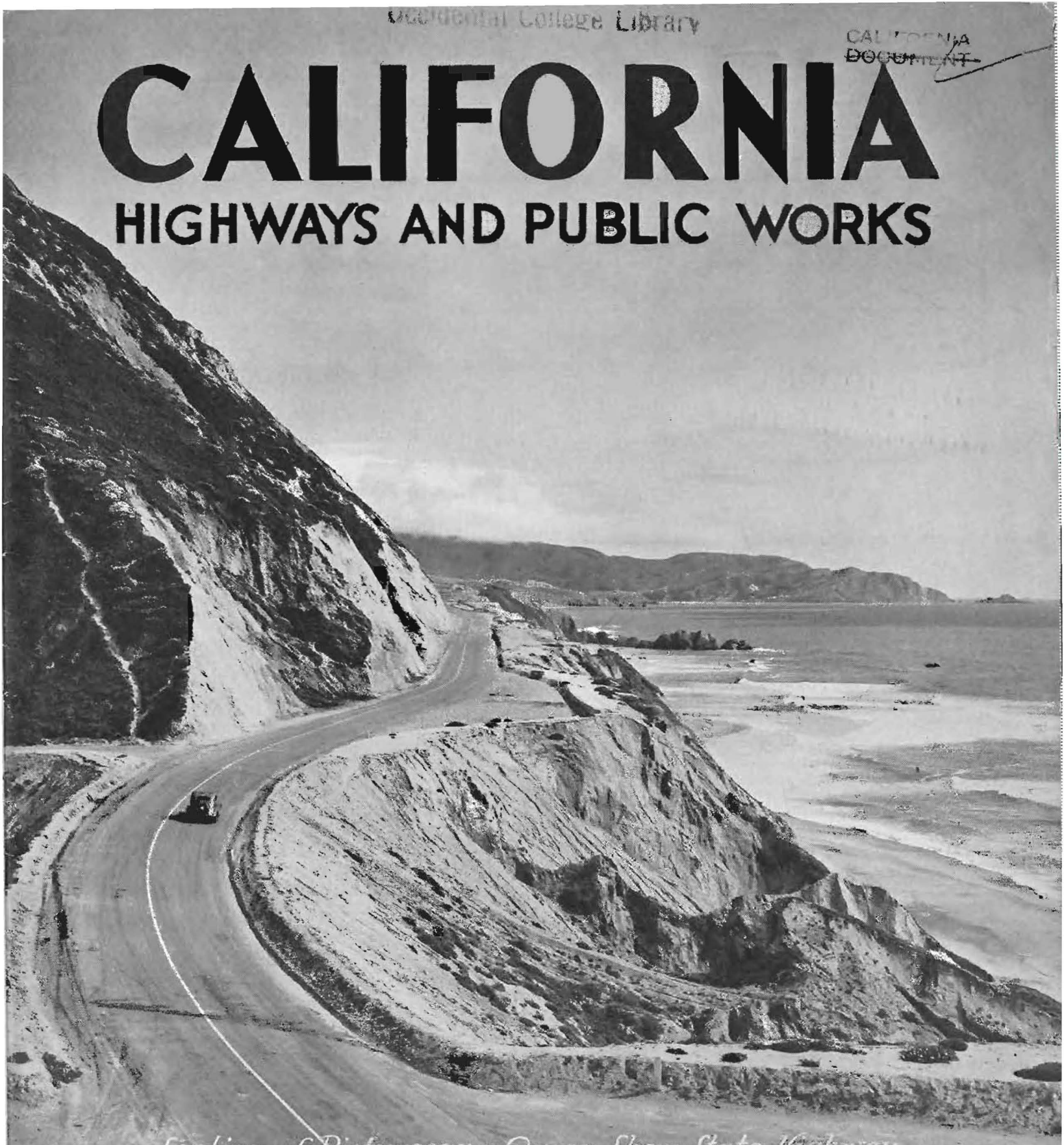
CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Section of Picturesque Ocean Shore State Highway Being Built in San Mateo County

Official Journal of the Department of Public Works

JUNE · · 1937

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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New Highway Over Pedro Mountain Will Eliminate Dangerous Existing Grade

By E. G. POSS, District Construction Engineer

A STATE highway, located within 15 miles of the city of San Francisco, is now under construction on the coast of San Mateo County which will take the place of one of the most dreaded travel routes of the Peninsula. This highway, between Rockaway Beach and Farallone City, will be a portion of the Ocean Shore Highway, Route 56, between San Francisco and Santa Cruz; and it is being built as a cooperative project, in which are joined the Federal government, the State, and Joint Highway District No. 9, comprising the counties of San Francisco, San Mateo and Santa Cruz.

The following comparative statistics of the old and the proposed routes, will serve to show the great improvement in travel facilities afforded by the new highway:

Route	No. curves	Total curvature	Circles	Curve length % of total	Maximum grade	Total rise and fall	Length miles
Present	250	15193° 51′	42.2	46.6%	7%	2409′	10.618
Proposed	28	1372° 28′	3.8	47.8%	7%	1225′	5.903
Diff'nce	222	13821° 23′	38.4			1174′	4.715

The above figures show that the distance and the rise and fall are practically cut in half.

PRESENT ROAD DANGEROUS

The statistics and map, however, do not tell the complete story. The present road is very narrow, with an average roadbed width of 16 feet, steep cut banks, and extremely sharp curvature, most of the curves being under 100 foot radius. The new alignment has a minimum radius of 400 feet. The old line has a continuous climb of 3 miles, and reaches a summit elevation of 922 feet, only to drop back to the coastal flat on the other side. The new line has a climb 1.2 miles long, with a summit elevation at Station 440 of 465 feet. The new roadway width is a minimum of 26 feet with numerous wider sections for turnouts and parking, particularly on the cliff section between Stations 400 and 440 where the entire ocean side has been daylighted.

Montara, or, as it is locally known, San Pedro Mountain, is a westward spur of the main north and south range dividing San Francisco Bay and the ocean. The geologists describe it as a dioritic batholith, which marches to the ocean in this area and results in the formation of sea cliffs a thousand feet in height between San Pedro Point and Green Canyon. Tremendous pressures convulsed this section and the sedimentary deposits uplifted by the batholith on the ocean front show unbelievable folding and faulting.

RICH AGRICULTURAL COUNTRY

Both north and south of San Pedro Mountain are sections of rich agricultural lands interspersed with a more or less continuous string of suburban development on the narrow coastal flats and valleys extending back into the main range. There are many fine beaches on either side of the mountain. Therefore, from the earliest times, despite the formidable barrier of San Pedro Mountain, means of communication were established between the two sections.

The almost inaccessible cliff face between Devils Slide and San Pedro Point, while offering lower grades, discouraged all the early builders, and therefore the first trails and roads were built farther inland over steep grades and through passes high up on the mountain. The remains of these early endeavors can be found all over the mountainside.

With the advent of the automobile and the need of better communication between the two sections, the county of San Mateo, in or about 1914, constructed the existing route, which was taken over by the State Highway for maintenance in 1933 under legislative action. However, this road, because of its grades, alignment and width, discouraged any large amount of travel in spite of a heavy, latent, metropolitan traffic waiting to take advantage of a modern highway to the beach and recreational areas to the south.

To remedy this situation, Joint Highway District No. 9 was organized to improve, with State aid, the general route of the Coast Highway between San Francisco and Santa Cruz. One of the first studies and projects undertaken was the rerouting of the highway between Rockaway Beach and Farallone City. The route selected by the Joint Highway District's engineers followed, in general, the former roadbed of the Ocean Shore Railroad by way of San Pedro Point; but after contracts were let the construction was bogged down by right of way litigation and was finally abandoned.

HIGH CLIFF OVERCOME

After taking this section of the road over as part of the Ocean Shore State Highway between San Francisco and Santa Cruz, the pressure of the traveling public and the agitation by official and unofficial bodies of the Peninsula, particularly Joint Highway District No. 9, resulted in a thorough reexamination of all possible locations and the final adoption of the present route now under construction.

(Continued on page 4)

Waldo Approach An Engineering Feature of Golden Gate Bridge

By JNO. H. SKEGGS, District Engineer

SAN FRANCISCO'S great Fiesta celebrating the dedication and opening to traffic of the Golden Gate Bridge on May 28 is history.

The Golden Gate Bridge, spanning the deep waters of ocean and bay at the entrance to San Francisco's world-famous harbor, is in full operation and has assumed its place as an enduring monument to engineering skill and the spirit of progress. It stands as a proud and fit companion for the San Francisco-Oakland Bay Bridge linking the San Francisco peninsula with the eastbay mainland.

The opening to the public of the Golden Gate Bridge marked the engineering achievement of what a large portion of a doubting population of earlier years predicted could never be accomplished. Those who doubted were sincere in believing that the obstacles imposed by Mother Nature were too great to be overcome.

BIG OBSTACLES OVERCOME

But the bridge builders surmounted these obstacles with the longest single over water suspension span in the world, with towers one-seventh of a mile high, set four-fifths of a mile apart. What they did will live as long as engineering annals are written.

Now that the tumult and the shouting have died down, the pageantry and parades and the gay revels of Fiesta Week become never-to-be-forgotten memories, it seems but natural for the engineers of the Division of Highways of the Department of Public Works to survey with pleasure the Waldo Approach, the new highway leading to the Marin end of the Golden Gate Bridge, which was the State's contribution to this huge project.

The Marin Approach, popularly called the Waldo Approach, was constructed by the Division of Highways from the north landing of the bridge to a connection with the Redwood

JNO. H. SKEGGS

Highway at Waldo. The total cost of this project, including engineering and rights of way, will exceed $2,000,000.

DIFFICULT ROAD BUILDING

This section of road, traversing heavy mountain slopes for the greater portion of its 3.6 miles of length, ends at the Waldo Junction, in a marsh or tide flat having a depth of soft mud of seventy feet. Mountainous as the terrain is, with all the usual attendant difficulties of construction of cuts and fills of vertical depths up to 150 and 200 feet, even average mountain stability of formation is lacking, and developed slides have required the removal of more than two and one-half million yards of roadway excavation.

The job required a tunnel 1000 feet long with a bore 28 feet 9 inches high on the center line. The roadway width in the tunnel is 42 feet and one sidewalk, 42 inches wide, is provided.

Statistics of costs and of construction quantities, however, have but slight significance to the average citizen. A comparison with past highway construction achievement presents a more vivid picture, and will give a truer conception of the magnitude and economic value of this important contribution of the State to the Golden Gate Bridge project.

WALDO APPROACH JUSTIFIED

When California voted its first bond issue of $18,000,000 for highways back in 1911, each section of completely constructed highway was considered an achievement. The three and one-half mile Waldo Approach, with its 1,000-ft. tunnel and heavy grading, would have built sixty miles of average graded and concrete paved highways of that bond issue. It would have constructed the complete original Redwood Highway from Sausalito to Healdsburg. Applying present-day contract prices to the contract quantities of the construction of those days, the money required to build the Waldo Approach would have graded and paved the original Redwood Highway from Sausalito to Hopland. Another vivid comparison shows that the cost of the Waldo Approach would pay for all the snow removal on 5,000 miles of State highways for four years, using the maximum yearly snowfall ever encountered in the State as a basis for this comparison.

With these comparisons in mind, as an essential part of this great bridge project, without which it could not adequately serve its purpose, the Waldo Approach is more than justified.

MUCH TIME SAVED

The Golden Gate Bridge will save from 24 to 45 minutes in travel time for San Franciscans motoring to northbay points and into the Redwood Empire.

This time saving is really quite tangible, and has an effect of bringing holiday and vacation resorts of the vast Redwood playground from

