principal Assistant' in 1913 covered the position now known as 'Assistant District Engineer.'"

HAS A BIG JOB

Mr. Stalnaker was appointed Principal Highway Equipment Engineer of the Division of Highways in July, 1921. His job today is one of the most interesting and important in the service. Upon him falls the responsibility of keeping in perfect condition approximately 600 passenger cars, 1000 trucks and about 2000 pieces of equipment used by the Division of Highways in its far-flung highway building and maintenance operations.

In the Headquarters Shop the service varies from adjusting a carburetor to the construction of a huge forest fire fighting machine and repairing and rebuilding great rotary snow plows. The shop occupies a total of 125,000 square feet of space.

The Equipment Department is a self-supporting agency of the Division of Highways. It is maintained by funds paid by the other divisions and State Departments as rentals for equipment. During the last fiscal year these rentals amounted to \$1,924,000 which, with miscellaneous income of \$3,000, made a total of \$1,927,000.

SHOWS NET PROFIT

Operating expenses amounted to approximately \$1,100,000. There was set aside for depreciation and



Old Oregon Stage Road through Shasta County as it looked in 1912.

BUILDING THE PACIFIC HIGHWAY

reserve \$713,950 so that the year's operations showed a nice net profit.

Mr. Stalnaker came to California in October, 1906. In making his application for membership in the Old Timers' Club he forwards his two old identification cards and writes:

"After coming to California, I worked for a few months for various firms in Los Angeles engaged in land subdivision work. I went to San Diego in June, 1907, and entered the employ of the Spreckels interests in that city as an engineer. In the spring of 1910 I went to the San Diego County Highway Commission under Austin B. Fletcher, who at that time was Secretary-Engineer of the commission and later was the first Director of the California State Department of Public Works.

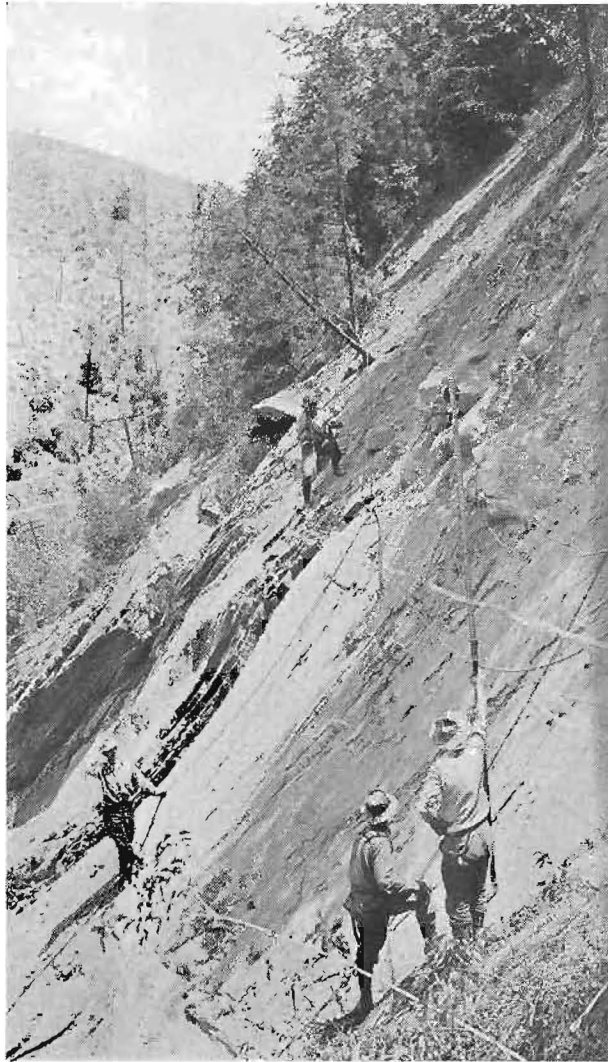
ENTERED STATE SERVICE

"In August, 1911, I went to the Los Angeles County Highway Department and worked there as draftsman and resident engineer until I entered the service of the California Highway Commission.

"I reported for duty at Redding on April 1, 1912, and was in charge of a location party there until March, 1913, when I was appointed Assistant Division Engineer of that Division.

"In February, 1918, I was transferred to the Headquarters Office in Sacramento as Assistant Highway Engineer. In the spring of 1920 I was assigned to the position of General Inspector for the northern part of the State and served in that capacity until my appointment as Equipment Engineer in July, 1921. I have been in charge of the Equipment Department since that time."

During his first employment with the Division of Highways in 1912 and 1913 Mr. Stalnaker was engaged in the interesting and arduous work of



Surveying party working on bluff near Delta, Shasta County, locating Pacific Highway through Sacramento River Canyon in 1913

locating a route for the Pacific Highway, State Route No. 3, through the rugged, mountainous country of Shasta County north of Redding.

The old Oregon Stage Road, a narrow, winding dirt trail worn and rutted by the wheels of the pioneers' covered wagons, was the only available route through that rough terrain when the newly organized field parties began the work of surveying and building a State highway to replace it.

It meant many months of living in crude camps in the heart of a forest wilderness, scaling precipitous cliffs or hanging from them by ropes to do the necessary surveying for a highway with grades and alignment that would be travelable by automobiles.

All food and supplies for the crews had to be freighted in from Redding by ten-team outfits and required many miles and days of heavy hauling. Mr.

Colton Bottleneck Subway Abolished

(Continued from page 14)

the problem a traffic bottleneck and danger spot for motorists.

On account of more serious grade separation problems at other locations which required available highway funds for their solution, reconstruction of the existing subway was deferred.

The heavy inter-city traffic between Riverside and San Bernardino has long been hampered by the sharp curves, lack of sight distance and restricted width at the old subway. During rush hours, traffic has often backed up as much as one-half mile on each side of the old subway.

The old subway was so narrow that accidents repeatedly occurred when too wide loads became locked inside of the structure and all traffic had to detour for several miles.

RIGHT TURNS ELIMINATED

The old subway approaches included four right angle turns. The new subway eliminates all of these right angle turns. The width of the new structure is ample for heavy vehicle traffic and an additional width is provided for pedestrians.

There will be a saving in distance of one-fifth of a mile.

This project was financed from Federal funds which must be devoted solely to railroad grade separations. The location of the new subway was made so that when other funds are available to extend the highway south toward Riverside, a direct connection can be made to the Santa Ana River Bridge.

Voice over wire: "Madame, your husband has been run over by a truck!"

Madame: "Good heavens! On the afternoon of my bridge party!"

Approximately 3,000,000 children are transported to and from school in more than 77,000 motor buses, according to statistics gathered from school officials throughout the United States.

Bank Clerk: "So you wish to open a joint account with your husband. What kind?"

Mrs. Bright: "Oh, just a deposit account for him—a checking account for me."

Stalnaker's camera caught some interesting "shots" of the parties and their work which are reproduced in this article.

Plea For Cooperation in Preserving Benchmarks

Reprinted by request from ENGINEERING NEWS RECORD

SIR—This is a plea for the cooperation of engineers in preserving benchmarks, in their own interest as well as that of profession and public.

The United States Coast and Geodetic Survey during the past 65 years has been extending lines of precise levels ("first-order" levels) throughout the country. These first-order lines are spaced at intervals of about 100 miles, while within these areas the leveling is of second-order accuracy. The leveling in the vertical control net now totals slightly over 250,000 miles of lines, with benchmarks set at intervals of several miles on the oldest work, and on the latest leveling about one mile.

This work has established well over 100,000 benchmarks, most of which are marked by properly inscribed metal tablets set in concrete posts, bridge abutments, culvert headwalls and other structures such as buildings, monuments and seawalls.

Frequently new construction or repair to existing structures makes it necessary to destroy these marks, in spite of the fact that every effort has been made to place them where they will be as permanent as possible. This bureau has no funds from which to pay field parties to go about and relocate these marks when they must be moved. The result is that, if these marks are to be preserved for the use of all engineers and surveyors who may have occasion to use them, we must depend on the cooperation of engineers and others throughout the country for assistance in their preservation.

We have worked out a routine method of handling such cases. If engineers who encounter our marks in the course of construction, repair or maintenance operations will cooperate as outlined below, the destruction of useful benchmarks will be very much reduced.

As soon as it becomes known that a mark must be moved, a letter should be sent to the Director, U. S. Coast and Geodetic Survey, Washington, D. C., attention Section of Leveling, stating the necessity for moving the mark and giving its designation. The

designation consists of the letters and numbers found to have been stamped with dies on the disk. It is desirable to furnish a rubbing of the disk as well. A rubbing can be made by placing a piece of medium-weight paper over the disk and then rubbing over the paper with a hard pencil to bring out the legend cast in the disk, especially the letters and numbers stamped on it with dies.

WILL SEND NEW DISK

Upon receipt of this information, this office will send out a new disk properly stamped to show that it has been reset. Necessary instructions for the establishment of the new mark and the transfer of elevation will also be sent. The proper procedure, in most cases, is to establish the new mark in a safe place nearby and transfer the elevation from the old

Billboard Law Upheld

The efforts of the State Department of Public Works to enforce the provisions of the Outdoor Advertising Act receive deserved support from the decision of Superior Judge Welsh at Sacramento upholding the act.

Judge Welsh holds that the regulation of roadside signs is clearly within the State's police power to preserve the public peace, safety, morals and general welfare. The decision accords with rulings of courts in other States which have similar laws, and with decisions of United States courts in which such laws have been tested.

It is not known whether or not the case will be appealed thus giving the higher courts of California an opportunity to pass on the matter.

The decision has received much favorable comment from various newspapers and citizens interested in the beautification of highways.

mark to the new one by means of an engineer's level and rod. The levels should be run in duplicate to avoid the possibility of large errors, and all readings should be made to three decimal places in order to preserve the accuracy of the original elevation.

The old mark should not be disturbed until the observations involved in the transfer have been checked by the observer or the recorder. An assumed elevation for the old mark may be used in the transfer, since what we are primarily concerned with in a case of this sort is the difference in elevation between the old mark and the new one established to replace it.

After the new mark has been established and the elevation transferred to it, the old disk should be broken out and returned to this office in a franked mailing sack which will be supplied for the purpose. A complete report on the action taken, including a description of the location in which the new mark is established and a copy of the field notes involved in the transfer of elevation, should also be forwarded to this office; a franked envelope will be furnished for this purpose.

The cooperation which individuals and organizations may extend to this office in preserving the benchmarks will be a service not only to this bureau and other government surveying organizations but to anyone who may have occasion to use the marks.

HOWARD S. RAPPEL, E.
Chief, Section of Leveling,
U. S. Coast & Geodetic Survey.

Washington, D. C., Feb. 4, 1936.

Highway Development Curtailed by Diversion

Evidence that diversion of revenue from gasoline taxes and motor vehicle registration fees to nonhighway purposes tends drastically to curtail highway development is shown in studies comparing road progress made in the various states.

It has been found that Florida, Georgia, New York, and Texas, all of which have made a regular practice of diverting highway funds to other expenses, have made gains in their road mileage averaging only 66.8 per cent since 1928, whereas other states have showed an average gain of 92.4 per cent in the same period.

The percentage of improvement of highways in Florida was only 43.8, while that of New York was only 45. The percentage increase in Georgia was 71, and that of Texas 89.2.

Jibboom Street Grade Separation

(Continued from page 5)

tion of columns and piers. A 22,000 volt underground duct line, two 30-inch steel water mains, a 4-inch gas line, a 30-foot diameter water tank and numerous telegraph and signal lines are located in the railroad yard.

In the interests of economy, it was highly desirable to avoid shifting any of these facilities. Any expense incurred in this manner would naturally be chargeable to the total cost of the project. A suitable alignment and column location was finally selected that provides a minimum of interference.

Along the Old Pioneer Mill on the Jibboom Street unit, columns are spaced between loading doors so as not to interfere with freight loading operations. At one location on this approach, a huge rigid frame 69 feet long extending beyond the bridge deck on either side is necessary to span over four railroad tracks. Silicon steel, a special alloy of high strength, will be used in this frame to secure necessary resistance to the heavy loads applied. Full 22-foot vertical clearance is provided over all tracks.

APPROACH FILLS USED

Approach fills leading onto the bridge structure proper are used at the end of each approach unit. Economic studies were made to determine the proper distance to use this fill, beyond a certain height it being less expensive to construct piers and columns.

Considerable saving is effected in the bridge deck by using rolled steel beams and extending them over their supports as cantilevers. This arrangement causes a reduction in stress in the center of a span by transferring it to the support, thus permitting a substantial saving in weight of steel.

Rolled beams are cheaper than fabricated sections, requiring but little shop work to prepare them for use. This fact was satisfactorily reflected in the bids received for the Jibboom Street unit, and justified the selection of this method of design.

Headroom was at a premium over the two main line tracks and freight line crossovers immediately east of I Street bridge. In one instance a 36-inch rolled beam weighing 280 pounds

FORTY STATES LAY PLANS TO GEAR ROADS TO NEEDS

Federal authorities and officials of forty states are cooperating in plans under which State highway systems will be "tailored" exactly to fit the needs of citizens and industries in each state.

Under the State planning system, the idea that highways "just run from one place to another" is to be discarded as an obsolete relic of days when all highway vehicles were drawn by animals. Careful studies will be made in individual states to determine how existing highway systems must be adjusted to meet present-day conditions and those which may be expected to arise in the future.

Increased safety on highways, better use of money paid by motorists in special taxes and fees, construction of highways on the basis of traffic demands and adequate highway facilities for communities which lack other transportation services are among the benefits foreseen by officials of the Bureau of Public Roads, U. S. Department of Agriculture.

Preliminary arrangements for cooperation in making the studies have been initiated with ten other states.—*Highway Highlights.*

HIGHWAY SAFETY ENEMY AN "UNHOLY ALLIANCE"

The enemy of highway safety is "an unholy alliance," of outmoded highways, automobiles and traffic laws, and irresponsible drivers and pedestrians, Alfred P. Sloan, Jr., president of General Motors, said in an address at a luncheon of the National Safety Council to honor cities that won the fourth annual national safety contest.

"We now know what the enemy is—an unholy alliance of ancient and inadequate highways; automobiles that are too old for safe use—or that have been allowed to become old before their time; antiquated and conflicting laws; drivers and pedestrians who do not know—and all too often do not care whether they know—how to conduct themselves safely, considerately and courteously," he said.

per foot, one of the heaviest sections rolled, was necessary to support the load placed upon it. A deeper section would have been preferable, but 22 feet vertical clearance above the tracks left just enough space for this beam.