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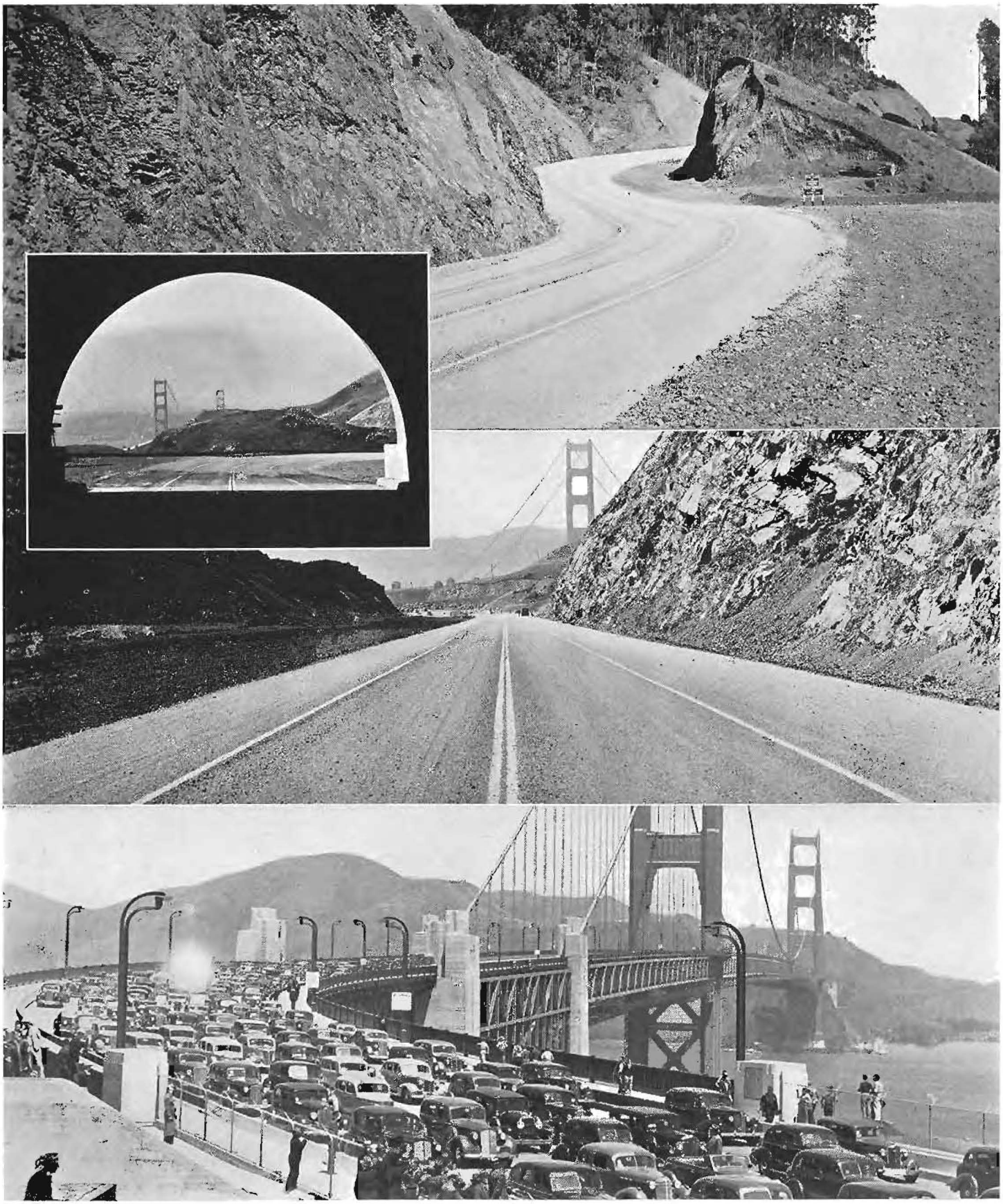
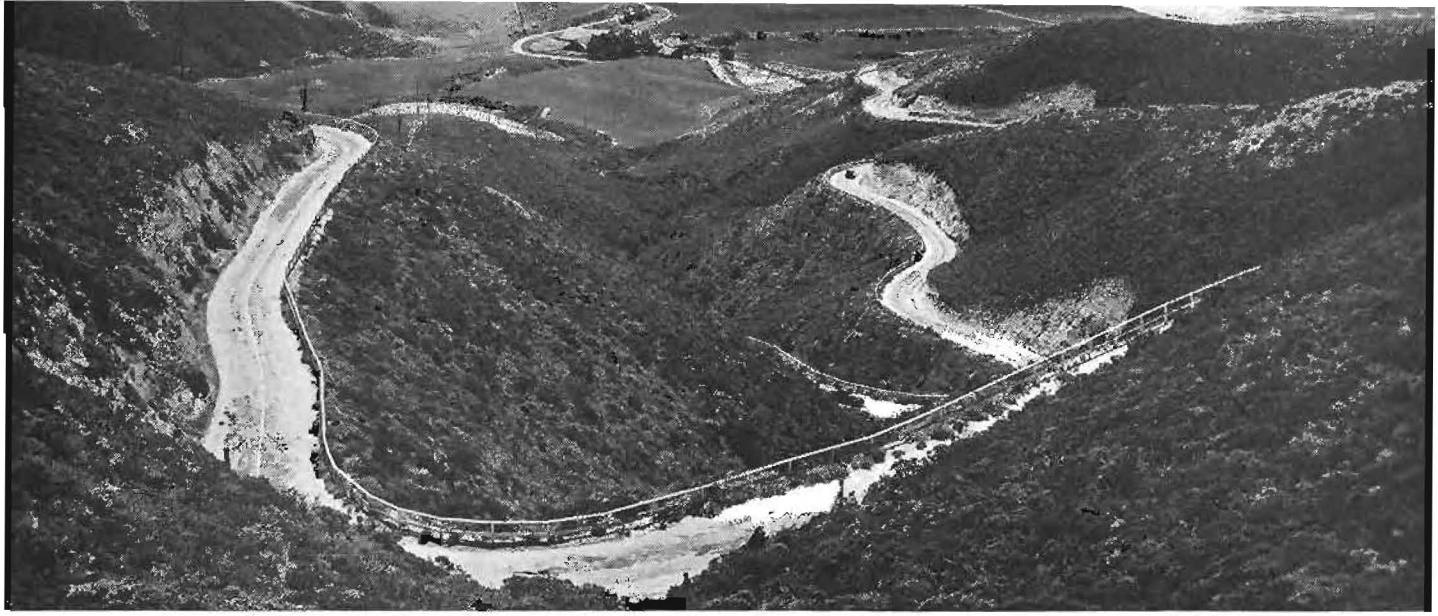


Upper picture is of Waldo approach showing one of deep cuts. Inset: View taken from Waldo tunnel mouth looking south towards Golden Gate Bridge. Center: Another stretch of new highway leading to Marin side of bridge with south tower of span in distance. Lower: Parade of official party autos arriving at San Francisco toll plaza after dedication ceremonies on Marin side.



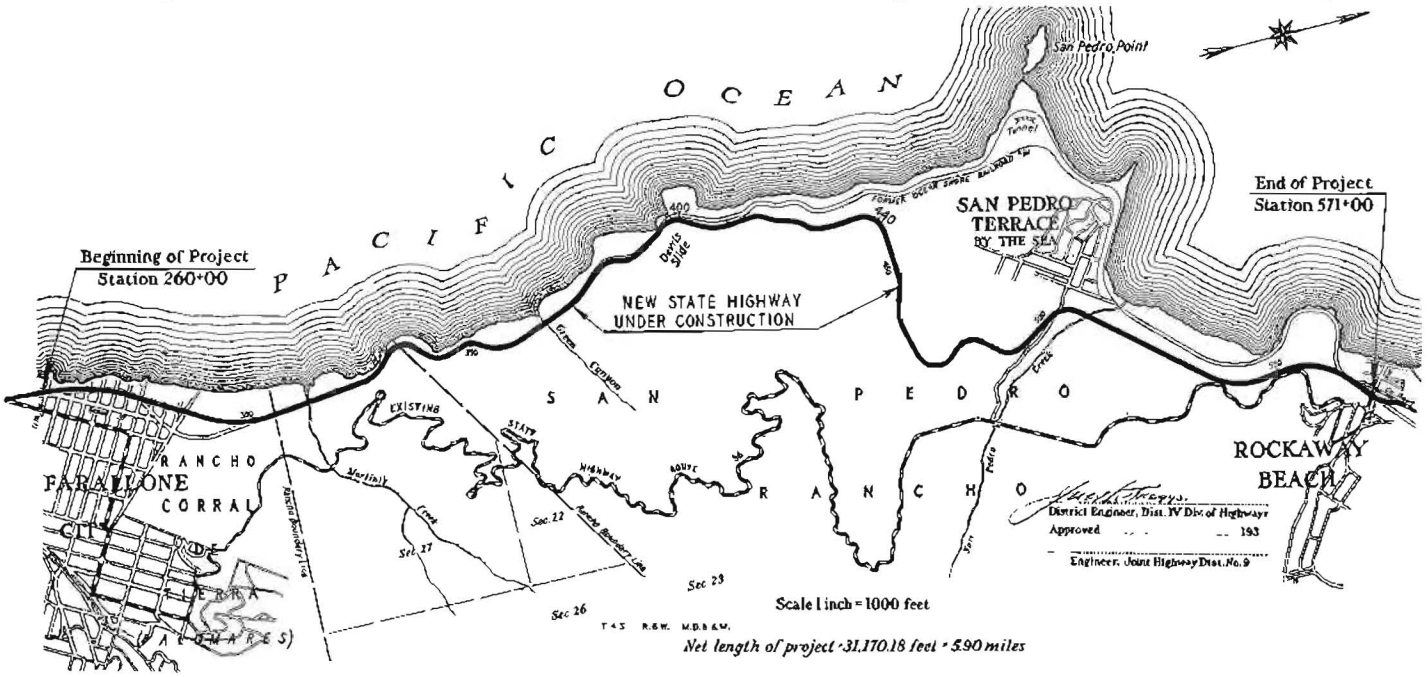
This photograph taken on the south slope of San Pedro Mountain shows type of existing winding and hazardous road which will be eliminated by new State highway now under construction in San Mateo County.

New Pedro Mountain Highway Eliminates Bad Grade

(Continued from page 1)

The undoubted and great advantage of easy grades that could be had by following the more or less level bench above the ocean was offset by the tremendous height of the unstable cliff and the difficulty of good alignment around San Pedro Point. A patient and thorough study of the terrain disclosed a low break in the cliff face about half way between Devils Slide and San Pedro Point. This break resulted from the erosion of a small stream flowing easterly and with its headwaters on the easterly side of the cliff face. Advantage was taken of this break and the location was laid down the face of the cliff from Stations 440 to 400; and in this short distance are concentrated the main construction problems on the project.

The location of the highway along the cliff face required men with the agility of mountain goats, courage, experience, and complete lack of nerves. One false step meant a tumble into the breakers. The contractor's pioneering operations in this area are also an epic in themselves. To launch 15-ton cats into space and carve a precarious foothold in the cliffs could be entrusted only to a few specially skilled and daring cat skinners. That this work was safely accomplished, with only one serious injury, is a tribute to the skill and daring of the men and the contractor. On several occasions shovels, cats and compressors were covered by great slides, but only one worker was injured.



Sketch map shows proposed realignment of Pedro Mountain grade in San Mateo County. Dotted line indicates existing route.

Scenes on Ocean Shore State Highway in San Mateo County now being built. Upper—Section of scenic route which will become modern highway. Center—Stretch of new highway with San Pedro Mountain in distance. Lower—Constructing highway along face of cliff on which engineers constantly battle slides which plunge into Pacific ocean below.

Photo Electric Recorders Make Count of Highway Traffic

By K. A. MacLACHLAN, Assistant Maintenance Engineer

FORTY-SEVEN per cent of the 16.16 billion annual vehicle miles in California occur on the State Highway System. It is of vital importance to the engineers designing highway routes, supervising their construction and maintaining them in condition to render the service demanded of them, that the flow of traffic along these roads and their tributaries be adequately metered.

In the past this has been done by manual count of passing vehicles, using the sampling method. Most of the counts have been 16-hour with some 24-hour records, and occasional 24-hour full week counting. The cost of such sampling has been relatively high, and the samples necessarily limited.

In 1936 in connection with the State-wide highway planning surveys the Bureau of Public Roads drew up specifications and took bids on a device designed to count passing vehicles without human aid. California ordered ten of these counters and they were installed in January and February of this year.

24-HOUR COUNTS

Inconspicuous in appearance, located where traffic proceeds at a normal pace, unlighted, so far as the human eye can detect without close inspection, these recorders are giving the Division of Highways 24-hour counts day after day.

The automatic traffic counter operates on the well-known photo-electric principle. Two parallel beams of infra-red light are projected across the road to a receiving unit housing the counting and printing mechanism. When one of these beams is interrupted by a passing pedestrian no count is made. A vehicle interrupts both beams causing the counter to work. At the end of each hour the machine automatically prints the day, the hour, indicating whether a.m. or p.m., and the cumulative total of passing vehicles.

PHOTO-TUBES USED

The photo-electric tube employs the principle used in all radio tubes, that electric current will flow across space on light waves. When light is present in the ordinary radio tube, that is, when the filament is lighted, current passes across the gap between the filament and plate and actuates the loud speaker. In the photo-electric tube, the light is supplied from an outside source, and reflected into the tube, providing a path for electric impulses between anode and cathode in the photo-tube.

Since infra-red and ultra-violet light have the same ability as white light to provide this current path, it has been possible to use filters on the light source, eliminating visible light, which might prove a traffic hazard at night.

The inconsiderable current passing the photo-cell is amplified to provide energy sufficient to operate a relay at the moment needed to introduce into the circuit the comparatively powerful current needed to operate the counting mechanism.

OPERATION COST LOW

A synchronous motor also operating on exceedingly small current operates the day, hour, and minute type wheels, and by interruption of one of the relay circuits each hour, causes the device to print the total of vehicles counted during the preceding hour. It is thus seen that, except when actually counting vehicles, or printing the hourly totals, the current consumption is very low; in fact the average cost of operation when counting 300 vehicles per hour is about $2.25 per month for current.

The counter needs attention only once a week, when the tape, bearing a printed record of vehicles by hours, by days, is removed. The light source bulbs have a normal life of six to ten months and require only occasional cleaning and inspection. They are ordinary automobile headlight bulbs of 50 candle power.

LOCATIONS CAREFULLY PICKED

Several months were spent in study of the correct locations for the photo-electric counters. Two purely physical limitations existed, namely—the need of an a-c power supply, and the necessity of locating on a two-lane highway to minimize the error due to cars passing each other at the recorder. It was also desirable to locate them near Highway Maintenance Stations so that the operation could be watched and the tape could be removed each week without excessive travel.

It was desired to pick locations which would give hourly and seasonal variations of various types of traffic.

Three counters were located on secondary roads in agricultural areas. One is on Route 50 just west of its intersection with Route 7 near Woodland. Another is located at Somis on Route 153 just below its junction with Route 154. A third counter is east of the city limits of Calipatria on Route 201. These three counters are used to develop seasonal factors representing the fluctuation of traffic in three quite different agricultural districts.

THREE COUNTERS ASSIGNED

Three counters were assigned to primary highways. They are on Route 3 just south of Redding; at the San Joaquin River Bridge on Route 4 between Madera and Fresno; and just west of the junction of Route 26 and Route 187 at White water.

A combination of through and recreational traffic is registered by the counter near Ukiah on Route 1 just north of the junction with Route 15. A counter in the Santa Ana Canyon on Route 43 provides a profile of through traffic also, but combines it with an agricultural factor of considerable importance. The Santa Ana Canyon record also reflects some of

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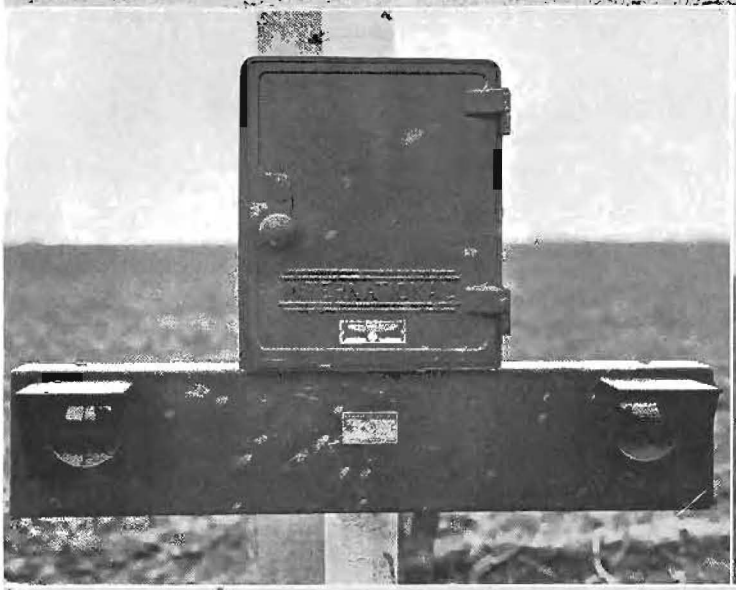

Upper picture shows automobile passing between traffic count machines on each side of road and being registered automatically. Center left: Close-up of one of traffic count devices. Center right: Shows counting machine open and member of Maintenance Department staff reading ticker tape count. Lower: Automobiles have just passed through two parallel beams of infra-red light projected across road as indicated by dotted line.