Tower Span Wins in Beauty Contest

(Continued from page 8)

an appearance of massive strength that it indicates the need of a massive supporting structure. Actually the pier is much smaller than appearance indicates as the greater part of the tower loads come on the front leg of the tower and no pier or pedestal is used under the rear tower leg. All loads coming at that point are taken by the approach truss span. This arrangement of the fender system gives the proper balance and symmetry of design when viewed from the side.

UNIQUE PORTAL DESIGN

The curved portals over the roadway and at each intermediate panel point are a unique feature of the structure and add greatly to the aesthetic effect of the bridge from the viewpoint of the motorist as he travels over the roadway.

The massive abutments and pylons at each end of the bridge blend fittingly with the general proportions, color and natural surroundings of the structure. All steel members of the bridge, including the towers, are painted with aluminum paint which gives them a metallic luster.

For a distance of 2000 feet on the west approach to the bridge a beautification project was initiated to improve the appearance of that approach. This consisted of leveling all the area within the State right of way, installing a sprinkler system, planting small park areas immediately adjacent to the bridge and landscaping the approach by planting shrubs and trees.

The Tower Bridge, only bridge in the West to win an award, was built by the State Department of Public Works, in cooperation with the city and county of Sacramento and the Federal Government, at a cost of \$994,000. The design and construction was under the direction of C. H. Purcell, State Highway Engineer, and F. W. Panhorst, Acting Bridge Engineer. The Division of Architecture cooperated in designing the architectural features of the structure.

Teacher—Who can tell me just what an island is?

Carl—It is a piece of land that went out for a swim.

Value of Better Roads for Farmers

WHAT is the value of improved roads to farmers? An answer to this question was sought in a survey conducted last summer by the New York State College of Agriculture, the results of which have been issued recently. A questionnaire was sent to a group of farmers, and in answering it each farmer was asked to place a reasonable value on his land and buildings. The farms were classified by the type of road running by—dirt, gravel or hard surfacing—and each farmer was asked to estimate the value of his land and buildings if the farm were on the other two types. A total of 3365 replies was received giving these comparisons; the average value of farms on dirt roads was \$37 an acre, farms on gravel roads \$55 and farms on hard roads \$71. The farmers on dirt roads estimated, as an average, that their farms would be worth \$45 an acre if the roads were gravel and \$53 if the roads had hard surfacing. The farmers on gravel roads thought that their farms would be worth \$45 an acre on dirt roads and \$65 on hard roads. Those on hard roads estimated that their farms would be worth \$47 on dirt roads and \$57 on gravel. Combining these figures gives the following per-acre values: with dirt road, \$43; with gravel road, \$52; with hard road, \$64. Thus the farmers considered it worth an average of \$9 an acre to a farm to have a dirt road graveled and \$21 an acre more to have a hard-surfaced road rather than a dirt road. On a total-farm basis it was worth \$1,389 to have a dirt road graveled and \$3,030 to have a dirt road hard-surfaced. Evidently, farmers in New York State place a considerable value on road improvement, although in certain sections where hard-road traffic is unusually heavy, a number of farmers indicated a preference for a farm on a gravel road.—*Better Roads.*

Contract has been awarded for surfacing of the State desert highway route 146 near the eastern boundary between Blythe in Riverside County and Palo Verde on the Imperial County line.

Oski: Make a sentence with the word "fascinate."

Wow-Wow: I have nine buttons on my shirt but I only fascinate.

BUILDING STATE HIGHWAY IN KINGS RIVER GORGE

By R. M. Gillis, District Engineer

THE completion last year of the thirty miles of the Generals Highway by the Federal Government to connect Sequoia and Grant parks has brought about an enormous increase in travel to this mountain area and has drawn public attention to the Kings River Highway work being carried on by the California Division of Highways.

The many people who make the trip to these two National Parks and then drive on from Grant down into the rugged gorge of the Kings River as far as the road is open, very naturally ask why this road is being built and where it is going.

Construction of the Kings River Highway was started in 1929 by the State of California in order to open an entirely new recreational area in the heart of the highest Sierra. Beginning at the north boundary of Grant Park the ultimate goal of this road is to reach the valley of the Kings River some twenty-six miles away.

COMPARES WITH YOSEMITE

While this valley does not have the water falls of Yosemite, the general characteristics are in many ways similar; it is about twelve miles long and from half a mile to a mile wide with an elevation of 4500 at the lower end and 5000 at the upper end. On each side of the valley are high granite

cliffs, numerous streams coming in from the sides and grassy meadows with cedar and pine groves on the valley floor. Beyond the valley rise many peaks over twelve thousand feet high.

By this fall approximately eighteen miles of this new highway will have been completed and opened to the public, carrying the road through the roughest part of the Canyon of the Kings to Windy Cliff.

ROAD ALONG STREAM

From Windy Cliff the road will cross to the north side of the Kings and follow along the waters edge for a distance of eight miles to the lower end of the valley. Much heavy construction yet remains although none of it will compare with the portion now being finished.

All of this road is within the Sequoia National Forest, a National reserve of over 2000 square miles, which is now being extensively developed for public enjoyment by the Federal Government.

The United States Forest Service has already completed surveys and plans for the public use of the Kings Valley under its supervision and control as soon as this highway can reach it. The highway will never be carried further than the valley. Its completion will give access to one of the outstanding scenic and recreational areas of the State.

WM. T. HART APPOINTED HIGHWAY COMMISSIONER

(Continued from page 18)

in southern California equipped him with a wide knowledge of road building.

As chairman of the city, county and State Highway Committee of the San Diego Chamber of Commerce, Frank G. Forward long has led the fight to win for San Diego representation on the State Highway Commission. He welcomed the appointment to that body of Mr. Hart in a public statement in which he said:

"Governor Merriam's selection of William T. Hart of Carlsbad to be a

member of the State Highway Commission is the most important step in realization of a completed coast highway through San Diego County and construction of a low grade route to Imperial County."