Governor Dedicates Link in Roosevelt Highway in South

By P. A. McDonald, Assistant Engineer

COLORFUL ceremonies in which Governor Merriam, a "Queen," scores of civic leaders and several bands participated were held Saturday, June 5th, to open officially the "Wilmington link," the final section of State Highway Route 60, completing Roosevelt Highway in Los Angeles County, between the cities of Santa Monica and Seal Beach. This through traffic artery, thirty-six miles in length, has been constructed since 1932 at a total cost to the State of $4,425,000.

Route 60 is one of the original State highway routes, having been adopted by the Legislature in 1912 as a primary State Highway, but it was not until 1932 that an extensive program was undertaken to improve this route within Los Angeles County.

VALUABLE LINK

Prior to this time many stretches of the then existing traveled way were of very inadequate 20-foot wide pavement. No direct route was then available and traffic was forced to detour over the existing county roads and city streets. As this section of highway serves the beach cities and closely parallels the ocean, it is important, not only from a local standpoint to each community, but is important as well in that it carries traffic through the lesser congested sections of the beach cities comprising a most valuable link in the Roosevelt Highway (U. S. No. 101-Alt.), leaving the "Coast Route" (U. S. No. 101) at Oxnard, in Ventura County, and joining it again at Serra, near San Juan Capistrano, in Orange County.

Governor Merriam cut a blue and gold ribbon which was carried away by little Christine Book and Lou Ellen Traller, following an hour dedication program at the Avalon Boulevard intersection of the new highway. The dedication ceremonies were attended by some five hundred persons, including representatives from many civic organizations, and government authorities.

DIGNITARIES PRESENT

The Governor, Chairman Harry A. Hopkins, Commissioners P. A. Stanton and Wm. T. Hart of the California Highway Commission, accompanied by Assistant Director Justus F. Craemer, Harold F. Norton, and District Engineer S. V. Cortelyou represented the Department of Public Works.

Present also were Supervisors Leland Ford and Gordon L. MacDonough, of the county of Los Angeles, E. J. Amar, President of the Los Angeles Board of Harbor Commissioners; Mayor Colfax Bell of Redondo; Mayor Tom Eaton of Long Beach; Charles Bland, Long Beach harbor commissioner; Walter Gillman, representing Sheriff Eugene Biscailuz; Edith Smith, Tom Blair, Ray Baldwin, and Mrs. J. R. Parkhurst, President of the East Wilmington Property Owners Association, all early organizers and workers for the highway; as well as a host of others.

Attending also was a representative of the Canadian Government, Mr. John Playfair Price, His Britannic Majesty's Vice Consul. Telegrams of congratulation were received from Director Earl Lee Kelly and Deputy Director Neron expressing regret in not being able to attend.

Councilman Franklin P. Buyer was chairman for the day of festivities, which were staged jointly by the Wilmington Property Owners Association and the American Legion, Robert Hillyer, commander. Supervisor Leland Ford was master of ceremonies.

GOVERNOR MERRIAM SPEAKS

Governor Merriam delivered the main address and told of his long interest in this highway, first as a member of the State Assembly, later as speaker of the Assembly, then as Lieutenant Governor, and now as Governor. He recalled the proposal to build a highway along the Pacific Ocean, from San Francisco to San Diego, as an objective in front of the Legislature twenty years ago. To this end, bond issues were approved and a small beginning was made. Although those first highways have disappeared, with the original bonds still standing, the entire project stands completed today, and paid for out of the gasoline tax.

The rapid development of highway traffic was stressed, and he predicted that before this year is passed there will be registered, for operation on the highways of the State, two and one-half million vehicles.

"California already has more vehicles than any other State in the Union. The resources of the State Division of Highways are constantly employed to keep up with this ever increasing demand," the Governor stated.

Governor Merriam then spoke of the benefits to the communities of such expenditures, and how four hundred million dollars collected through the gas tax have been spent in this State on highway construction.

"You have provided for yourselves, out of gas tax revenues, a great opportunity for travel and traffic for every community of the entire State of California," the Governor said in conclusion.

MUSICAL PROGRAM

Preceding the program of speaking and the introduction of many prominent guests, musical numbers were given by the Phineas Banning High School Band of Wilmington, and the Swiss Yodler Family, a very talented and colorful group in their Swiss mountain folk costumes.

Following the dedication ceremony, all of the officials and friends of the project were present for a dinner at the California Yacht Club. Governor

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Scenes at dedication of Wilmington link of State Highway Route 60, completing Roosevelt Highway between Santa Monica and Seal Beach. Upper—Governor Frank F. Merriam cuts ribbon throwing new road open to traffic. Left to right: Councilman Franklin P. Buyer, chairman of the day; E. J. Amar, president of Los Angeles Harbor Commissioners; State Highway Commissioner W. T. Hart, Governor Merriam, Harry A. Hopkins, chairman State Highway Commission; Supervisor Leland Ford, Los Angeles; Highway Commissioner Phil A. Stanton, District Highway Engineer S. V. Cortelyou, Assistant Director of Public Works Justic F. Craemer. Ribbon girls with Governor are Christine Book and Lou Ellen Traller. Center—Section of new highway looking towards Long Beach. Lower—View of speakers' platform at dedication ceremonies.

Uniform Pavement and Traffic Signs Great Aid to Motorists

By F. M. CARTER, Assistant Maintenance Engineer

IN THIS, the sixth and concluding article in the series on California highway signs, we take up the temporary and pavement signs and traffic signals.

Uniformity in the wording and positioning of temporary signs is just as imperative as for the permanent signs previously discussed. Inasmuch as these temporary signs give warning and indication of potential hazards not expected and at unusual places; it may be said that it is quite important that these temporary signs be uniform and consistently placed. These signs should be recognized and obeyed by the motorist.

Because of the fact that these temporary signs may be placed at places such as long tangents where the motorist through familiarity has been accustomed to fast traveling, it is very important that the temporary signs are placed only when necessary and removed immediately when their use is no longer required.

STANDARD COLOR AND SHAPE

It is necessary therefore that the construction and maintenance crews using these temporary signs become sign conscious so that these signs will not be abused.

In the same manner it is equally as important that standard color, wording and shape, as well as positioning be observed by all users of these signs. When this consistent use and removal is obtained, more respect will be obtained.

Probably the most important temporary sign is the MEN AND EQUIPMENT WORKING sign. These are supplemented with a red flag and are the only protection the workmen have. These signs should slow down the traffic so that a full stop may be made quickly. While the general observance of the motorist is good, full cooperation is not being given and steps will be taken to see that the reckless driver who does not observe these protective signs is made aware that they are placed to be obeyed.

DETOUR SIGNING

On construction and maintenance where detours from the highway are necessary, standard uniform signing is required as follows:

1000 feet in advance of the barricade where detour starts the STATE HIGHWAY UNDER CONSTRUCTION sign is placed. If a bridge, then BRIDGE UNDER CONSTRUCTION.

At 800 feet, the DANGEROUS BUT PASSABLE.

At 600 feet, a CURVE sign right or left 90° or if tangent on detour is less than 200 feet, then a reverse curve sign right or left.

At 400 feet BEGIN DETOUR 400 FEET.

If a narrow road is used for detour, a NARROW ROAD sign is placed at 200 feet.

At the barricade a ROAD CLOSED, a 9 unit red reflector head-on sign and a W46R reflectorized arrow sign.

If it is a long detour passing over city streets or county roads, then a reflectorized directional sign is placed on the barricade and CURVE signs are placed in advance of all turns with DETOUR signs with an arrow at the point of turning. When a detour is made over a US or State Sign Route, it is customary to erect US or State shields bearing small plates reading DETOUR to mark the temporary routing.

OTHER TEMPORARY SIGNS

When returned to the main highway again an END DETOUR sign informs the motorist that the detour is completed.

Other temporary signs placed to advise the motorist of unusual conditions are the SLIPPERY, SOFT SHOULDER, FRESH OIL, et cetera. The wording, color, shape and positioning of these signs has been standardized and the signs are removed when the condition is cleared. Inasmuch as the majority of these signs are the SLOW type warning sign, diamond shape, strict observance should be given by the motorists.

PAVEMENT MARKINGS

The painting on the pavement is always open season. Everyone has ideas which can be put on a pavement with white traffic lacquer. In many localities all sorts of pavement markings are made. It would appear that everything suggested is tried and while some of the markings have considerable merit, their use as a standard is ruined because of their lack of definiteness.

When some new pavement marking is placed, it immediately presents an unusual appearance. The motorists, because of the surprise effect, tend to slow down and give the impression of obedience. In many cases the motorist does not know what the marking means.

Because these markings are apparently a success when first tried they are immediately painted for everything and through this inconsistent use the motorist soon learns that he has been duped again and he ceases to give any attention to the markings.

USE IS SPECIFIC

This is the reason that many apparently worthy ideas have not been adopted as standard.

The standard State Highway pavement markings have been held to a minimum and their use has been definite and specific.

The most common pavement marking is the white traffic lane to guide and advise the motorist in daylight, darkness or fog. It is the most important of all methods for assisting traffic.

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Pavement and Traffic Group of Highway Signs

Standard sign to warn motorists they are approaching construction work on highway.

Standard sign to inform traffic of bridge under construction. These first two signs are placed approximately 600 feet in advance of construction work.

A warning sign erected following the above signs to notify traffic to proceed with caution.

Pavement markings placed 400 feet in advance of an intersection to call attention in advance to the presence of a STOP sign.

Standard pavement marking for a school crossing. Motorists should pay particular attention to this sign, especially during periods when schools are in session.

Standard pavement marking for Pedestrian Crossing other than at a school. Strict observance of this sign by motorists will tend to lessen pedestrian accidents.

Uniform Traffic Signals

The State of California has in general adopted the Manual on Uniform Traffic Control Devices as issued by the Bureau of Public Roads, The American Association of State Highway Officials and the National Conference on Street and Highway Safety.

The use of traffic signals is very carefully explained in this manual.

Of all other traffic control devices it is imperative that the motorist should be presented with the same appearance of traffic control signals in the same position. It is very important for lack of observance means serious accidents.

The standard as approved by the foremost traffic experts and described in the manual is the three light type for far right hand corner installation.

UNIFORM SIGNALS

The question as to whether some other signal is not better or some other positioning would give better view is not the issue.

Many different organizations as well as traffic engineers met and discussed every favorite scheme and device and have given up each pet idea to form a standard uniform installation, all of which is described in the Manual.

In considering what should be adopted as uniform, it was necessary for the experts to choose a traffic signal which could be used everywhere in the United States—in cities where expert mechanics and electricians are available or in some remote rural area. It was for this reason that the standard type as approved by the manual was adopted.

PROBLEM NARROWED

The advantages of uniformity is quickly realized by the traveler. What a relief when he finds everywhere he knows just what the speed laws are, where he will find his warning informaiton and guide signs, and where he will look for his traffic control signals.

Used to mark a Temporary Detour routing. This sign is accompanied with an arrow sign at turns showing direction traffic is to follow.

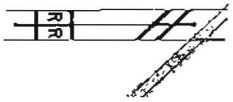
Standard sign placed as the name indicates.

Placed on a barricade when a highway is closed for repair or construction.

Placed following sign 1 and in advance of detours.

Used extensively and accompanied by a red flag when maintenance crew is improving our highways. Traffic should proceed with caution when this sign is displayed.

Pavement Marking used in connection with STOP sign.



Pavement Markings for Railroad Grade Crossing. Markings are the same on each side of track.

California's Chief Executive formally dedicates Waldo Approach to Golden Gate Bridge, broadcasting his words over a nation-wide radio hookup. Left to right: Highway Commissioner Paul Jasper; Harry A. Hopkins, Chairman of Highway Commission; Governor Frank F. Merriam; Director of Public Works Earl Lee Kelly

Governor Opens Waldo Approach To Gate Bridge

Dedicating the Waldo Approach to the Golden Gate Bridge, constructed in the mountainous country of northern Marin County by the State Division of Highways, Governor Frank F. Merriam, at ceremonies held on the Approach on the morning of May 28, said, in part:

THE HISTORY of nations is quite accurately written in their roads and the means of transportation of their times. Through the centuries, the genius and perseverence of the road builder have determined the borders of nations and have given direction to the course of commerce and civilization.

America and California are outstanding examples. The adventurous blazed a trail, and following came the pioneers in constantly increasing numbers as facilities for transportation were lengthened and the barriers of mountain and stream removed.

Few, if any of that time even dreamed of today's accomplishment. The present heights were not reached at a single bound. By slow and constant processes and experiences, from the primitive trail marked by the

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Marin Approach Built by State

(Continued from page 2)

20 to 35 miles closer to San Francisco. This will have a tendency to bring new resort territory within reach of summer week-end travel—will tend to reduce the irritation of the slow surge of stopping and starting progress toward present ferries on the Sunday night return home—and will relieve the minds of motorists of a feeling that they must start home early to avoid a traffic jam.

Many hours of additional enjoyment will be afforded to all, in the assurance that they will be able to cross the bay at any time of the night or day in a steady stream of traffic.

FACTOR IN NATIONAL DEFENSE

As a contribution to the national defense of our country during time of war, and as an economic advantage to the military and naval garrisons in time of peace, the influence of this highway project is not easy to analyze. In time of war, the events of minutes might influence the developments of centuries.