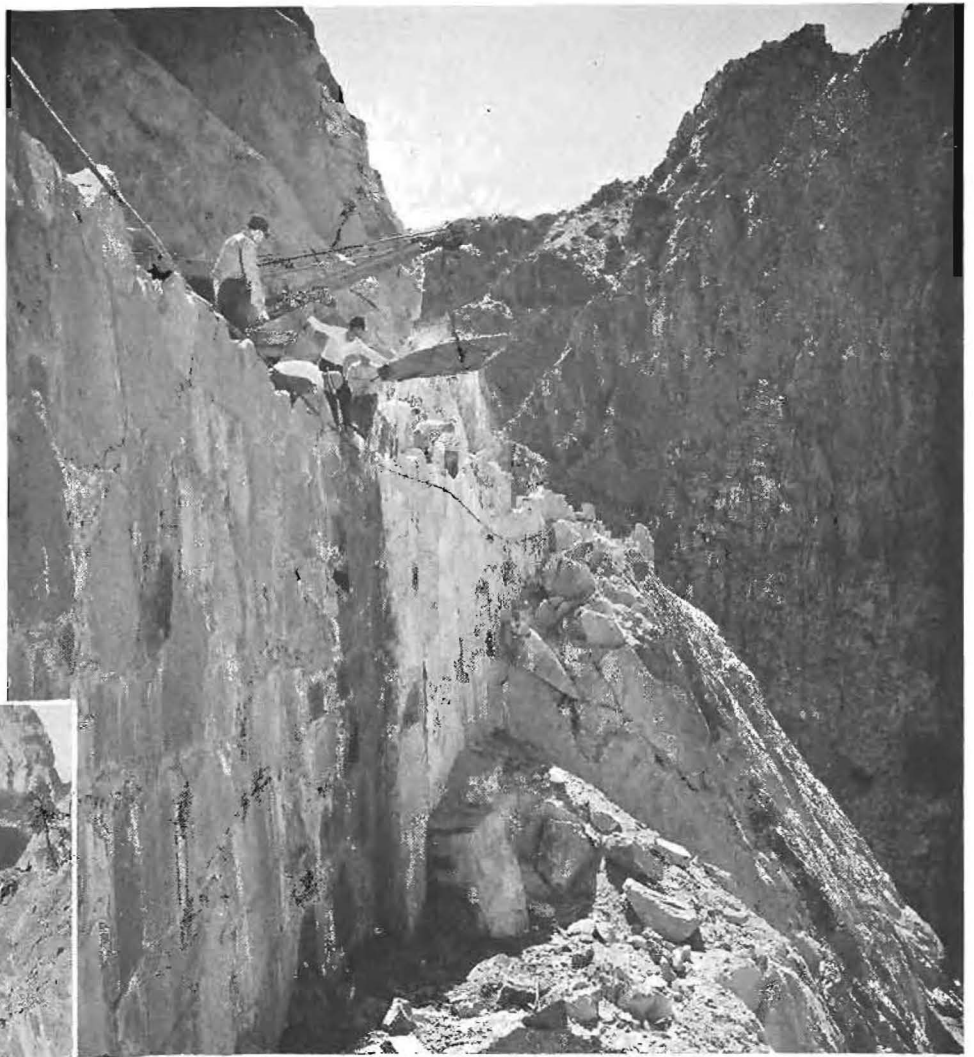
Mr. Hart is an active member of leading fraternal organizations having held offices in these orders, and also is an active member of various San Diego civic organizations.

He attended his first meeting of the Highway Commission in his official capacity in Long Beach on July 10th.

He—You are so wonderful, so beautiful, so marvelous, so—so—
She—So what?

Heavy construction work necessary in the Kings River Canyon is shown at right where a retaining wall for the new highway is being built with granite boulders.

Lower right shows completed retaining wall section. At lower left is scene after 74,450 pounds of explosives blasted away a mountain spur barrier on the line of the highway



Highway Bids and Awards for June, 1936

ALAMEDA COUNTY—At Niles, 6 undergrade crossing structures under Southern Pacific and Western Pacific railroad tracks, 1 bridge, and 2.9 miles graded and paved with P. C. C. and plant-mixed surfacing. District IV, Routes 5 and 107, Sec. CA. F. O. Bohnett & Co., Campbell, \$482,272; Wood & Bevanda, Stockton, \$486,903; J. F. Knapp, Oakland, \$487,356; Guy F. Atkinson Co., San Francisco, \$513,134; McDonald & Kahn Co., Ltd., San Francisco, \$476,344. Contract awarded to Eaton & Smith, San Francisco, \$453,169.82.

ALAMEDA COUNTY—Between Folger avenue and Camelia street, 2.4 miles, grade and surface with crusher run base and plant-mixed surfacing. District IV, Route 69, Section Emv. and Ber. Heafey-Moore Co., Oakland, \$123,106; United Contr. Co., Portland, Ore., \$126,673; Union Paving Co., San Francisco, \$128,340. Contract awarded to Hanrahan Co., San Francisco, \$122,538.70.

ALAMEDA COUNTY—Between Camelia street and San Pablo avenue, 3.1 miles, grade and surface with crusher run base and plant-mixed surf. District IV, Route 69, Sections Ber, Alb, A, Reh and E.Cr. Hanrahan Company, San Francisco, \$224,573; Wood and Bevanda, Stockton, \$278,888; Heafey-Moore Co., Oakland, \$268,977; Peninsula Paving Company, San Francisco, \$211,286. Contract awarded to Union Paving Co., San Francisco, \$209,335.50.

ALAMEDA COUNTY—Between Irvington and Centerville, about 1.9 miles to be surfaced with plant-mix surfacing. District IV, Route 69, Sec. A. W. H. Larson, Oakland, \$19,716; Independent Const. Co., Ltd., Oakland, \$16,700; E. A. Forde, San Anselmo, \$17,423; Lee J. Immel, Berkeley, \$17,975. Contract awarded to Jones & King, Hayward, \$16,295.

ALAMEDA COUNTY—In Oakland at Berkeley city line about 0.10 mile, grade and surface with plant-mixed surfacing. District IV, Route 206, Section Oak. Ransome Co., Emeryville, \$10,255; Lee J. Immel, Berkeley, \$9,989; W. H. Larsen, Oakland, \$10,226. Contract awarded to Hanrahan Co., San Francisco, \$8,197.20.

ALAMEDA COUNTY—Between 34th street and 7th street in the city of Oakland, 1.4 miles grade and pave with A. C. and P. C. C. District IV, Route 69, Section Oak. Peninsula Paving Co., San Francisco, \$147,660; Union Paving Company, San Francisco, \$142,559. Contract awarded to Hanrahan Company, San Francisco, \$124,748.50.

CONTRA COSTA COUNTY—Between 2 miles west of Lafayette and Walnut Creek, 5.2 miles, grade and surface with plant-mixed surf. on cr. run base. District IV, Route 75, Section A. Hanrahan Company, San Francisco, \$359,152; John Carlin and Cranfield, Farrar & Carlin, San Francisco, \$314,037; A. Teichert & Son, Inc., Sacramento, \$328,169; Guy F. Atkinson Company, San Francisco, \$329,876; George Pollock Company, Sacramento, \$347,841; Wood & Bevanda, Stockton, \$361,814; D. McDonald, Sacramento, \$328,329. Contract awarded to Union Paving Co., San Francisco, \$293,291.

FRESNO COUNTY—Between Belmont Circle and Biola Junction, 4.5 miles to be graded and paved with P. C. C. and asphalt concrete. District VI, Route 4, Section Fre.&C. Union Paving Co., San Francisco, \$235,897; Griffith Company, Los Angeles, \$242,824; Wood & Bevanda, Stockton, \$233,419. Contract awarded to Hanrahan Co., San Francisco, \$229,510.55.

GLENN COUNTY—Between 4 miles north of Willows and 1 mile south of Artois, 1.5 mile to be graded, surfaced with crusher

run base and plant-mix surfacing or widened and crusher run borders constructed, fences and reinforced concrete bridge to be constructed. District III, Route 7, Section B. A. T. Howe, Santa Rosa, \$46,869; Leo F. Piazza, San Jose, \$46,305. Contract awarded to N. M. Ball Sons, Berkeley, \$43,671.65.

KERN COUNTY—Between 3 miles and 12 miles north of Mojave 9.1 miles to be surfaced with road-mix surfacing and seal coat. District IX, Route 23, Sec. B. M. J. B. Const. Co., Stockton, \$26,363. Contract awarded to A. S. Vinnell Co., Los Angeles, \$18,211.85.