Suffice it to say that the Presidio of San Francisco, the headquarters

(Continued on page 13)

State's Share of Bridge Project Is New Highway

Speaking at the dedication of the Marin Approach to the Golden Gate Bridge on the morning of May 28, Earl Lee Kelly, Director of the Department of Public Works, which constructed the highway leading to the span through its Division of Highways, said, in part:

THE State of California today joins happily with the Golden Gate Bridge and Highway District and the counties of the great Redwood Empire in dedicating the world's longest suspension bridge.

Standing here this morning we can see the two monumental structures that represent fulfillment of long-ago dreams of California Argonauts. Off there to the east is the San Francisco-Oakland Bay Bridge, the largest over-water span ever constructed, concrete realization of a vision of San Francisco's pioneers. It was built by engineers of our own State Division of Highways with public funds and dedicated to public use.

Below us in all its structural beauty is the splendid span across the Golden Gate. It will stand an everlasting tribute to that valiant band of citi-

(Continued on page 16)

Gate Span Approach Opened By Governor and Director of Public Works

(Continued from page 12)

of the Ninth Corps Area of the United States War Department, will be from 36 to 46 minutes closer to the Mare Island Navy Yard, Marin Bombing Base (Hamilton Field), Fort Barry and Fort Baker in the North Bay, than at the present time. These north bay reservations will enjoy comparable savings in travel time with Forts Scott, Miley, Funston, Mason, and the Sunnyvale Air Base on the Peninsula. The Marin Approach is a vital factor in these considerations of national defense.

The Redwood Highway, with which the northern bridgehead approach connects at Waldo, is an arterial of major importance in the California State Highway System, officially designated as State Highway Route 1 and U. S. 101. It not only serves as a commercial outlet for the fertile agricultural areas in the valleys of Marin, Sonoma and Mendocino counties, but leads into the heart of the great Redwood Empire of the northern California coast country in Mendocino, Humboldt, and Del Norte counties.

INTO REDWOOD EMPIRE

It also provides connection between Crescent City and the Pacific Highway at Grant's Pass, Oregon, and via State Route No. 71, connects with Oregon's Coast Highway at the State line near Smith River. With the recent completion of five major bridges on the Coast Highway in Oregon, eliminating five former State-operated ferries, the Redwood Highway provides a direct continuous scenic coast trip from San Francisco to Portland and points north via Astoria or McMinnville.

The Redwood Empire stretches from San Francisco to Grant's Pass, Oregon, and ranks with national parks as a world attraction. It includes the counties of San Francisco, Marin, Sonoma, Napa, Lake, Mendocino, Humboldt, and Del Norte in California, and Josephine County in Oregon.

Over $54,000,000 have been spent by the Division of Highways and these counties within the Redwood Empire. Difficult engineering feats characterized the construction of many of these roads. Stream beds were moved, rock cliffs and mountains blasted, deep canyons and wide rivers bridged, big trees felled and acres of dense forest undergrowths cleared. These hard-surfaced all-year highways lead into one of the most attractive vacation lands in the world.

BEAUTY SPOTS SERVED

San Francisco and her sister counties with their innumerable beauty spots will be served by the Golden Gate Bridge.

Construction of the Redwood Highway from Sausalito to the Oregon line to make it conform to modern standards of alignment, grade and width has been a foremost consideration in the general program of the State Division of Highways, with the result that the entire route has now reached a high standard, especially the southern portion of one hundred miles between Sausalito and Hopland.

The completion in recent years of the braided crossing at Manzanita adjoining Waldo on the north, the Richardson Bay Bridge, the Greenbrae, Corte Madera and California Park bridges and highway on new location, saving four miles over the former route to San Rafael, is a notable example of a portion of this progress.

Other portions of the State Highway System served by the Redwood Highway and the new Waldo Approach include the Black Point Cutoff, taking off at Ignacio, eight miles north of San Rafael and leading to Sonoma and Jack London's famous "Valley of the Moon," or to Napa and Calistoga's hot springs and spouting geysers, the extinct volcano of Mount St. Helena and Lake County's beautiful Clear Lake country, so aptly named "The Switzerland of America."

OTHER ROUTES

Another beautiful highway vacation route leaves the Redwood Highway at Cloverdale, proceeding in scenic mountain country to McDonald,

(Continued on page 16)

Huge redwood logs forming barrier across Waldo Approach to Golden Gate Bridge were sawed apart by champion saw wielders at close of ceremonies dedicating new span across entrance to San Francisco Harbor on May 28, 1937.

Road Compacting With Crane and Ball Cuts Highway Costs

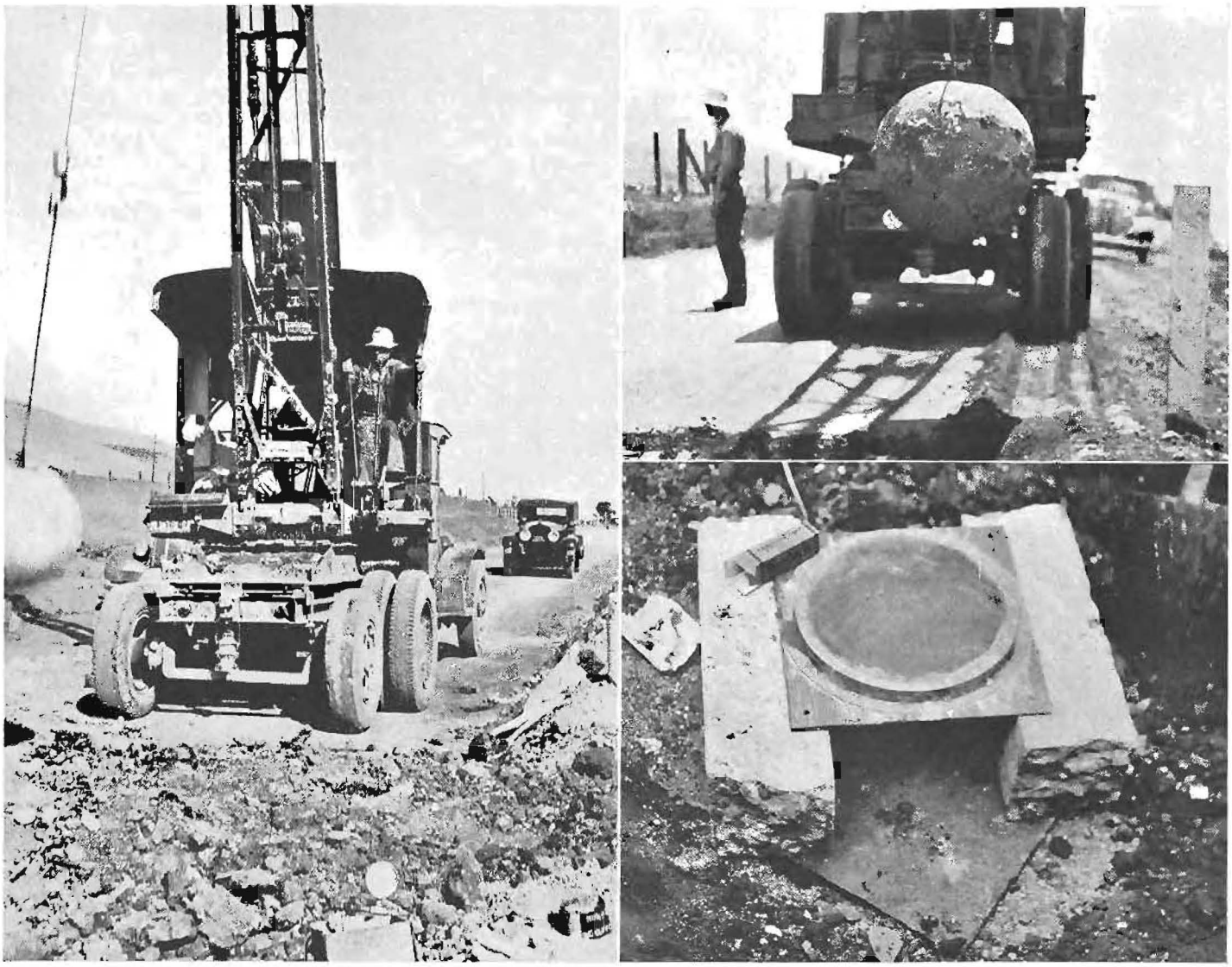
By VICTOR E. PEARSON, Resident Engineer

EXPERIMENTS with a crane and ball method of compacting old highway end-dump fills which had not yet reached a state of equilibrium have proved eminently satisfactory on a section of the Coast Highway in Santa Barbara County.

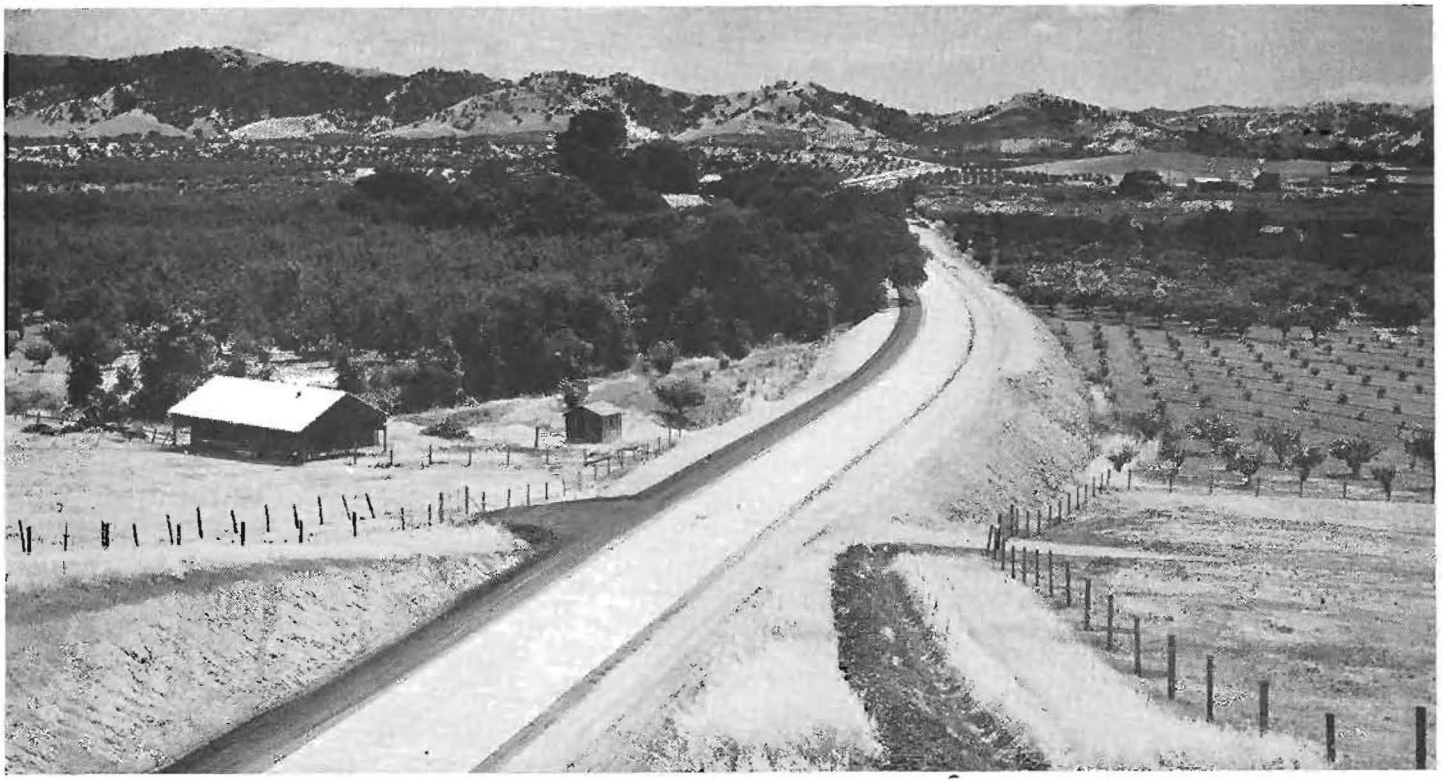
Recent reconstruction work performed on a 3.1-mile section south of Gaviota by Granfield, Farrar & Carlin, contractors, required the compaction of several end-dump fills. It was planned to remove these old fills to a depth where a relative compaction value of 90 per cent had been developed by settlement under gravity, and then replace and recompact this material by accepted methods of embankment construction.

A portable crane and 2500-pound iron ball was used by the contractor to break out the old existing pavement, and it was noticed that in vari-

(Continued on page 28)



The picture on the left shows portable crane with 2500-pound iron ball attached which is used to break out old highway pavement. Upper right: Iron ball in place on crane truck for transportation. Lower right: Pressure cell on steel plate and concrete blocks placed eight feet below grade to test compaction strength of ball.



View of stretch of newly completed Vacaville By-Pass constructed to route highway away from schools and congested business district in city of Vacaville.

Vacaville Highway Open to Public

By R. E. PIERCE, District Engineer

THE VACAVILLE BY-PASS, opened to the public this month, eliminates another bottle-neck on this important highway from the State Capital to San Francisco and the bay region.

In addition to keeping the through traffic out of the business district of Vacaville, it also removes the hazard caused by both the grammar and high schools being located on the old route.

While this by-pass is slightly shorter than the present tortuous route through the city, the principal advantage to through traffic will be in reducing hazard to pedestrians, particularly school children and to the saving of time due to the easy grades, direct alignment, long sight distances and lack of congestion which now exists on the present route.

This is the fifth project involving realignment on this route between the Carquinez Bridge and Sacramento, which have made savings in the distance between these points.

These listed in order of completion, showing savings in distance, are as follows:

Cordelia Cut-off	**0.40 miles**
Cordelia-Fairfield Cut-off	**0.75 miles**
Orchard Line Change	**0.75 miles**
American Canyon Cut-off	**6.00 miles**
Vacaville By-pass	**0.14 miles**
Total Saving	**8.04 miles**

Possible future changes could reduce the distance by 6 more miles, making a total reduction of 14 miles.

The twenty-foot Portland cement concrete pavement built in two 10-ft. strips and tied together with tie bolt assemblies is of Class "B" concrete 0.55′ thick, increasing to 0.75′ at the outside edge of each strip, starting from a point 2′ from the edge.

The pavement is bordered by road oil mix surface treatment 3′ wide by 0.25′ thick, except that at two railroad grade crossings, for a distance of 300 feet each way, the pavement is bordered by plant asphalt mix surfacing 10′ wide by 0.25′ thick.

CONCRETE BRIDGE BUILT

The subgrade is oil treated upon which was placed before the pavement was laid selected material varying in thickness from 0.5′ to 0.9′.

A reinforced concrete bridge with concrete piles has been constructed over Ulatis Creek. The bridge has a center span of 30′ with a 23′ span on each side of the center span.

The two railroad crossings are each protected by two flashing type signals, as well as two advance overhead illuminated R X R signs, the lights of which are actuated when trains approach the crossings.

View of section of crowd gathered to witness dedication of Waldo approach to the Golden Gate Bridge.

Governor Opens Approach to Bridge

(Continued from page 12)

courageous pioneers, ridden by the pony express and constantly developed by the settler, this great accomplishment is the result of obstacles overcome and the application of science in the preparation of plans, the selection of materials and the art of construction.

The achievement we celebrate today is the direct result of cooperation of the six coastal counties of the Redwood Empire which have combined their energies as communities and pledged their resources in the removal of a barrier to travel, and the exchange of products.

The economic value of improving highways fully justifies the expenditures made annually in maintenance and construction. The saving in time, the cost of each mile traveled and the less wear on the machine and tires furnish a definite yardstick for determining the value of any highway. This, multiplied by the number of vehicles traversing it daily, indicates the time necessary for a road to repay its cost to the motorist who supplies the funds, through the gasoline tax, for such enterprises.

This work is carried on under the direction of the Highway Commission of five members and the Director of Public Works, Hon. Earl Lee Kelly. My congratulations to the people of the state upon the splendid personnel and ability of the highway officials, and upon their fine accomplishments.

Gate Span Approach Opened by Governor

(Continued from page 13)

thence through Boonville and the Redwoods of the Navarro River to the sea, Fort Bragg and other North Coast points.

All the preceding well defined system of State roads, and all connecting county roads will receive the full benefit of the Golden Gate Bridge. Passing time only will reveal all the factors of influence, and the economic contribution, to the development and welfare of San Francisco and the Redwood Empire of Northern California.

The San Francisco-Oakland Bay Bridge has linked San Francisco with the mainland on the east with all its transcontinental arteries of commercial and tourist traffic, and now this noble span vaulting the waters of the Golden Gate brings into close union the famed metropolis of northern California and the vast Redwood Empire country, whose possibilities of development challenge our imaginations.

The Golden Gate Bridge removes the last major water barrier on the Redwood Empire and Pacific Coast highway systems between Canada and Mexico. It closely links eight northbay coastal counties with San Francisco. It breaks the water-bound isolation of the San Francisco peninsula. It is, indeed, a fit companion for the great San Francisco-Oakland Bay Bridge which connects the Eastbay Empire with San Francisco.

State's Share of Bridge Project

(Continued from page 12)

zens of San Francisco, Marin, Sonoma, Napa, Mendocino and Del Norte counties who through the years clung steadfastly to their purpose and who today see the vindication of their faith and tireless efforts.

STATE'S CONTRIBUTION

Climaxing its own achievement in bridging the bay from San Francisco to Oakland and her sister cities, it was a high privilege for the State of California to participate in the project whose completion we celebrate today. The State, through its Division of Highways of the Department of Public Works, has had the honor of constructing the Marin Approach to the Golden Gate Bridge. We call it the Waldo Approach.

The State's contribution, the Marin Approach, an outstanding engineering achievement, extends from the north landing of the Golden Gate Bridge to a connection with the Redwood Highway at Waldo. The total cost of this approach, including engineering and rights of way will exceed $2,000,000.

The economic influence of this great project in welding Marin County into the great Bay Area metropolitan district cannot be overestimated, nor can we fully foresee the influence which this project will have in moving all the Redwood Empire coastal counties closer to San Francisco.

Tortuous Humboldt Highway Being Modernized By State

By J. C. BLACK, Chief Draftsman District I

WITH work now 50 per cent complete, the reconstruction of the portion of the Redwood Highway between Trinidad and McNeill's Ranch in Humboldt County is proceeding at a satisfactory rate which should assure completion of the project by September of this year.

Designed to thoroughly modernize the tortuous, sharp alignment at Mill Creek, near the beginning and at McNeill Creek near the end of the project, and to greatly improve the rolling grades of the existing highway, the present project is of the greatest importance in improving road transportation conditions on this section of the Redwood Highway.

Eight hundred feet in length, 389 degrees of curvature, and one hundred sixty-two feet of rise and fall will be eliminated in a distance of 2.3 miles. The new roadbed will be thirty feet wide of special section which substitutes a rolled gutter for the old type, hazardous side ditch. Poulos and McEwen are the contractors.

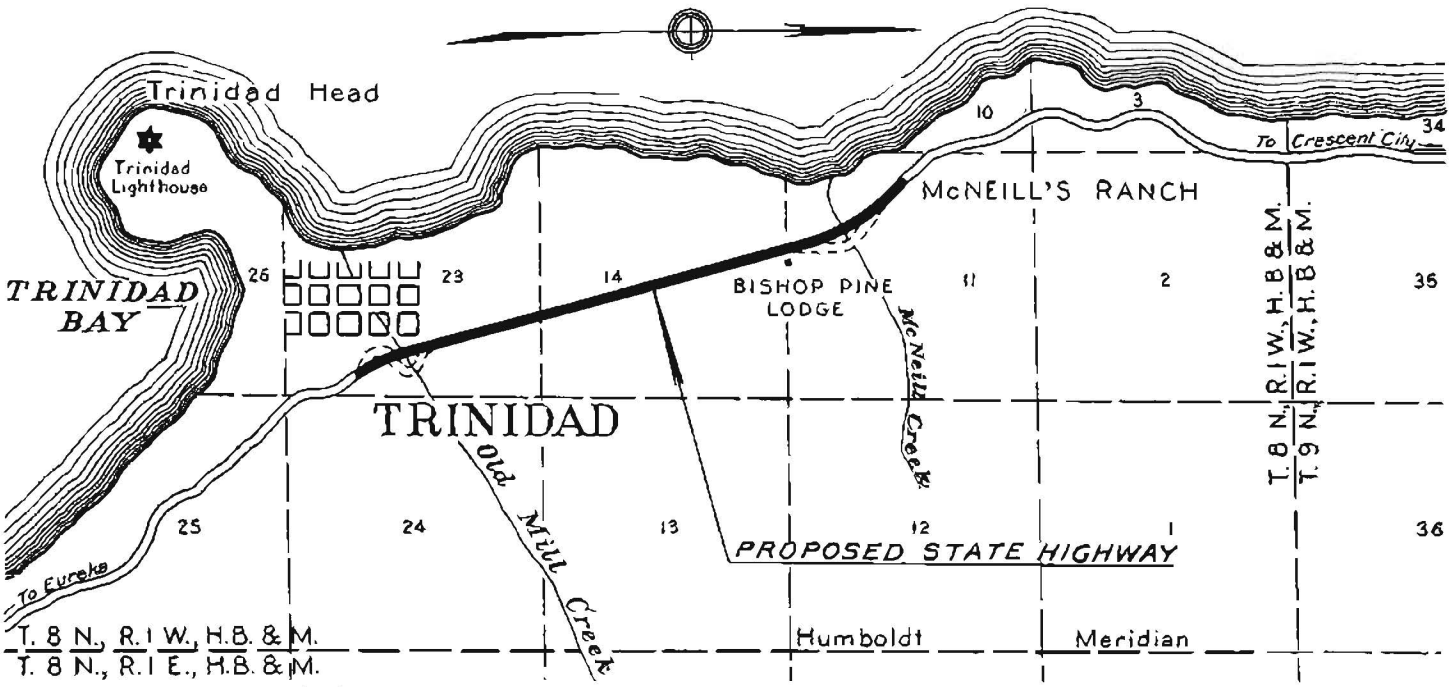
There are no local deposits of gravel that comply with the grading requirements of the standard specifications for mineral aggregate for bituminous treated surfacing. Suitable rock for crushing is available, but the cost of production for so small a project would be prohibitive. There are, however, numerous deposits of ancient beach gravel and beach sand exposed in roadway cuts within a short distance of the project. This material is much finer in grading than the material generally used as mineral aggregate in surfacing. However, samples were submitted to the Materials and Research Department and test results indicated the possibility of developing a satisfactory base and oil mixed surfacing.

Based upon these reports several test sections of surfacing, using a combination of these materials, were constructed by State forces in 1936. One of the test sections was constructed using approximately 80% of the beach gravel and 20% beach sand, road-mixed with liquid asphalt, and although constructed under adverse weather conditions, has shown that a good, economical surfacing can be obtained with the materials and this type of surfacing has been set up for use on the project now under construction.

The full width of roadbed, including the gutters, is to be surfaced with road mix and sealed with a Class "B" seal coat.

Juan Bodega discovered and named Trinidad on June 9, 1775, taking possession of the country in the name of King Charles II of Spain. Trini-

(Continued on page 20)



Sketch map shows proposed relocation of portion of Redwood Highway between Trinidad and McNeill's Ranch in Humboldt County now under construction.

Public Works Department Moves Into New Building

By GEORGE B. McDOUGALL, State Architect

CALIFORNIA'S Department of Public Works moved this month into its new home, the State's latest administrative building at Twelfth and N streets in Sacramento.

Crowded conditions in the old headquarters at Eleventh and P streets necessitated erection of the new structure to house the Division of Highways, Division of Water Resources, Division of Architecture and Division of Contracts and Rights of Way, together with the headquarters staff of the Department.

Due to expanding highway construction and the large increase in highway mileage effected by legislative enactment, the engineering force of the Division of Highways for several years has been working in cramped quarters in the old building. In the new home the drafting, mapping and planning engineers of the Division have the room and equipment for scientific work they require.

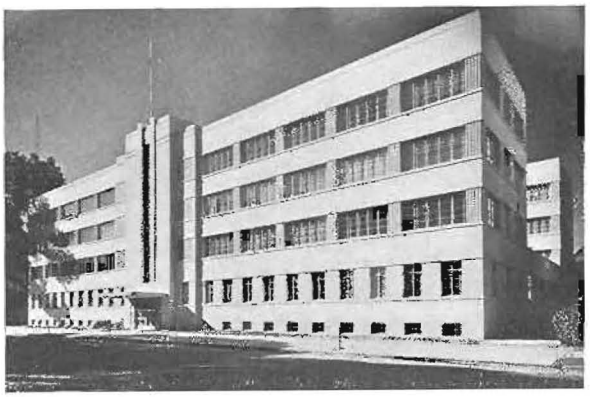
NO COST TO TAXPAYERS

The new Department of Public Works building, as well as its sister structure housing the Department of Motor Vehicles, was built without cost to California taxpayers. Prior to moving last year, the Department of Motor Vehicles had been paying rent to the Public Works Department at Eleventh and P streets. At the rate its rentals were accruing as an equity in the Public Works Building it would not have been long before Motor Vehicles would have owned the building and the Department of Public Works in turn would have had to begin paying rent to the Motor Vehicle Department.

As a result of this unusual situation, Governor Frank F. Merriam, Director of Public Works Earl Lee Kelly and Finance Director A. E. Stockburger decided to let each department erect its own building and pay for the same out of their respective equities in the Eleventh and P streets structure and savings they would effect in rentals. The Department of Finance bought the equities of the two departments and other State agencies will be housed in the old headquarters.

BUILT FOR SCIENTIFIC WORK

Architecture as a fine art has a language of its own and you naturally look for and find so-called monumental characteristics in the design and plan of the Capitol Building with its classical Corinthian order and crowning dome and lantern, which to all of us speak of the actual seat of the government itself, as personified in the Governor and other elective officers, and the legislative chambers of the Senate and Assembly, and corresponding characteristics also, subservient to the Capitol itself, in the Library and Courts Building and its companion structure, the so-called State Office Building.



New Public Works Building at Twelfth and N Streets, Sacramento, California

The design of the building is in the modern manner and the plan is in the form of the capital letter "H" with the result that when the thinking person looks upon it either as a whole or in detail he will, independently of any technical knowledge he may have, automatically understand what the nature of its occupancy is and when he observes the interior arrangement as a whole or in detail, he will with equal facility understand that there is practically no space in it which is not available for the doing of efficient scientific and technical work.

Dignity, beauty and charm are present in all the characteristics of the building. The force of these characteristics is not lessened but rather emphasized and intensified by the simple lines of the exterior and the directness of the plan arrangement of the interior.

REINFORCED CONCRETE STRUCTURE

The building is of reinforced concrete construction including its skeleton frame. Due to the exactness with which the manufacturer of reinforced concrete is controlled, the resulting four-story building is as sound structurally with reference both to vertical and horizontal loads as though its skeleton frame had been fabricated from structural steel shapes at considerably greater expense. Provision has been made for the addition of a future fifth story. The entire building is air conditioned for proper cooling in the summer and warming in the winter and scientific acoustical treatment has been applied throughout.

The citizens of California and those of Sacramento in particular may be assured that this building with its sister structure, the Motor Vehicle Building, measures up to the loveliness of our beloved capital city of Sacramento and to the dignity and power of the sovereign State of California.

"My wife can be an angel when she wants to be."

"Mine, too—any time, now."

Palm sentineled vista of entrance to new Public Works Building in Sacramento as seen from Capitol Park.

Governor Dedicates Link in Roosevelt Highway in South

(Continued from page 8)

Merriam was unable to attend the evening festivities, including the dinner, a parade, and concluding ceremonies held at the Wilmington Women's Club under the auspices of the Wilmington Post of the American Legion, but was ably represented by Assistant Public Works Director Craemer.

The parade from the California Yacht Club to the Wilmington Women's Club was a very colorful spectacle, with several legion posts taking part. Thousands of residents and out of town friends lined the streets to cheer the marching units, led by the three times national champion bugle and drum corps of the San Gabriel Post.

CORONATION OF QUEEN

Other uniformed bodies also taking part in the parade were: Redondo Beach Corps, Long Beach Post Band, Santa Monica and Santa Ana Corps, Cleveland's Boys' Band of San Pedro, North Long Beach Auxiliary Drill Team, Phineas Banning High School Band. Trucks from the fire department and units from several other organizations also took part.

Following the parade to the Women's Club, approximately thirty-five hundred persons witnessed the coronation of Miss Virginia Parkhurst, "Queen of the Highway," surrounded by her ladies in waiting. Miss Parkhurst had previously been chosen through a contest conducted by the Wilmington Post of the American Legion, and is a junior at Banning High School.

A military ball was the concluding event on the highway dedication program, presided over by the "Queen" and her six ladies in waiting.

California motorists consumed 1,459,993 gallons of gasoline in 1936 to lead all States with the exception of New York, Federal statistics reveal.

An itinerant musician was stranded in a village one Sunday morning, and, as he was playing his cornet in the street, he was approached by the clergyman of the parish, who said: "Do you know the Fourth Commandment, my good man?"

"No," the man replied, "but if you'll just whistle it over, I'll do my best."

Men of Division of Highways are Paid Compliment

Motoring down the broad highway in good weather the average motorist seldom gives a thought to the toil and foresight that went into the planning, the construction and the maintenance of the smooth ribbon that unrolls under the wheels of his machine.

But it is a different story when trouble comes along. As, for example, when stormy weather hits the highways; when torrential rains wash out sections of the road; when trees or slides block the route; or, occasionally when deep snowdrifts make travel impossible. Then the motorist becomes, suddenly, acutely "road-conscious." And it is then that he begins to really appreciate the work that goes on daily, endlessly, year after year, in the maintenance of the public thoroughfares.

In California, the State Division of Highways is responsible for keeping the highways clear at all times. Fair weather or foul, it is their duty to see that the roads are kept open and that travel may continue uninterrupted. Under blazing sun or in the midst of a swirling blizzard the men who comprise the maintenance section must play their daily role, often forsaking family and fireside to work long hours overtime to patch up some particularly dangerous sector of the route.

Those who carry on that important work may be heroes unsung, but they may rest assured that their work stands for itself, beyond the need of mere human acknowledgment by thoughtless humans who too often take such things for granted.—*Eureka Standard.*

Note from teacher on Betty's report card: "Good worker, but talks too much."

Note from father over signature on back of card: "Come up sometime and meet her mother."

Humboldt State Highway Being Modernized

(Continued from page 17)

dad was first settled by white men in 1850 and grew rapidly, having a population of over 3000 in 1852 when the gold placer mines of the Trinity River were being operated, and was at that time the county seat of Klamath County. Two years later the population dwindled to practically zero and at the present time there are only 107 inhabitants.

Little did those early settlers imagine that at one time a wide surfaced highway would be constructed through the village with between three and four thousand mechanically operated vehicles, called the automobiles, passing every day. Served for many years by a county constructed wagon road, the residents probably believed that the highway built by the State through Trinidad sixteen years ago was "the last word" in highway construction. They did not realize that traffic would increase so rapidly that the then new highway would become obsolete in relatively so short a time.

Of particular interest from a construction standpoint on this new project are the methods being used in stabilizing embankments and the type of surfacing being constructed.

The new highway crosses an unstable area at Mill Creek on a fifty foot fill. Trenches were excavated from twenty to twenty-five feet deep through this unstable area and backfilled with quarry rock, with 18-inch perforated metal pipe underdrains placed in the bottom of the trenches. More than 3000 cubic yards of quarry rock were used in the backfilling.

Hitch-hiking has just been made illegal in Long Beach following robbery of a local motorist who had picked up a thumb-jerking walker. Numerous "Good Samaritans" have been held up at gun point in payment for their generosity and many pedestrians have met with the same fate after accepting rides from strange motorists.

A small boy was asked to write an essay in as few words as possible on two of life's greatest problems. He wrote, "twius."

Upper picture is view of section of highway between Trinidad and McNeill's Ranch looking north across Mill Creek showing rolling grade of existing road, which is being realigned. Lower: Redwood stumps which were removed to widen highway.

Evolution of Traffic Stripe Marker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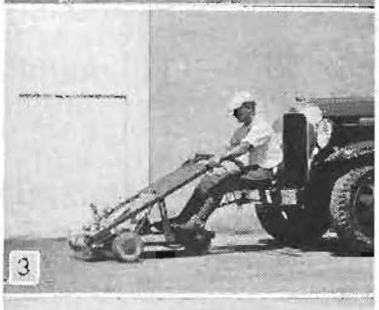
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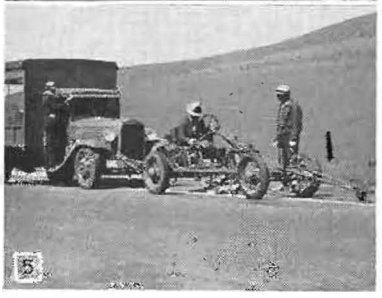
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EVOLUTION of the highway traffic stripe marking equipment of the Division of Highways since the early 20's has been rapid and revolutionary.

The first machine used to paint white traffic lines on roads was a home-made, hand operated one invented by engineers of District IV of the Division of Highways.

Photo No. 1—On this machine the paint was deposited in a reservoir attached to the frame and flowed by gravity through a rubber tubing to the pavement immediately ahead of a paint brush which spread the paint on the road. At this time, most of the striping was confined to curved sections of roadway. It soon became obsolete.

Photo No. 2—The hand-powered machine followed the home-made one in the late 20's.

Photo No. 3—Next came the unit on which the paint supply and compressor were mounted on a truck. A seat for the operator was arranged on the bumper of the truck and the unit was propelled by a push bar from the truck united. Used in early 30's.

Photo No. 4—Next came the chassis which provided a seat for the operator and was constructed with a longer wheel base, which only painted a single 4-inch line. On this unit also paint supply and air compressor were mounted on the truck propelling the unit. This was used until recently.

Photo No. 5—The most recent improvement, which was constructed by Shop 4, District IV, is designed to lay the three-stripe centerline on pavements in one operation. The two 3-inch white lines and one 3-inch black line are laid all at one time, thereby saving considerable time in doubling back over the section to paint the adjacent lines, as well as caring for the drying of the three lines at one time instead of in two or three operations as formerly.

The paint and air controls are mounted on the chassis of the striper which is propelled ahead of the truck by a push bar. The truck carries the paint supply in tanks, one for the black paint and two for white paint. The two white paint tanks are so hooked up that one may be filled while the other is being used.

The truck also carries the air compressor unit and mixing tank equipped with an agitator where the paint is prepared for filling the supply tanks. The supply tanks are filled by pumping the paint from the mixing tank.

Photo No. 6—Shows front view of complete unit, 1937 traffic stripe marker used in District IV.

Photo No. 7—This is a close-up of spray box showing position of the three spray units on the stripe marker now being used.

Photo No. 8—Shows lines recently laid with 1937 model traffic stripe marker.


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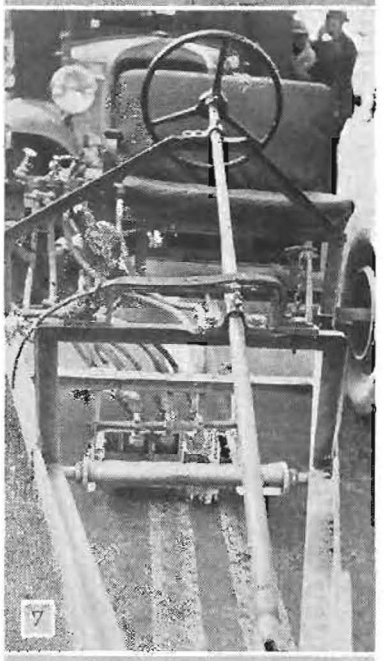
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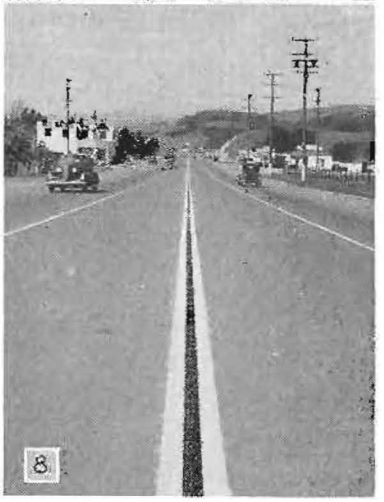
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Highway Bids and Awards for the Month of May

LOS ANGELES COUNTY—Carson St. between Lakewood Blvd. and Norwalk Rd., 4.0 miles to be graded and paved with Portland cement concrete and plant-mixed surfacing. District VII, Route 178, Section A.L.Bch. Dimmitt and Taylor, Los Angeles, $113,711; Matich Bros., Elsinore, $102,976; J. E. Haddock, Ltd., Pasadena, $111,575; Griffith Co., Los Angeles, $102,162; United Pipe Corp., Los Angeles, $117,347; C. O. Sparks and Mundo Engineering Co., Los Angeles, $119,739; Oswald Bros., Los Angeles, $98,617. Contract awarded to Sully-Miller Contracting Co., Long Beach, $96,909.00.

MONO COUNTY—At East Walker River, 6½ miles north of Bridgeport, timber and concrete bridge to be constructed and approaches graded thereto. District IX, Route 96, Section A. B. A. Hawkins and Co., San Francisco, $9,271; Vido Kovacevich, South Gate, $8,429; Young and Son Co., Ltd., Berkeley, $7,839; Rexroth and Rexroth, Bakersfield, $9,240; A. S. Vinnell Co., Los Angeles, $9,672; Isbell Construction Co., Reno, $8,230; Parish Bros, Los Angeles, $7,957; Contract awarded to Robert D. Paterson, Santa Barbara, $5,878.00.

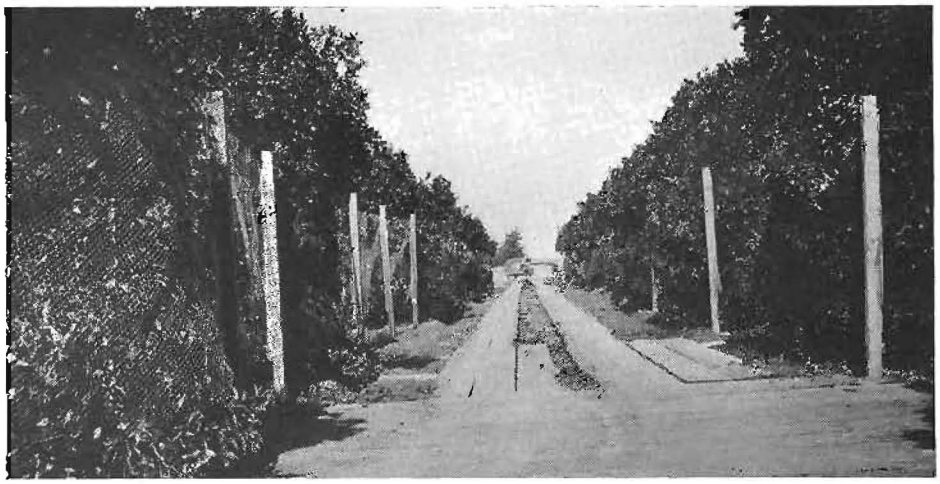
SAN JOAQUIN COUNTY—An undergrade crossing under tracks of the A. T. & S. Fe Ry. at Wilson Way in Stockton, consisting of steel and concrete structure and 0.29 mile to be paved with Portland cement concrete and asphalt concrete. District X, Route 4, Section Stockton. Lord and Bishop, Sacramento, $219,832; Louis Biasotti and Son and John Rocco, Stockton, $267,084; O. H. Chain, Stockton, $245,100; Gates and Huntley, Los Angeles, $229,930; United Concrete Pipe Corp., Los Angeles, $216,734; F. O. Bohnett, San Jose, $220,598; Lindgren & Swinerton, Inc., Oakland, $225,650; Contract awarded to Earl W. Heple, San Jose, $212,364.50.

SAN LUIS OBISPO COUNTY—Between San Luis Obispo Creek and Cuesta Siding, 3.3 miles in length to be graded and surfaced with plant-mixed surfacing on crusher run base. District V, Route 2, Section D. United concrete Pipe Corporation, Los Angeles, $846,537; Granfield, Farrar and Carlin, San Francisco, $741,551; C. O. Sparks and Mundo Engineering Co., Los Angeles, $798,278; Griffith Company, Los Angeles, $798,881; Macco Construction Co., Clearwater, $683,137; Guy F. Atkinson Company, San Francisco, $794,313; Utah Construction Co., San Francisco, $773,923; Basich Brothers, Torrance, $737,953; George Pollock Company, Sacramento, $666,633; J. E. Haddock, Ltd., Pasadena, $726,764; Bodenhamer Construction Co. and Lewis Construction Co., Oakland, $707,070; A. Teichert and Son, Inc., Sacramento, $708,235; Contract awarded to Metropolitan Construction Co., Los Angeles, $646,027.90.

SISKIYOU COUNTY — Between Cougar and Macdoel, 20.3 miles to be graded. (District II, Route 72, Section B) Union Paving Co., San Francisco, $310,229; Hemstreet and Bell, Marysville, $295,230; Clifford A. Dunn, Klamath Falls, Oregon, $225,608; Donald Atkinson, San Francisco, $274,710; A. Teichert & Son, Inc., Sacramento, $216,607; Geo. K. Thompson, Los Angeles, $286,598; Isbell Construction Co., Reno, $269,642; Morrison-Knudson Co., Inc., Los Angeles, $198,596; Harms Bros. and Larsen Bros., Sacramento, $197,216; Contract awarded to Harold Blake, Portland, Orgeon, $171,882.00.

TEHAMA COUNTY—A plate girder bridge with concrete deck across Sacramento River at Red Bluff. District II, Route 3, Section D. Andy Sordal and R. R. Bishop, Long Beach, $347,614; D. W. Thurston, Los Angeles, $346,887; Lord and Bishop, Sacramento, $279,214; Bodenhamer Construction Co., Oakland, $297,243; Guy F. Atkinson Company, San Francisco, $337,992; Pacific Bridge Co., San Francisco, $337,200; George Pollock Co., Sacramento, $309,694; Gates and Huntley, Los Angeles, $281,961. Contract awarded to J. F. Knapp, Oakland, $255,194.

VENTURA COUNTY—Between Pyle Road and Telegraph Road, 2.2 miles to be graded and surfaced with asphalt concrete and plant-mixed surfacing. District VII, Route 79, Section B,Fil.,C. Dimmitt & Taylor, Los Angeles, $91,372; Oswald Bros., Los Angeles, $97,440; United Concrete Pipe Corporation, Los Angeles, $92,684.



Picture shows how highway engineers built detour through orange grove and protected trees

Flood Compelled Detouring Through Fine Orange Grove

By E. T. SCOTT
District Maintenance Engineer

WHEN a river decides to change its course it has no respect for anything in its path. When a mild little creek like the Trabuco Creek in Orange County becomes a river it usually behaves as such, and during the storm of February 6–7 this little stream decided to change its course, cutting out over 300 lineal feet of an important State highway north of Capistrano to a depth of about 25 feet.

It not only washed away the State Highway but it cut into a beautiful orange grove, one of the few groves in Southern California to emerge from the cold spell of the winter with fruit that had not been damaged by the frost.

With the highway washed out and beyond immediate repair, and with the usual heavy traffic on this portion of U. S. Highway 101 eager to pass, the problem of detouring this great gap was made more difficult by the presence of the beautiful orange grove laden with a fine crop of fruit.

The only possible chance of detouring the washout was through the orange grove since all other roads for miles around had been rendered impassable by the heaviest storm to visit this part of Orange County in half a century.

The owner of the orange grove, Judge R. Y. Williams, was contacted and permission was received to permit light traffic to go through the orchard, provided same could be done without injury to the trees or the oranges.

Planks solved the detour surface problem but the beautiful fruit would have been very tempting if it could not be removed from the reach of passing motorists.

To protect the trees and hold the branches back from the roadway, a fence built of fine mesh chicken wire to a height of seven or eight feet was constructed parallel to the detour and it not only protected the trees from passing vehicles but prevented persons from picking the fruit.

Uniform Highway Signs

(Continued from page 10)

On a two or three lane road and for all but the center stripe for multiple lane roads, a four-inch white traffic lacquer stripe is used.

For the center of four-lane roads and for the crests of grades where less than 800-foot sight distance is obtained, a so called double line is used. This really is three lines of striping formed by two three-inch white lines separated by a three-inch black line.

TRANSITION STRIPE

The change from two to three, four or more lanes either increasing or decreasing the number is made by a standard transition stripe which guides traffic into the proper lanes for proceeding.

On obscured view crests of grade the double line is placed to give one lane up with a standard transition on the crest to permit two lanes down. The length of the double line is determined by adding four hundred feet to each end of the impaired sight distance. In advance of the one up double line, a dashed single line transition leads the motorist into the one lane up; because it is dashed, travel in the two lanes down may cross the transition line if the way ahead is clear.

The double white traffic line is being used to imply that it should never be crossed. Through this definite use the motorist will soon learn that the double line means just that. Wherever it becomes necessary because of intersections or turns for traffic to cross, the double line is either omitted or made a solid nine inch line.

CITIES COOPERATE

The above use of the double line is standard uniform practice on State highways. Those public ways over which the State does not have jurisdiction have been requested to cooperate in this standard use and with the exception of a few cities the uniform striping is used.

It is apparent that in order to obtain uniformity in traffic striping as well as in signs and signals, it is requisite that some central control be obtained and until the authority is given to such a control there will be no uniformity.

Safer Highways Make For Less Accidents

It will, of course, cost billions of dollars to give America even 100,000 miles of the high type of roadway, but that 100,000 miles might well carry 100,000,000,000 miles of traffic annually, and if that volume of traffic were carried on such highways, there would be a great reduction in the annual bill we are now paying for accidents. Leaving out any calculations for fatalities themselves, the total cost for property damage, doctors' bills, hospitalization, and lost time for 1936 was not less than $1,250,000,000. It looks to us as though America is paying for safe highways whether it has them or not.— *Michigan Roads and Construction.*

Many states have by legislative action seen the necessity in the interest of safety and the reduction of accidents to place such control in their Department of Public Works. The motorists soon learned upon entering a state whether such uniformity is obtained. It can readily be seen that when our traffic laws are uniform, when our signs, signals and markings are the same everywhere, the motorist will respond and our accidents will be reduced because of the ease of enforcement and the confidence given to the traveler.

REFLECTORIZED SIGNS

A recent form of marking is the use of reflectorized pavement markers placed on the center line. In order to keep the respect of this efficient but costly marking, these markers are placed only on curves which present a surprise to the motorist. When placed on a state highway the motorist knows that he should slow down because of the sharpness or unusual physical character of the curve he is approaching.

New Highway to Bay Bridge Will Be Ready July 1

To facilitate travel to the Golden Gate Bridge Fiesta, State Highway Engineer C. H. Purcell on May 26 opened the East Shore Highway, which forms a direct approach to the San Francisco-Oakland Bay Bridge from Richmond, El Cerrito, and Berkeley.

Informal ceremonies, in which the Richmond Junior Chamber of Commerce, the Berkeley Junior Chamber, and the Oakland Junior Chamber participated, were held at the junction of the road with San Pablo Avenue, near El Cerrito.

Harry A. Hopkins, Chairman of the Highway Commission cut the ribbon which opened this most recent Bay Bridge approach. Others participating were: Mayor of Berkeley E. E. Ament; Frank Tiller, Mayor of Richmond; State Highway Engineer C. H. Purcell; Colonel John H. Skeggs, District Highway Engineer; and J. N. Long, member of the Board of Supervisors of Contra Costa County.

Only two lanes of the four-lane highway were opened at the time and then closed. The final concrete paving will be completed before July 1. The project will cost approximately $1,020,000 (including the 1452-foot concrete El Cerrito Overpass). The section opened is 4.14 miles long. It has a 10-foot dividing strip down the center. When completed, it will be one of the most modern and finest stretches of highways in California.

Bridge Accidents Less

Accidents on the San Francisco-Oakland Bay Bridge were reduced 40 per cent in May according to the monthly report of Roadside Service and Accidents made by Chief Engineer C. H. Purcell.

There was a total of 9 accidents on both the bridge and approaches during the 31 days of May as compared to 15 for April. A reduction in drunk drivers and speeders over the bridge was also announced.

The total number of accidents since the bridge opened was brought to 74, with the number of persons injured totaling 75, out of an approximate estimate of 10,000,000 patrons.

Free Parking for Motorists on Bay Bridge

MOTORISTS using the San Francisco-Oakland Bay Bridge are entitled to free 24-hour parking in a paved and fenced area situated beneath the main approach on the San Francisco side.

The area lies between Third and Fourth streets and also includes a section just west of Fourth Street.

Motorists are advised that the most convenient way of reaching the area is from the Fifth Street Plaza, driving right to Harrison Street and then right again to Perry Street. The parking place lies longitudinally between Perry and Stillman streets.

Motorists leaving the parking area should drive via Bryant Street over Third or Fourth Street, and thence onto the Fifth Street Plaza and over the bridge.

This parking area leaves the motorist within only a few short blocks of the business district, with Third and Fourth Street streetcars available.

Motorists desiring to use the parking area will be given a ticket by the toll collector on the Oakland side, which will be surrendered to the attendant at the parking site.

Bay Bridge Ranks Third in Country in Traffic Carried

THE five millionth vehicle crossed the San Francisco-Oakland Bay Bridge May 31, bringing the actual total number of vehicles crossing the great span to 5,007,027 in the six and a half months of its operation, according to Earl Lee Kelly, State Director of Public Works.

The bay bridge ranks third in the United States in amount of traffic for a toll crossing. This was revealed by Chief Engineer C. H. Purcell, State Highway Engineer, in a report on six months' operation of the giant 8¼ mile structure.

According to traffic figures for March, gleaned from the leading toll crossings, the Bay Bridge is exceeded only by the Holland Tunnel of New York and the Delaware River Bridge at Philadelphia.

Traffic for the month of May topped all records for previous months by approximately 130,000 vehicles, with a total of 896,027 vehicles for May as compared with 766,790 for April, heaviest to that time, he announced from figures contained in the monthly traffic report on the Bay Bridge submitted by Chief Engineer Purcell.

The last four days of the month, including two holidays and featuring also the opening of the Golden Gate Bridge, brought 166,692 vehicles across the Bay Bridge.

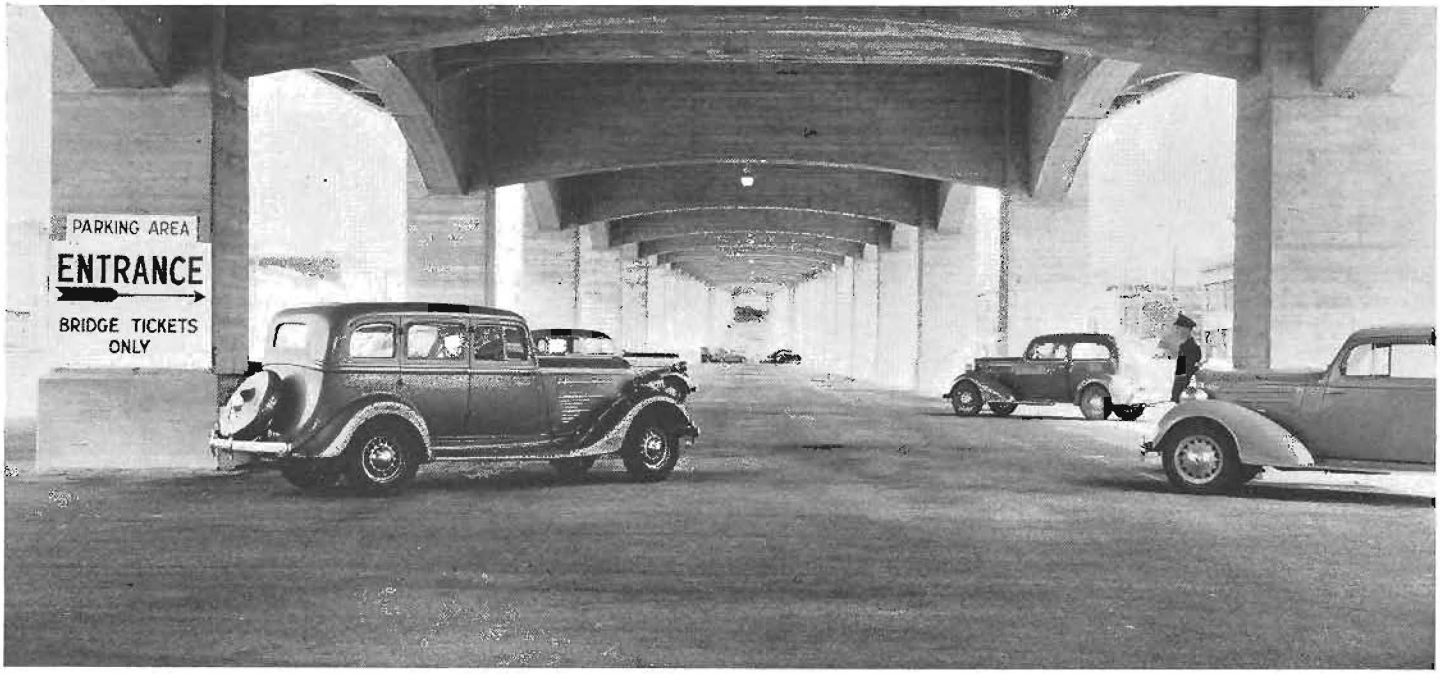
Among the factors attributed by Mr. Kelly to May's large traffic were the normal seasonal rise and the 31-day month.

Traffic for May averaged 28,904 vehicles a day, an increase by approximately 3000 per day over April's daily average making May the banner month for patronage since the bridge opened. Average toll per vehicle was .5237 cents, with the month's total income amounting to $469,240.05.

Other notable features of May traffic over the Bay Bridge, Mr. Kelly pointed out, were the increase in auto trailers and motorcycles by a third over April figures. Number of trailers for May was 1584; number of motorcycles, 3334.

The number of buses crossing in May was doubled over the preceding month, with a total of 8585 as compared to 4559.

Trucks and freight pounds show a slight but consistent increase, with 56,808,330 freight pounds for May, bringing the total to date to 289,721,-682. Trucks numbered 24,981, in comparison to April's total of 24,737.



Spacious parking space under San Francisco Bay Bridge free for 24-hour period to patrons of the span.

IRRIGATION DISTRICTS

The petition for a new district, to be known as Shafter-Wasco Irrigation District, was approved as to sufficiency by the Kern County Board of Supervisors on May 10th, and submitted to the State Engineer for investigation and report as to feasibility. The proposed district embraces an area of about 40,000 acres northwest of Bakersfield.

A report was made on the proposal of Richvale Irrigation District to issue bonds in the amount of $90,000 for acquiring additional water rights and irrigation facilities from the Sutter Butte Canal Company. The district was recently enlarged by inclusion of the Maxwell Tract containing about 3155 acres.

Carmichael Irrigation District completed plans for refunding an outstanding bond issue in the amount of $79,600 through a loan of $53,000 from the Reconstruction Finance Corporation, augmented by district funds.

Districts Securities Commission

At meeting of the Commission held in Los Angeles on May 14th the following district matters were given favorable consideration:

The plan of readjustment of indebtedness of El Dorado Irrigation District was approved and consent was given to the filing of a petition in the superior court, pursuant to provisions of the new Irrigation District Refinancing Act.

The proposal of Tulare Irrigation District to expend $58,750 for purchase of additional shares of capital stock in the Wutchumna Water Company was approved.

Refunding bonds of Alpaugh and of Beaumont Irrigation districts, in the amounts of $101,000 and $159,000 respectively, were validated for certification by the State Controller.

Plans of Imperial Irrigation District for development of power on the All-American Canal were approved. The district will enter into contracts with the Federal Government, and issue revenue bonds to PWA and REA for funds with which to construct power plants and distribution facilities in Imperial Valley.

FLOOD CONTROL AND RECLAMATION

Relief Labor Work

During this period an average of 75 men on WPA Project No. 6805 (formerly No. 5416) were engaged in clearing the Feather River channel north of Marysville. SRA Transient Camp No. 7, in the Sutter Basin, furnished an average of 25 men. These men were engaged in cleaning up the grounds round pumping plant No. 3 and also in installing a tile drain system at the Sutter maintenance yard.

WPA Project No. 6654, in Yolo County, furnished an average of 33 men during the period. They have been engaged in clearing brush and timber in the Sacramento By-pass.

SUPERVISION OF DAMS

Application was received on April 23, 1937, for the alteration of the Huntington Lake Dam No. 1 of the Southern California Edison Company situated on Big Creek in Fresno County. The work contemplated is the construction of an auxiliary spillway and the placing of fill on the downstream face of the dam. This work was approved on May 4, 1937.

Application was filed on April 22, 1937, by the Pacific Gas and Electric Company for alterations at Lake Arthur dam located on Dry Creek tributary to the Yuba River in Placer County. The work comprises reconstruction of the crest to provide a greater spillway capacity. This application was approved on May 3, 1937.

Application was filed on April 22, 1937, by the Pacific Gas and Elcetric Company for the alteration of the Lake Theodore Dam situated on South Fork of Dry Creek tributary to Yuba River in Placer County. The work proposes the reconstruction of the spillway chute. This application was approved on May 3, 1937.

WATER RIGHTS

Supervision of Appropriation of Water

Twenty-six applications to appropriate water were received during April, five were denied and twelve were approved. In the same period seven permits were revoked and the rights under eleven permits were confirmed by the issuance of license.

Inspections of projects covered by permits of the Division are being made during the current month in Santa Cruz, Santa Clara and Stanislaus counties and other coastal and adjacent counties northward to Del Norte and Siskiyou counties.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISION

During the past month the activities have been both in the field and office. The field work has consisted of visiting all points of diversion and acquainting the operators with the record keeping procedure. Measurements are being made of the few plants which are actively operating. The pumping has not been very heavy to date on account of the abundance of rainfall.

The Sacramento River at Sacramento has remained fairly high during the past month and the flow on May 24th was 35,000 cubic feet per second. The melting snows have caused a rise in the San Joaquin Valley east side streams and the flow of the San Joaquin River at Lathrop into the delta on May 24th was 18,500 cubic feet per second.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the first week of May the final scheduled snow surveys for this year were made at all key snow courses. These snow surveys were made for the purpose of determining the amount of snow melting that had taken place in the mountains during the preceding month and to serve as a check on the previously published estimates of stream flow forecast early in April.

WATER RESOURCES

San Luis Rey River, San Diego County

The report on the investigation and survey of San Luis Rey River in San Diego County for the purpose of securing data and preparing plans for flood control, rectification of river channel and conservation and utilization of the waters of the San Luis Rey River was completed by the Division of Water Resources and released during the present month.

CENTRAL VALLEY PROJECT

The United States Bureau of Reclamation continued work during the month on the preparation of plans necessary for starting construction on the initial units of the project. Preliminary investigations and exploration work have been continued at Kennett and Friant dam sites as have the surveys along the Contra Costa conduit and Friant-Kern canal. Appraisers are working in the field evaluating lands and necessary rights of way to be acquired. The Division of Water Resources has continued surveys and investigations in the San Joaquin and Sacramento Valleys preliminary to acquisition of properties and water rights.

Photo Electric Recorders Make Count of Highway Traffic

(Continued from page 6)

the characteristics of the metropolitan area of Los Angeles.

Two counters have been assigned to record traffic that is definitely known to be recreational in character. One is on Route 42 west of its junction with Route 55, the Skyline Boulevard. This records traffic into the Big Basin, Boulder Creek, and Redwood Park. The second is located on the famous Arrowhead Springs Road, Route 43 at the Panorama Point Maintenance Station.

INTERESTING VARIATIONS

Some interesting variations have been observed in the records turned in by these installations. The highest 24-hour count recorded to date was on the counter at Whitewater, Easter Sunday, with a total of 15,862 vehicles. This represented 33% of the total traffic for that week, whereas the average Sunday traffic at Whitewater is only 25% of the week's total.

The counter at Panorama Point, on the other hand, dropped to its lowest Sunday count on Easter Sunday, a total of 2,265 vehicles. This was 33% of the week's total travel, the same as at Whitewater. However, the average Sunday traffic at Panorama Point is 54% of the week's total—more than twice as high a percentage as at Whitewater in the valley below it. Thus we find what a great difference exists in the traffic pattern of recreational and primary through routes even in the same area.

Practically all records agree in one characteristic. The traffic curve between midnight and daylight is nearly a straight line, with the same number of vehicles passing each hour. With the coming of summer the curve starts to rise at an earlier hour, and the total for the day increases but the total traffic at each location during the hours from midnight to daylight does not increase correspondingly.

The light source and receiving units are placed with a skew angle of 23° across the center line of the road. This does not entirely eliminate the recording of a truck and trailer as two vehicles. On the other hand a certain percentage of cars pass each other at the recorder and therefore record as only one vehicle instead of two. In some installations these two errors very nearly balance out. At the counter located at the San Joaquin River bridge on Route 4, the preponderance of heavy truck and trailer traffic during the night hours makes the count higher than it actually should be, whereas the day count due to cars passing each other often goes under actual.

In the Santa Ana Canyon, the counter sometimes records two or more vehicles for one passing automobile due to the fact that cars approaching the curve on which it is located, at high speed, cut in on the shoulder which is lower than the center of the road, permitting the beams to pass through the glass of the car instead of being continuously interrupted by the body.

"PHANTOM" TRUCKS

Most of the installations are so placed as to give a northern exposure to the receiving unit in order to minimize the effect of stray light. In some instances this has resulted in "phantom" trucks passing the recorder without counting. This phenomenon is accounted for by the fact that the flat sides of a truck painted white or aluminum color will, at certain hours of the day in Spring or Fall, reflect enough light back in to the receiving unit to replace the light ordinarily furnished by the light source. This holds the relay down and does not permit the counter to operate.

The recorders count instantaneously and will clock cars as fast as they pass and as close together as they can run. It has been found advisable, however, to place them only on two-lane highways.

In spite of the occasional errors due to double counting, or failure to count the second car when two cars are passing at the same time, cursory inspection of the records of the machines indicates that the total of the errors is insignificant.

Father: "Isn't it wonderful how little chicks get out of their shells?"

Son: "What gets me is how they get in."

C. H. Purcell Is Named Member of U. S. Road Group

Twelve nationally known experts in highway engineering, including State Highway Engineer C. H. Purcell of California, have been appointed by Secretary of Agriculture Wallace to work with the U. S. Bureau of Public Roads in developing standards of highway design to promote maximum safety and highway utility.

The work to be done has the full support of the American Association of State Highway Officials, which through its Executive Committee recently stressed the urgent need of reviewing administrative policies concerning minimum standards for the design of roads.

Meetings of the experts with Bureau of Public Roads officials will be held from time to time to consider matters such as road surface widths, maximum grades and curves, design of multi-lane highways, protection of grade crossings and many other problems.

Thomas H. MacDonald, Chief of the Bureau of Public Roads, will act as chairman of the committee of 12 who are:

C. H. Purcell, State Highway Engineeer, Sacramento, California. Ernst Lieberman, Chief Highway Engineer, State Department of Public Works and Buildings, Springfield, Illinois. Fred Kellan, Design Engineer, State Highway Commission, Indianapolis, Indiana. Hugh Barnes, Chief of Highway Planning, State Highway Commission, Topeka, Kansas. G. H. Delano, Chief Engineer, State Department of Public Works, Boston, Masachusetts. O. L. Kipp, Construction Engineer, State Department of Highways, St. Paul, Minnesota. Murray D. Van Wagoner, State Highway Commissioner, Lansing, Michigan, Harold W. Giffin, Engineer of Surveys and Plans, State Highway Department, Trenton, New Jersey. R. H. Baldock, State Highway Engineer, Salem, Oregon. P. M. Tebbs, Assistant Chief Engineer, State Department of Highways, Harrisburg, Pennsylvania. Gibb Gilchrist, State Highway Engineer, Austin, Texas. C. S. Mullen, Chief Engineer, State Department of Highways, Richmond, Virginia.

Cost of Highway Construction Cut By New Methods

(Continued from page 14)

ous locations over old fills, considerable settlement took place during this operation.

EXPERIMENT ORDERED

It was therefore assumed that a thorough job of pounding might accomplish satisfactory consolidation without removal and recompaction over shallow fills, and might be used in conjunction with removal and recompaction of a more shallow trench construction through the deeper fills.

Between Station 386+00 and Station 387+50, the portable crane and ball operated over an area of 154 square feet per hour at a cost of $8.79, equal to 5.7 cents per square foot, and was able to break up the old pavement and drive it into the old fill and lower the grade of the entire area by one foot.

To subexcavate and backfill in order to recompact this area would have required complete removal and disposal of the existing pavement, at an estimated cost of about $76. At the contract price of 30 cents per cubic yard for roadway excavation, the removal and recompacting cost per sqare foot was 2.22 cents per foot depth of fill reconsolidated. The depth of fill reconsolidation by excavation and backfill methods equivalent to the crane and ball method, therefore, was but 2.56 feet, and since a satisfactory job could not be obtained without recompacting double this depth, it is evident that this method deserves further consideration.

Relative compaction tests taken before and after tamping show very favorable results, increases being as follows: Directly underlying the existing pavement, compactions increased from 89.1% to 92.9%, and at a depth of 5 feet, the increase was from 82.1% to 91.8%. The soil was a mixture of black adobe and brown clay, with a moisture content far above the optimum value, running 28% to 33%, and therefore accounts for the relatively low increase at the surface, the value of 92.9% being about the maximum compaction attainable under such high moisture content.

In Memoriam

GEORGE McIVOR

The State of California lost a valuable citizen, the Department of Public Works a faithful employee and co-workers a staunch friend, when death suddenly overtook George McIvor of District X of the Division of Highways May 2, 1937.

Born October 17, 1892, McIvor was educated in Tuolumne County, and spent a great portion of his life there. Early in his career he was employed by large lumber companies and the Sierra Railway Company in the Mother Lode. On May 16, 1928, he joined District X of the Division of Highways as a sub-foreman and on September 1, 1933, was promoted to the position of superintendent with headquarters at Bishop in District IX.

At McIvor's request he was transferred to District X on December 1, 1935, to serve as superintendent of construction projects in connection with maintenance improvement activities.

While it was known that McIvor had not been in the best of health while on duty in District IX, after his return to the Mother Lode country his condition was so much improved that his sudden passing was a shock and sorrowful surprise to his many friends.

On May 2 McIvor was driving to his new assignment, with his nephew following in a second car. At a point a few miles north of Jackson, McIvor's car suddenly left the road, crashed into a cut bank and turned over. He passed away while being rushed to a Jackson hospital. The coroner's inquest attributed his death to heart failure. Interment was at Tuolumne.

HEAVY PRESSURE DEVELOPED

A pressure cell placed 5 feet under ground was carefully backfilled and compacted by dropping the 2500 pound ball a height of 18 feet, and a pressure gauge placed at the ground surface registered a maximum reading of 16 pounds per square inch. Adding to this value 2.3 pounds per square inch due to the 5-foot column of water between the cell and the gauge, the pressure developed at the cell would be 18.3 pounds per square inch. The dead load of 5 feet of compacted earth would equal about 5 pounds per square inch at the depth of the pressure cell, so it is evident that a pressure of 1900 pounds per square foot was being exerted by the compression in the soil. Since about a 10 pound fluctuation of the needle was visible at the instant the ball struck the ground, it is evident that at this depth there was an additional active force of 1440 pounds being exerted toward compacting the soil.

Harry A. Hopkins Resumes Post As Highway Chairman

IN RECOGNITION of his past service as a member of the California Highway Commission and in response to many requests from different parts of the State, Harry A. Hopkins, who resigned as chairman of the Commission to run for Congress in the Tenth District, was reappointed head of California's road building agency by Governor Frank F. Merriam on May 20. Mr. Hopkins was defeated at the May 4 special election held to select a successor to the late Congressman Henry E. Stubbs.

Mr. Hopkins, pioneer resident and civic leader in Kern County, was appointed a member of the Highway Commission in January, 1931, by the late Governor James Rolph, Jr., and in 1932 was elevated to the post of chairman, a position he held up to his resignation last spring.

Chairman Hopkins was sworn in by Judge Harry W. Beatty of Taft on the afternoon of May 20. Present at the ceremony as witnesses were Mrs. Harry Hopkins, Mrs. Elmo Fullmer, daughter of Mr. and Mrs. Hopkins; Miss Theda Fleming, secretary to the chairman; W. H. Fitzgerald, Herb Arndt, secretary of the Taft Chamber of Commerce; Abe Marks, Lee Coker, R. F. Casey and Miss Alma Wilson, Judge Beatty's secretary.

STATE OF CALIFORNIA

Department of Public Works

Headquarters: Public Works Building, Eleventh and P Streets, Sacramento

FRANK F. MERRIAM.....Governor

JUSTUS F. CRAEMER.....Assistant Director

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

CALIFORNIA HIGHWAY COMMISSION

HARRY A. HOPKINS, Chairman, Taft
PHILIP A. STANTON, Anaheim
H. R. JUDAH, Santa Cruz
PAUL G. JASPER, Fortuna
WILLIAM T. HART, Carlsbad
JULIEN D. ROUSSEL, Secretary

DIVISION OF HIGHWAYS

C. H. PURCELL, State Highway Engineer, Sacramento
G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

J. W. VICKREY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
JNO. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego

SAN FRANCISCO-OAKLAND BAY BRIDGE

C. E. ANDREW, Bridge Engineer

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer Water Rights
GORDON ZANDER, Adjudication, Water Distribution

DIVISION OF ARCHITECTURE

GEORGE B. McDOUGALL, State Architect, Chief of Division
P. T. POAGE, Assistant Chief
W. K. DANIELS, Administrative Assistant

HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Draftsman
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