KINGS COUNTY—Between westerly boundary and Kings River Slough. District VI, Route 10, Section B. A. S. Vinnell Co., Los Angeles, \$15,131; John Jurkovich, Fresno, \$14,555; Palo Alto Road Materials Co., Palo Alto, \$13,244. Contract awarded to Stewart & Nuss, Inc., Fresno, \$13,103.50.

LASSEN COUNTY—Between Susanville and Milford, and between Johnstonville and Lake Leavitt, 13.3 miles to be graded and treated with liquid asphalt. District II, Route 29, 73, Section C. D. A. Isbell Const. Co., Reno, Nevada, \$68,801; Larsen Bros., Sacramento, \$65,373; A. Teichert & Son, Inc., Sacramento, \$62,729; Harms Bros. Doyle, \$58,789. Contract awarded to Fredricksen & Westbrook, Lower Lake, \$58,442.50.

LOS ANGELES COUNTY—Between Patata street and Florence avenue, 1.1 miles widen roadbed and place widening strips of plant-mixed surf. and P. C. C. District VII, Route 167, Section A and Bell. Southern California Roads Co., Los Angeles, \$33,960; C. F. Robbins, Los Angeles, \$34,127; C. O. Sparks & Mundo Eng. Co., Los Angeles, \$32,909; Oswald Bros., Los Angeles, \$29,351; J. E. Haddock, Ltd., Pasadena, \$30,039; Griffith Co., Los Angeles, \$33,778. Contract awarded to Geo. R. Curtis Paving Co., Los Angeles, \$28,526.20.

LOS ANGELES COUNTY—At Walnut Canyon about 0.6 miles to be graded and paved with P. C. concrete. District VII, Route 60, Section A. Gibbons & Read Co., Burbank, \$54,177; J. F. Haddock, Ltd., Pasadena, \$57,211; C. O. Sparks, & Mundo Eng. Co., Los Angeles, \$52,603; Geo. R. Curtis Paving Co., Los Angeles, \$53,506; R. E. Campbell, Los Angeles, \$69,427; Oswald Bros., Los Angeles, \$52,266; A. S. Vinnell Co., Los Angeles, \$56,236. Contract awarded to C. F. Robbins, Los Angeles, \$50,716.40.

LOS ANGELES COUNTY—A reinforced concrete girder bridge across Rio Hondo, 2 miles west of El Monte, 0-67' and 2-26' spans. District VII, Route 26, Sec. A. R. R. Bishop, Long Beach, \$133,555; Daley Corp., San Diego, \$132,749; Case Const. Co., Alhambra, \$147,393; Carlo Bongiovanni, Hollywood, \$130,858; Shofner & Gordon, Los Angeles, \$143,146; Byerts & Dunn, Los Angeles, \$129,852; J. E. Haddock, Ltd., Pasadena, \$122,924. Contract awarded to Oscar Oberg, Los Angeles, \$117,876.10.

LOS ANGELES COUNTY—At Rivera on San Gabriel boulevard, an undergrade crossing under tracks of A. T. & S. F. R. R. to be constructed. C. O. Sparks and Mundo Engineering Co., Los Angeles, \$102,266; R. E. Campbell, Los Angeles, \$115,277; Fred E. Potts Co., Los Angeles, \$108,632; Daley Corporation, San Diego, \$109,752; Shofner & Gordon, Los Angeles, \$139,435; Oswald Bros., Los Angeles, \$113,994; John Strona, Pomona, \$107,541; Griffith Co., Los Angeles, \$99,900. Contract awarded to J. E. Haddock, Ltd., Pasadena, \$98,671.

MENDOCINO COUNTY—0.5 mile to be graded and timber bridges removed, between Gualala and Navarro River. District I, Route 56, Section A, C. Guerin Bros., San Francisco, \$7,695; J. V. Galbraith & Don A. Canevari, Santa Rosa, \$8,664. Contract awarded to A. T. Howe, Santa Rosa, \$7,470.50.

MENDOCINO COUNTY—Between Navarro River and Williams Creek, 0.8 mile to be graded and timber bridges removed. District I, Route 56, Sec. D and E. J. V. Galbraith and Don A. Canevari, Santa Rosa, \$18,301; Helwig Const. Co., Sebastopol, \$19,737; M. J. B. Construction Co., Stockton, \$20,205; N. M. Ball Sons, Berkeley, \$24,099; A. T. Howe, Santa Rosa, \$25,116; Leo F. Piazza, San Jose, \$31,943. Contract awarded to Guerin Bros., San Francisco, \$12,999.60.

MONTEREY COUNTY—Between San Lucas and King City, about five miles in length, seal coat to be applied to existing roadbed. District V, Route 2, Section F. L. A. Brisco, Arroyo Grande, Calif., \$3,925; A. S. Vinnell Co., Los Angeles, \$4,613. Contract awarded to Granite Construction Co., Ltd., Watsonville, \$3,829.60.

MONTEREY COUNTY—Between Seaside Road and Castroville, about 12.2 miles in length, road-mix surface treatment to be applied to existing shoulders. District V, Route 56, Section 1. Lee J. Immel, Berkeley, \$15,250; Oilfields Trucking Co., Bakersfield, \$19,239. Contract awarded to L. A. Brisco, Arroyo Grande, \$14,950.50.

ORANGE COUNTY—Between the north city limits of Brea and the Orange-Los Angeles County line, about 2 miles existing roadbed to be surfaced with plant-mix. District VII, Route 19, Sec. A. A. S. Vinnell Co., Los Angeles, \$7,554; Goode & Schroeder, Los Angeles, \$7,782; Paul R. Hughes, Long Beach, \$10,480. Contract awarded to C. O. Sparks, Los Angeles, \$7,067.60.

PLACER COUNTY—Between 4½ miles northeast of Taboe City and Nevada state line, 7.1 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 39, Section A. Union Paving Co., San Francisco, \$179,288; Geo. Pollock Co., Sacramento, \$192,072; J. A. Casson, Hayward, \$196,596; Isbell Construction Co., Reno, Nevada, \$218,338. Contract awarded to Hemstreet & Bell, Marysville, \$163,069.

RIVERSIDE COUNTY—Between 12 miles east of Desert Center and 2.2 miles west of Blythe and between Routes 26 and 187, 12.5 miles in length, furnish and apply liquid asphalt. District XI, Route 64, 204, Section C, D, E-A. Gilmore Oil Co., Los Angeles, \$4,797; Square Oil Co., Los Angeles, \$4,925; Paulsen & March, Los Angeles, \$4,619; Oilfield Trucking Co., Taft, \$5,063; Morgan Bros., Huntington Park, \$4,503; Lambs Transfer Co., Long Beach, \$4,819. Contract awarded to Regal Oil Co., Long Beach, \$4,165.80.

RIVERSIDE COUNTY—Between San Bernardino County line and Beaumont, about 2.4 miles to be graded and paved with plant-mix surf. District VIII, Route 26, Sec. A. Geo. J. Bock Co., Los Angeles, \$80,603; Match Bros., Elsinore, \$77,546; Geo. R. Curtis Paving Co., Los Angeles, \$65,410; R. E. Hazard & Son, San Diego, \$75,966. Contract awarded to Oswald Bros., Los Angeles, \$65,160.40.

RIVERSIDE COUNTY—Pit run gravel surfacing between Palo Verde and Route 64, near Blythe, 16.5 miles. District XI, Route 146, Section AB. Jack Starkenburg, Los Angeles, \$14,025; Arthur C. Bussey, River-

Highway Bids and Awards for June, 1936

(Continued from preceding page)

side, \$7,225; R. E. Hazard & Sons, San Diego, \$10,455; V. R. Dennis Const., San Diego, \$10,455. Contract awarded to Martin Bros. Trucking Co., Long Beach, \$7,055.

SACRAMENTO COUNTY—Between O Street and American River, 0.6 mile, grade and A. O. and P. C. C. pavement. District III, Route 3, Sections Sac. and B. Heafey-Moore Co., Oakland, \$63,399. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$49,772.95.

SACRAMENTO COUNTY—An overhead crossing over tracks of S. P. at Jibboom street in Sacramento. District III. Lindgren & Swinerton, Inc., San Francisco, \$150,198; F. C. Amoroso & Sons, San Francisco, \$136,987; Geo. Pollock Co., Sacramento, \$149,888; M. B. McGowan, Inc., San Francisco, \$142,956; A. Teichert & Son, Sacramento, \$144,940. Contract awarded to Lord & Bishop, Sacramento, \$136,962.60.

SAN BERNARDINO COUNTY—Between Colton and Waterman avenue, about 1.3 miles to be graded and paved with P. C. C. and A. C. District VIII, Route 26, Sec. E. Griffith Company, Los Angeles, \$77,022; Daley Corporation, San Diego, \$86,783; V. R. Dennis Const. Co., San Diego, \$84,255; C. O. Sparks & Mundo Engr. Co., Los Angeles, \$83,177; Dimmitt & Taylor, Los Angeles, \$80,036. Contract awarded to Oswald Bros., Los Angeles, \$71,273.20.

SAN BERNARDINO COUNTY—Near Colton, 3 reinforced concrete bridges across Warm Creek, Santa Ana River and an overflow channel; grade and pave approaches with P. C. C. District VIII, Route 26, Section E. Griffith Co., Los Angeles, \$147,320; V. R. Dennis Const. Co., San Diego, \$148,072; Bent Bros., Inc., Los Angeles, \$145,989; John Strona, Pomona, \$158,554; R. R. Bishop, Long Beach, \$154,440; J. R. Haddock, Ltd., Pasadena, \$149,723; Byerts & Dunn, Los Angeles, \$138,542. Contract awarded to Daley Corp., San Diego, \$128,392.60.

SAN BERNARDINO COUNTY—An overhead crossing over the A. T. & S. P. R. R. at Palm avenue, 3 miles south of Colton, and grade and pave approaches with plant mixed surfacing. Robert D. Paterson, Santa Barbara, \$22,745. Contract awarded to John Oberg, Los Angeles, \$21,136.

SAN BERNARDINO COUNTY—Between National Forest boundary and Victorville, 21 miles road-mix surf. treat. to be applied to existing roadbed. District VII, Route 43, Sections J, K, L. Sou. Cal. Roads Co., Los Angeles, \$29,562; Dimmitt & Taylor, Los Angeles, \$27,028; Oilfields Trucking Co., Bakersfield, \$24,549; Clyde W. Wood, Stockton, \$27,945; Oswald Bros., Los Angeles, \$28,192; A. S. Vinnell Co., Los Angeles, \$22,423. Contract awarded to R. E. Hazard & Sons, San Diego, \$22,391.25.

SAN BERNARDINO COUNTY—Between a point near Third street in Barstow and 0.6 mile easterly, 0.6 mile. Grade and treat with liquid asphalt. District VIII, Route 58, Section E. A. S. Vinnell Co., Los Angeles, \$26,359; Dimmitt & Taylor, Los Angeles, \$26,459. Contract awarded to Match Bros., Elsinore, \$22,891.60.

SAN DIEGO COUNTY—Between 6.5 miles east of Rincon and one mile west of Henshaw Dam, 9.2 miles in length, liquid asphalt to be furnished and applied. District XI, Route 195, Sections D and E. Oilfields Trucking Co., \$4,473; Paulsen & March, \$3,728; Gilmore Oil Co., \$4,118; Square Oil Co., \$3,506; Regal Oil Co., \$3,311. Contract awarded to Morgan Bros., Huntington Park, \$3,295.60.

SAN FRANCISCO COUNTY—In San Francisco at the 5th Street Plaza. Furnish and plant trees and shrubs, grade and plant

lawn and furnish and install water system. District IV, Route 68, Section S. F. Rexroth & Rexroth, Bakersfield, \$22,377; Walter A. Hoff, San Francisco, \$24,506. Contract awarded to California Nursery Co., Niles, \$13,935.

SAN LUIS OBISPO COUNTY—Portions between Toro Creek and Cambria, about 7.8 miles in length, shoulders to be road-mix surface treated. District V, Route 56, Sec. C. John Fesler, Santa Maria, \$6,992; L. A. Brisco, Arroyo Grande, \$7,484; A. S. Vinnell Co., Los Angeles, \$8,570. Contract awarded to Oilfields Trucking Co., Bakersfield, \$5,908.50.

SAN LUIS OBISPO COUNTY—Between Nipomo and Arroyo Grande (V-S. L.O.-20F), between Santa Maria River and Pismo (V-S.L.O.56-E), and between Edna and San Luis Obispo (S.L.O.-147-A), about 16 miles, seal coat and road-mix surface treatment to be applied. District V, Routes 2, 56, 147, Sections F, E, A. A. S. Vinnell Co., Los Angeles, \$11,492; John Fesler, Santa Maria, \$11,294. Contract awarded to L. A. Brisco, Arroyo Grande, \$10,227.50.

SAN LUIS OBISPO COUNTY—Between Cambria and Route 2 (S.L.O.-33-D, E), between Morro and Shandon (S.L.O.-125-A,B,C), between Sta. Margarita and Creston (S.L.O.-137-A), about 41 miles in length, liquid asphalt to be furnished and applied. District V, Route 33, 125, 137, Section D, E, A, B, C, A. Lambs Transfer Co., Long Beach, \$11,398; L. A. Brisco, Arroyo Grande, \$11,973; Oilfields Trucking Co., Bakersfield, \$11,850. Contract awarded to Paulsen & March, Inc., Los Angeles, \$11,343.60.

SAN LUIS OBISPO AND MONTEREY COUNTIES—Between Atascadero and San Miguel and between Salinas and Monterey-Santa Cruz county line, about 34 miles in length, seal coat to be applied to existing pavement. District V, Routes 2, 118, 56, Sections B, A, A, J. Lee J. Immel, Berkeley, \$14,921; A. S. Vinnell Co., Los Angeles, \$15,470. Contract awarded to Granite Construction Co., Ltd., Watsonville, \$11,440.90.

SHASTA COUNTY—Between Viola and Forest Boundary, about 2.4 miles to be graded and surfaced with cr. run base and road-mix surf. District II, Route 20, Sec. E. Larsen Bros., Sacramento, \$75,465; J. G. Chigris, San Francisco, \$60,302. Contract awarded to Fredericksen & Westbrook, Lower Lake, \$59,617.30.

SOLANO COUNTY—Fender construction, Rio Vista Bridge across Sacramento River. District X, Route 53, Section C. C. A. Lauritzen, Antioch. Contract awarded to Bundeson & Lauritzen, Pittsburg, \$8,535.

STANISLAUS COUNTY—Between Turlock and Keyes, about 4.2 miles to be graded and surfaced with bit. tr. cr. grav. or stone (plant mix). District X, Route 4, Section A. Henfey-Moore Co., Oakland, \$44,628; Pacific States Const. Co., San Francisco, \$45,893; Biasotti, Willard & Biasotti, Stockton, \$48,381; A. Teichert & Son, Inc., Sacramento, \$48,378; M. J. B. Const. Co., Stockton, \$54,405. Contract awarded to S. M. McGaw, Stockton, \$44,163.50.

SUTTER COUNTY—Between Knights Landing and Robbins, 3.7 miles, grade and surface with cr. run base and road-mix surface. District III, Route 87, Section A. A. Teichert & Son, Inc., Sacramento, \$99,454; Pacific States Const. Co., San Francisco, \$92,220. Contract awarded to Hanrahan Company, San Francisco, \$85,588.50.

TEHAMA COUNTY—At the south entrance to Red Bluff, about 0.3 miles in length to be graded and paved with P. C. C. pavement. District II, Route 7, Sec. B. Contract awarded to N. M. Ball Sons, Berkeley, \$13,961.80.

TULARE COUNTY—Tulare to 7.6 miles south, 0.6 mile south to 2.8 miles north

Goshen subway, subway to 0.7 mile west, road-mix surface tr. shoulders. District VI, Route 4, 10, Section B-F, A. Stewart & Nuss, Inc., Fresno, \$6,814; Oilfields Trucking Co., Bakersfield, \$6,760; Palo Alto Road Mtl. Co., Palo Alto, \$7,104; L. A. Brisco, Arroyo Grande, \$6,742. Contract awarded to John Jurkovich, Fresno, \$6,640.

TUOLUMNE COUNTY—Between 3½ miles east of Sullivan Creek and Pooleys, 24 miles, grade and surface with road-mix surfacing on Untr. Cr. Gr. or St. Base. District X, Route 13, Section C. Biasotti, Willard & Biasom, Stockton, \$74,743; Union Paving Co., San Francisco, \$68,466. Contract awarded to M. J. B. Construction Co., Stockton, \$63,529.30.

VENTURA COUNTY—Between San Antonio Creek and Ojai and Mound School and 2.7 miles east and Simi 0.4 mile east of Santa Susana Overhead, 13.6 miles to be surfaced with plant-mixed surfacing. District VII, Routes 138, 151, 79, 9, Sections A, C, A. C. Geo. R. Curtis Paving Co., Los Angeles, \$68,425; A. S. Vinnell Co., Los Angeles, \$73,603; Oswald Bros., Los Angeles, \$63,493. Contract awarded to Southwest Paving Co., Roscoe, \$58,816.25.

VENTURA COUNTY—At Camarillo State Hospital, 1.5 miles to be graded and bit. treat. by the road-mix method. District VII, Route Camarillo State Hospital. C. F. Robbins, Los Angeles, \$28,765; Oswald Bros., Los Angeles, \$29,212; J. B. Haddock, Ltd., Pasadena, \$30,090; A. S. Vinnell Co., Los Angeles, \$27,047. Contract awarded to Dimmitt & Taylor, Los Angeles, \$24,391.

YOLO AND COLUSA COUNTIES—Between Dunnigan and Arbuckle, 10.3 miles to be graded and surfaced with plant-mixed surfacing (medium curing type). District III, Route 7, Section C and A. Union Paving Co., San Francisco, \$144,360; Hemstreet & Bell, Marysville, \$159,921; A. Teichert & Son, Inc., Sacramento, \$144,035. Contract awarded to Hanrahan Co., San Francisco, \$129,708.50.

YOLO COUNTY—Between "M" Street Subway and Sacramento River Bridge, about 0.4 mile of P. C. C. widening strips to be constructed. District III, Route 6, Section C. N. M. Ball Sons, Berkeley, \$5,520; L. C. Seidel, Oakland, \$10,181. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$8,971.50.

YUBA AND NEVADA COUNTIES—Between Parks Bar Bridge and one-quarter mile east of Nevada County line, 3.7 miles, grade and surface with crusher run base and seal coat. District III, Route 15, Sections B and A. Larsen Bros. & Harms Bros., Sacramento, \$179,721; Isbell Construction Co., Reno, Nevada, \$203,775; A. Teichert & Son, Inc., Sacramento, \$202,978. Contract awarded to J. G. Chigris, San Francisco, \$156,538.50.

A good speaker is one who says the things you would like to think of to say the way you would say them if you thought of them.
—Heron Lake News.

Automotive engineers predict automobiles soon will be built that can travel on land, sea and in the air. A better invention even than that would be an automobile that would travel on its own side of the highway.

"Are you positive?" demanded counsel, "that the prisoner is the man who stole your car?"

"Well," answered the witness, "I was until you cross-examined me. Now I'm not sure whether I ever had a car at all."

Safety in Double Strip Highway Modern Design Defies Obsolescence

IN AN ARTICLE dealing with modernization of obsolete sections of major highways recently published in *Western Construction News*, Lacey V. Murrow, Director of Highways of the State of Washington, says:

"To reconstruct obsolete primary highways and to bring them into condition to render the fullest and most satisfactory service to their users is the task confronting many a highway department. Assuredly, it is a task which in Washington we envisage and are moving steadily forward to accomplish. This does not mean the utter abandonment of the old roads. They simply cease to be main roads and become secondaries, serving the local territory through which they pass and furnishing connection to intersecting roads, etc.

"It may well be asked whether future years will not render obsolete the present high-standard construction in the same manner past years have dealt with past work. A definite negative answer can not as well be given to this question. The future is the future and keeps its own counsel.

CERTAIN PERMANENT FACTORS

"Nevertheless, it may be said that no future has ever or ever will render obsolete a straight line as the shortest path between two points; no future can ever make a second degree curve as awkward to negotiate as a twenty degree curve; no future can render obsolete good visibility once it is attained. In short, we can say confidently that what we are doing now in the reconstruction and reconditioning of our main highways is of a permanent, lasting character.

"This work may be refined in the future. It may be necessary to expand in the future. But it conforms with the major topographic features of the country traversed, with traffic needs, and with population centers. Therefore we do not expect obsolescence to deal with it as it has dealt with the work of 20 years ago."

Referring to certain sections of the Pacific Highway when relocation and reconstruction were required, Mr. Murrow describes the double strip type of highway adopted by the State Highway Department as follows:

"These sections were constructed with what has proved to be a most satisfactory type of heavy traffic road: two strips of 10-7-10-in. concrete pavement 20 feet wide with a 4-foot sodded neutral zone between them and with 9-foot shoulders on the outer sides. This requires a roadbed 62 feet wide on fills and 68 feet wide in cuts, the additional breadth being due to the side ditches in cuts.

"This double-strip pavement construction gives a complete two-lane pavement 20 feet wide to the traffic moving in each direction and, for normal highway uses, has a practically unlimited capacity. The 4-foot sodded neutral zone between the two pavements definitely divides the traffic streams and has a great psychological value in giving drivers a feeling of safety and security; oncoming traffic has its own pavement and must, or seemingly must, stay there.

NO HEAD-ON COLLISIONS

"This feeling of safety is a very real satisfaction to motorists and further increases the traffic capacity of the road. On the other hand should storm or accident temporarily close one strip of pavement the traffic can at any point be put under control, be taken across the neutral strip and detoured around the blockade.

"There is nothing imaginative about the increased safety afforded by the double strip construction. With it, passing another vehicle is accomplished without entering into the path and right-of-way of oncoming traffic. The temptation to take a chance in getting by a slow moving truck or a whole line of slow moving cars is eliminated by removing all hazard from the act. There has ceased to be any oncoming traffic to cause hazard and danger. Pass on curves if you want to.

"Illustrative of this safety is the fact that the records of our department show no instances of head-on collisions having occurred anywhere on the 70 miles of such road that we have built. On the other hand five lives have been lost and about \$100,000 property loss has been suffered in recent years in head-on collisions on the 13 miles of single strip pavement still remaining in service east of Olympia.

In Memoriam

LAURENCE ADOLPHUS CHRISTENSEN, Junior Highway Engineer in District V of the Division of Highways, and employed on the San Simeon to Carmel highway in Monterey County, lost his life on June 18th. Following his daily custom, he had left his home in Pacific Valley in early morning and while driving to the construction camp at Anderson Canyon his car struck a deer and plunged over the side of the road, dropping two hundred and fifty feet to the ocean beach below. Other employees driving along the road a few minutes later noticed the skid marks and the body of the deer and upon investigation found Mr. Christensen lying beneath his car.

Mr. Christensen had been employed in the Division of Highways since December 12, 1928. For the greater part of that period he was engaged in construction engineering on the scenic Carmel-San Simeon highway on work for which his ability and experience had particularly fitted him.

Laurence A. Christensen was born in Newton, Utah, on July 12, 1884, and was fifty-two years old at the time of his tragic passing. He attended high school and was graduated from University of Utah in 1911 upon completion of his course in civil engineering. After graduation his employment in his chosen profession was very broad and varied. It included two years on railroad construction, ten years in design, construction and operation of irrigation projects and five years of general practice on dams, storm drains, street improvements and buildings.

His vocation carried him into many of the western states and brought him a wide acquaintance and many enduring friendships. Wherever he went he was ever conscientious in his duties, faithful and loyal in his employment. He leaves behind him in the Division of Highways many friends who have associated with him and have been charmed by his quiet and genial character. In his passing he leaves his widow and aged mother, two brothers and three sisters.

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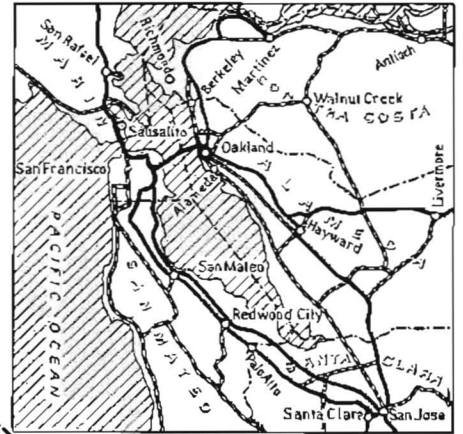
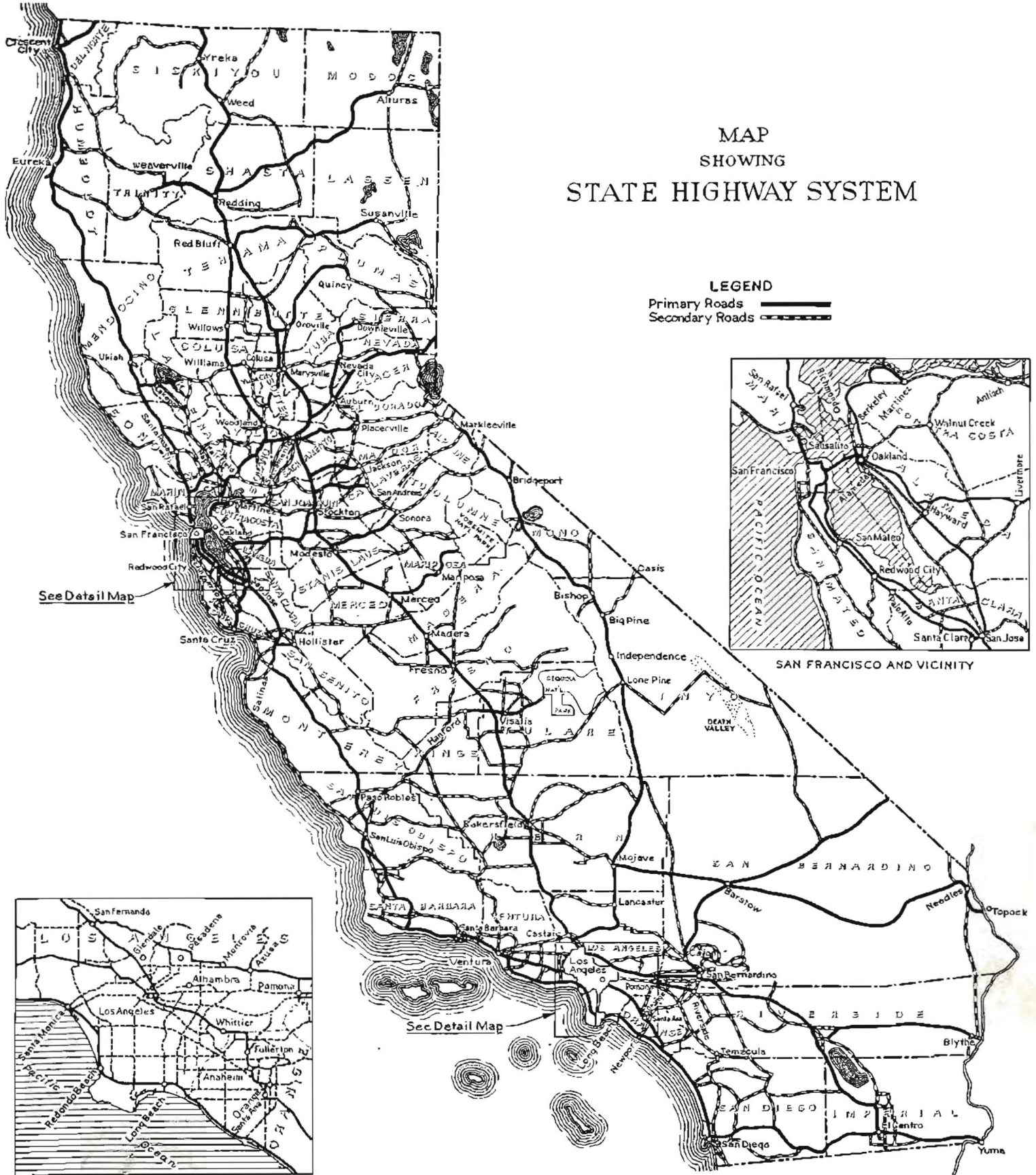
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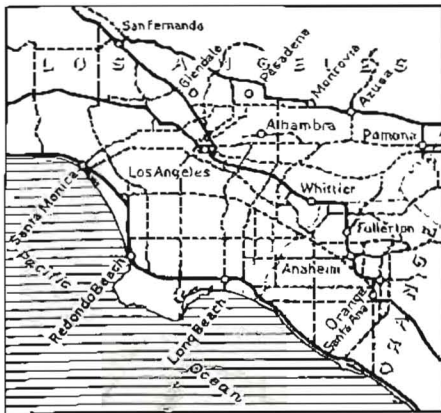
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MAP
 SHOWING
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LEGEND
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 Secondary Roads - - - - -



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY