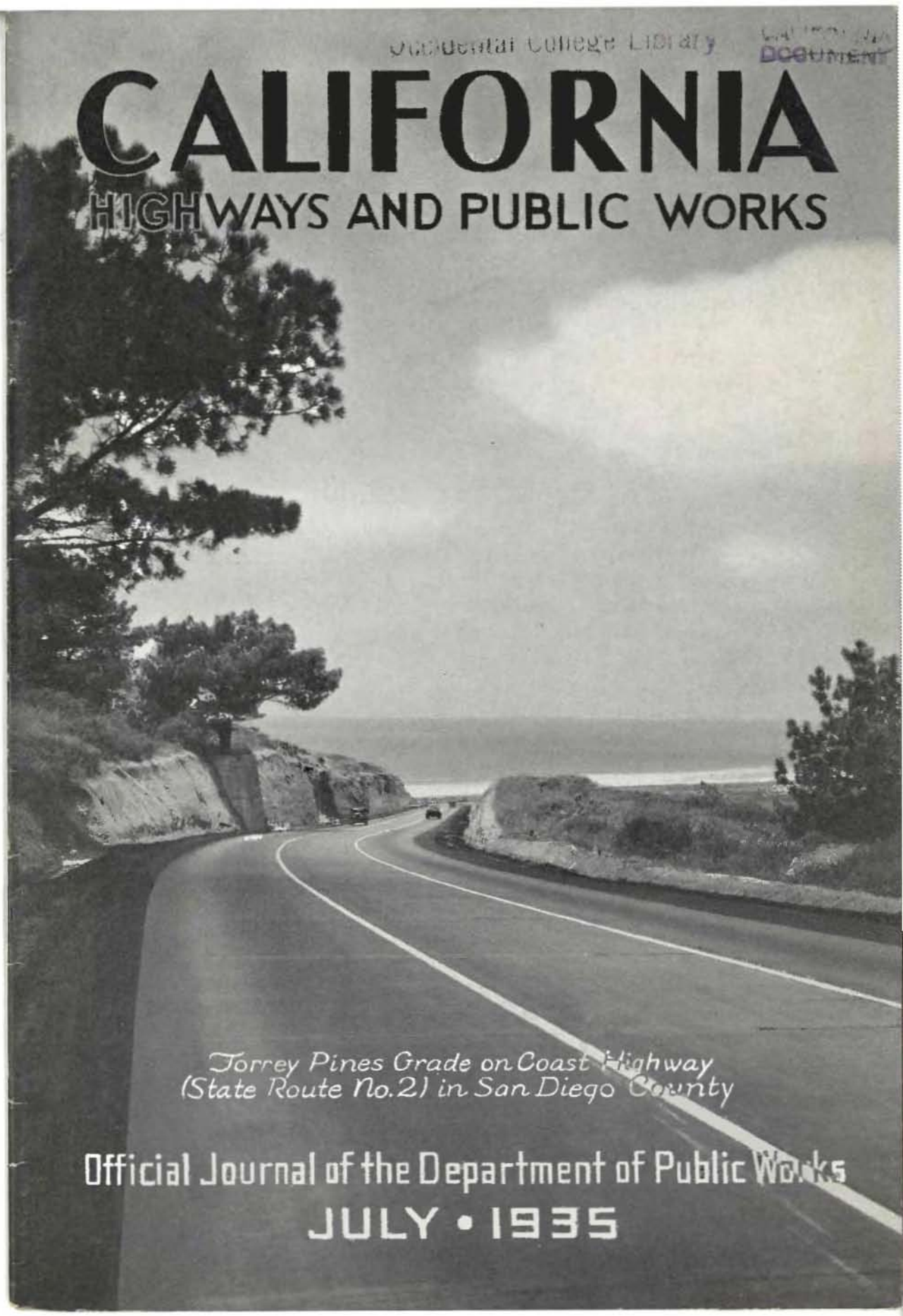
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



Torrey Pines Grade on Coast Highway
(State Route No. 2) in San Diego County

Official Journal of the Department of Public Works
JULY • 1935

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Governor Merriam Starts First Cable Spinning Operations on the Bay Bridge

Chief Executive Makes Adventurous Inspection Tour Over Wire Mesh Catwalk Swung at Dizzy Height Above Water to Talk With Workers on Job

"IF IT IS safe enough for our workmen, it is safe enough for me."

With this declaration, Governor Frank F. Merriam walked out over one of the steel mesh catwalks that rise to dizzy heights over the San Francisco Bay on the first mile of the San Francisco-Oakland Bay Bridge, after he had started cable spinning operations by placing the first loop of wire on the spinning wheel on June 15 last.

With the Governor were State Director of Public Works Earl Lee Kelly, Chief Engineer C. H. Purcell, and Ambrose N. Diehl, president of the Columbia Steel Company, contractors.

After performing his official function, Governor Merriam expressed a desire to go out on the catwalks. Some of his advisors protested, but the Governor was adamant, and his advisors, timid or otherwise, were forced to trudge after the Governor up the steep incline of horizontal fence wire through which they could see the bay and huge ships far below.

GOVERNOR MERRIAM Promenades on Catwalk

Governor Merriam paused frequently to talk with the steel workers at their airy posts.

On his first trip the contractors were still adjusting the cable spinning equipment, with frequent instances when the wire jumped off the spinning wheel. On the fifth of July, Governor Merriam again inspected the operations, when it was in full force with several hundred wires already laid in the cable.

As Governor Merriam and his party toiled up the steep incline of the catwalks, they would be warned by the tinkling of a cow bell fastened on the wheel, of the approach of the cable spinning apparatus dragging behind it a flopping steel wire.

The Governor and his party are the only persons, other than cable spinners and inspectors, who have been permitted on the catwalks during the spinning operations.

News reel camera men representing all the companies operating in America photographed the San Francisco-Oakland Bay Bridge on the occasion of the

Spinning Bridge Cables Across Bay

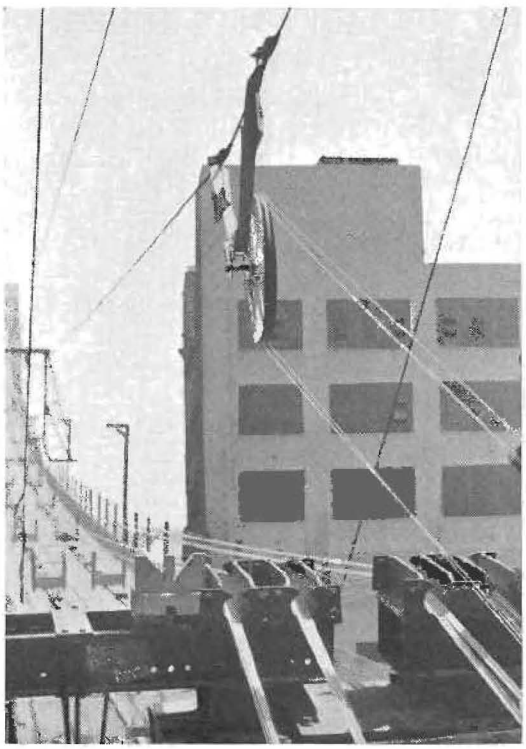
(Continued from preceding page)

Governor's second visit to the catwalks. The news reels represented were: Pathe, Hearst-Metrotone, Universal, Paramount, and Fox-Movietone. If these pictures of the cable spinning meet the standards of the Eastern editors, they will be disseminated throughout America before the end of July.

The spinning is now taking place on the most westerly of the twin suspension bridges. Two loops of the pencil-sized wire are carried in the two grooves of the wheel over the top of the towers and then to the center anchorage. Another spinning wheel returns with two loops of wire bound for the San Francisco anchorage simultaneously.

The spinning wheels are hung from an endless hauling cable similar to the pulley rope of a clothes line. Thus two spinning wheels are operating on each main cable, but in opposite directions.

Several hundred men of the cable spinning crew line the mile long catwalks seizing the wire as it comes along, and forcing it into grooves where its height is checked to a guide wire.



THE SPINNING WHEEL is 5 feet in diameter and carries two loops of the pencil size cable wire on each trip traveling 7 miles an hour.

The new safety catwalks have been found by Chief Engineer C. H. Purcell and his staff to be highly satisfactory. The open catwalk wire, bad for dizzy heads, is ideal for preventing wind swaying in these sky promenades.

With four strands completed in each of the cables of the western half of the suspension sector, preparations are under way for raising the catwalk ropes for the eastern sector from the center anchorage to the island.

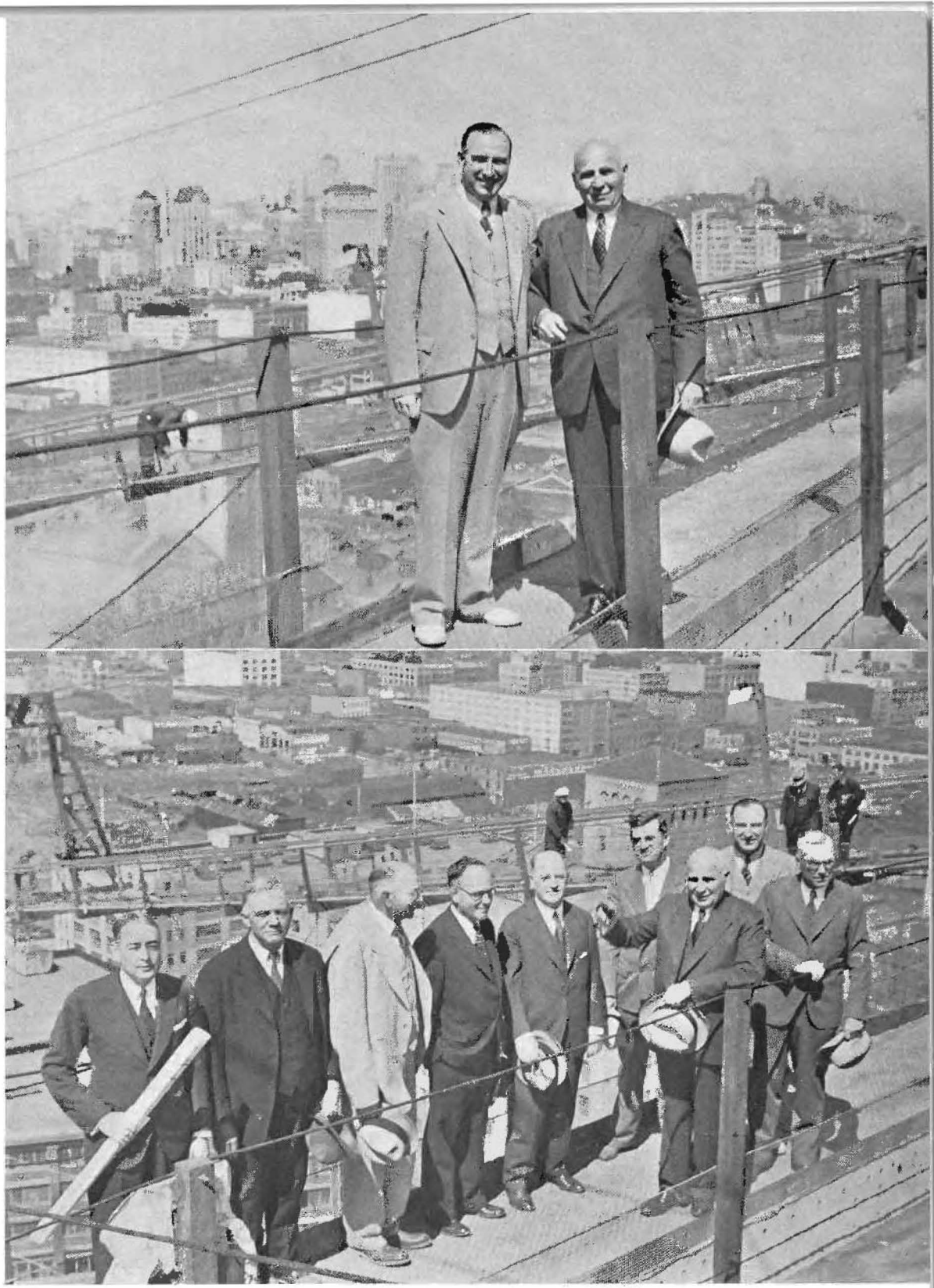
Several days were spent adjusting to correct elevation the four strands completed on the south catwalk. Since the sags of the completed cable depend upon the correct adjustment of these first four strands, a high degree of precision is required in the position of the wire already spun.

Night and day crews of men, supervised by State bridge engineers, check the height of the cable wires and correct those out of position by mechanical leverage devices.

Spinning of the next four strands on the south walk were started while the adjustment of the four strands on the north walk was taking place.

By mechanical devices it is provided that any slack is immediately taken up by brakes applied to the huge spools of cable wire. In addition to this mechanical control of slack, an electrical system of switches is provided at 250-foot intervals over the entire catwalk so that in case of accident or a snarled wire all movement can be immediately shut down by the workmen witnessing the accident.

The wheels travel approximately seven miles an hour over the one mile course. Each cable strand contains 472 wires so that each strand requires 236 trips of the spinning wheel. Except for the center, or nineteenth strand, which is laid up by itself, the strands are spun in sets of four, each set being adjusted to correct elevation before starting succeeding strands. There will be 37 strands, or a total of 17,464 individual wires in each main cable, and the spinning will be completed this year.



TWIXT HEAVEN AND EARTH, suspended on a three-foot walkway between two catwalks of the San Francisco-Oakland Bay bridge, 350 feet above the bayshore, Governor Merriam and his official party inspected the cable spinning and posed for photographers. With the Governor in upper picture is Director of Public Works Earl Lee Kelly. Below, left to right, are W. G. Swanson; James Ward, American Bridge Co.; E. J. Schneider, President A. M. Diehl and Jack Fox of Columbia Steel Co.; Assistant Director of Public Works Justus F. Craemer; Governor Merriam, Director Kelly and Chief Engineer C. H. Purcell.

Two Important Federal Aid Routes in San Francisco Widened by State

By **JNO. H. SKEGGS,** District Engineer, District IV

THE completion of the Bay Shore Highway by the State Division of Highways from the south city boundary of San Francisco to the Santa Clara-Alviso road, near Santa Clara and San Jose, and the completion within the City and County of San Francisco of the Bay Shore Highway from the south city boundary to Army street, created heavy traffic congestion on Potrero avenue and Tenth street as arteries between the business area of San Francisco and the Peninsula points.

The former street widths of these two links were such as to congest traffic during a great portion of the daylight hours, especially peak hours and the late afternoon and early evening.

With federal funds available to finance the work out of an allotment of $600,000 to be spent within the City and County of San Francisco the roadway to Potrero avenue was widened through the setting back of curbs to provide a uniform width of 72 feet between newly constructed curbs.

TRACKAGE RECONSTRUCTED

The Municipal Railway tracks in Potrero avenue were formerly the Ocean Shore Railroad trackage and were on 15 foot centers. To provide the two traffic lanes and a parking lane on each side of the car tracks it was necessary for the Municipal Railroad to reconstruct the trackage, reducing the centers between the tracks.

The major work on Potrero avenue consisted therefore of setting back curbs; replacing sidewalks; widening the existing pavement with portland cement concrete and resurfacing the existing pavement with asphalt concrete.

The widening and resurfacing of Potrero avenue, the most important link from the Bay Shore Highway to the business district, still left the arterial incomplete to the Civic Center; therefore the work of widening Tenth street from Potrero avenue to Market street, Van Ness and the Civic Center, was also undertaken and the work consisted of setting back curbs, constructing a portland cement concrete parking strip and resurfacing the old pavement with asphalt concrete.

ARTERIALS TO BRIDGE

The Market Street Railway had previously removed their trackage on Tenth street, leaving the newly constructed street an unobstructed arterial solely for highway traffic.

It is now possible to traverse newly constructed and reconstructed highways from Market street, San Francisco, directly into San Mateo and Santa Clara counties via the Bay Shore Highway.

Basically these two highways have been included in the highway system primarily to serve as arterials leading directly to approaches to the San Francisco-Oakland Bay Bridge. Bryant street and Harrison street from Tenth to Fifth street are also included under the same appropriation for widening and resurfacing as units which will lead traffic directly to the bridge entrance in Fifth street.

WIDENED TO 72 FEET

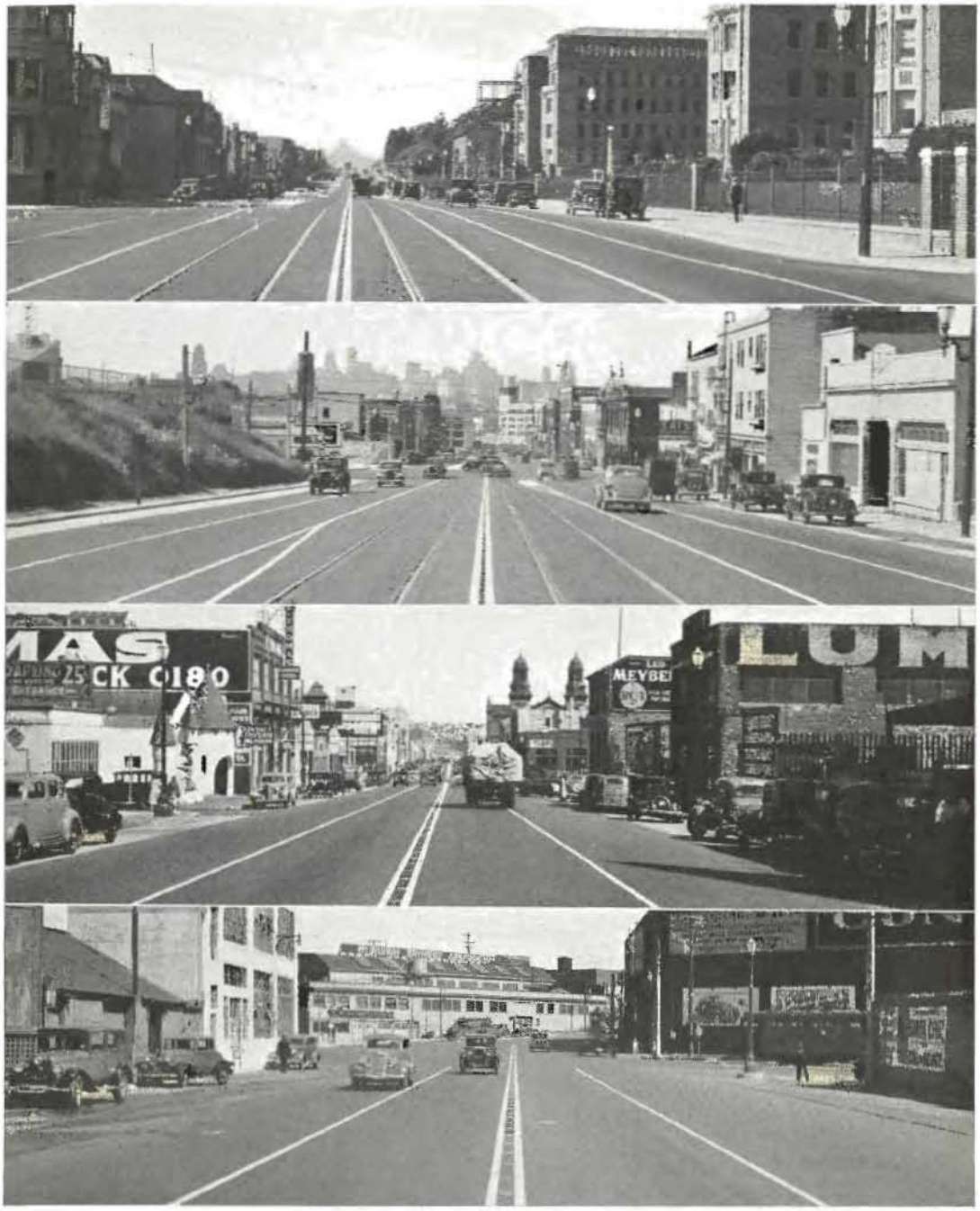
In April, 1934, a contract was awarded for widening Potrero avenue, from Division street to Army street, 0.85 mile, by placing portland cement concrete pavement strips seven feet wide and 0.6 foot thick on each side of the existing roadway, and resurfacing the remainder of pavement with asphalt concrete. Existing tracks of the Municipal Railroad being on 15-foot centers (wider than standard practice) required reducing to Municipal Railroad normal centers of approximately 11 feet.

A net distance between curbs of 72 feet was obtained, which, after allowing for parking on new concrete widening strip, leaves room for two lanes of travel on each side of railway area.

Major contract items included 1274 cubic yards of roadway excavation, 28,454 square yards of asphalt concrete surface and 4442 cubic yards of portland cement concrete removed; 4646 cubic yards of portland cement concrete pavement placed; 2133 tons of crusher run and 3142 cubic yards of ballast placed; 10,719 tons of asphalt concrete laid, and 11,817 lineal feet of granite curbs reset with 327 lineal feet of new curb placed.

Moving of trolley poles, span and feed

(Continued on page 11)



TWO CITY ARTERIALS on Federal Aid routing through San Francisco—Potrero Avenue and Tenth Street—have been rebuilt to modern traffic standards to serve as thoroughfares leading to the approaches of the San Francisco-Oakland Bay Bridge. Potrero Avenue has been widened and resurfaced to 72 feet between curbs, to provide two traffic lanes and a parking lane on each side of the car tracks. Extending the improvement to the Civic Center, Tenth Street was also widened and resurfaced. The two upper pictures show portions of the Potrero Avenue improvement looking northward from Twenty-fourth Street past the County Hospital and northward from Seventeenth Street. The improved Tenth Street, looking south from Market Street and another section looking into Potrero Avenue, are shown in the two bottom pictures.

Tunnel of Unusual Design to Carry Coast Highway Through Santa Monica

By **C. W. JONES**, Senior Bridge Engineer, Southern Office

THE urgent demand of traffic for a high standard coast highway to accommodate through travel in the highly congested metropolitan beach resort area has prompted the state to build a tunnel at Santa Monica. The construction of this tunnel will eliminate the necessity of climbing the Palisades bluff, will eliminate the crossing of main city streets and will eliminate the crossing of the railway tracks on Ocean avenue in the city of Santa Monica.

Upon the completion of the tunnel road project, through traffic proceeding south along the Coast Highway may go through the bluffs and under the intersection of Colorado street and Ocean avenue and under the tracks of the Pacific Electric Railway and then continue south on Lincoln boulevard toward San Diego. Following this state highway route, traffic will be able to avoid the congested areas in the cities of Los Angeles and Santa Monica.

After passing through the tunnel that portion of traffic which so chooses may turn onto one of several boulevards and enter the city of Los Angeles. In addition to serving through state highway travel, this new tunnel road will be a valuable arterial to the population of the southland in that it will provide a good, fast and safe road to and from the beach area, which additional road is sorely needed, especially on week ends and holidays during the summer months when the beaches and highways are crowded.

UNUSUAL IN DESIGN

The new tunnel will be 400 feet long and will be one of the widest in the state.

Physical conditions made economical design of the tunnel somewhat unusual. This unusual design together with existing interferences affects the method of construction.

In order to secure satisfactory alignment at reasonable cost it was found necessary to build the tunnel on a curve and make it cross under a portion of the Palisades Park area. Portions of the park disturbed will be replaced after the tunnel is completed.

In order to secure necessary vertical clearance without dropping the tunnel floor to such extent as would make necessary the reconstruction of a valuable sewer system, or on the other hand raising the top of the tunnel to such extent that a hump would appear in the tracks and street above, the designers were forced to work out a very flat type of construction which utilizes every available inch of space.

CONCRETE PILE FOUNDATION

While the biblical injunction to found structures on rock is sound, the designers, upon making their investigations, found that the ground upon which the tunnel had to be built was not rock and that it was not capable of safely supporting the load they proposed to place upon it. It was therefore decided to reinforce the ground by driving concrete piles into it so that the piles might act as a substitute for rock.

Traffic counts taken along the beach highway show that the road is one of the most heavily traveled highways in the state. In order to accommodate this traffic a structure 56 feet in width will be provided which will accommodate four lanes of traffic. This width will also provide room for pedestrian sidewalks on each side of the highway.

To insure that the eroding bluffs will not cave or slide down onto the highway and endanger traffic, retaining walls will be constructed at the ends of the structure.

CARRIES ENTIRE SURFACE WEIGHT

Although many tunnels are designed to support only a portion of the dirt above them, the theory being that the ground to some extent acts as a natural supporting arch, in the Santa Monica tunnel the structure has been designed to safely carry the entire weight of the earth above it. In the case of this structure the depth of earth above it will be small.

In order to secure good lighting, the tunnel floor will be white, tile walls will be used for some distance up the sides, and electric lights will be installed.

The architects were consulted on matters of esthetics and it is believed that the simple

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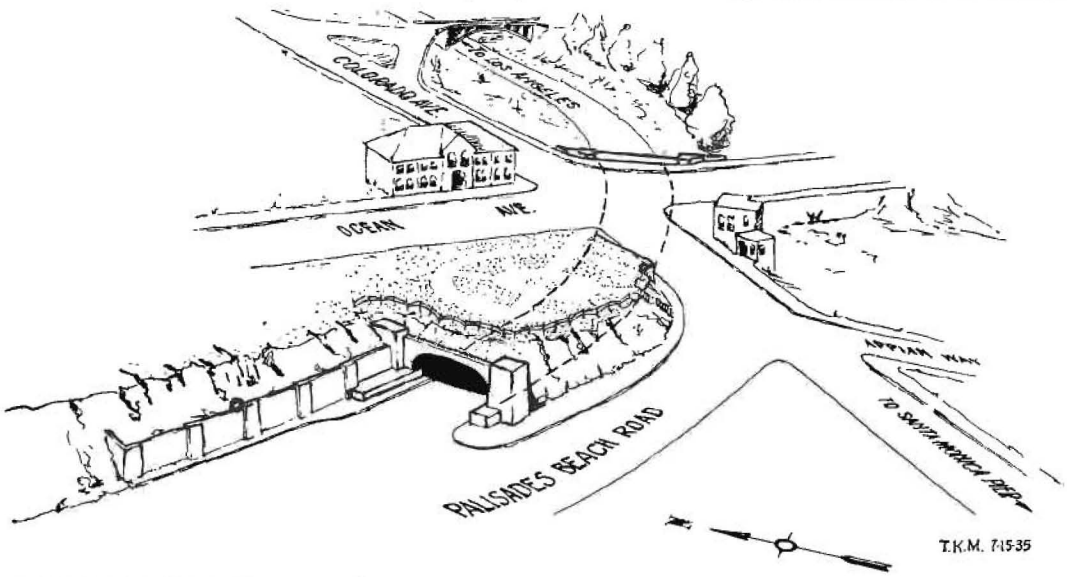
OPEN CUT CONSTRUCTION from the Beach road through Palisades Park and Ocean Avenue at Santa Monica to build tunnel for new highway. Part of old railroad tunnel shows in foreground.



SKETCH MAP showing route of tunnel from Beach Road under park and avenue in Santa Monica.

TEMPORARY TRESTLES for pedestrians and trolley cars are provided for the traffic on Ocean Avenue and to numerous beach resorts, especially heavy on weekends and holidays.

Bond Issue Building Program Will Provide 4705 Men With a Year's Work

THE voters of California will be faced with the responsibility on August 13th of providing adequate accommodations for patients in state mental hospitals and feeble-minded institutions.

The California Legislature at its last session, realizing the critical conditions in these institutions, adopted a proposed constitutional amendment providing a bond issue of $13,950,000 for this purpose without a dissenting vote. The act is known as the State Building Bond Act of 1935. The proceeds will be used for constructing buildings at state institutions, state prisons and extensions to the state buildings at Sacramento and Los Angeles.

The administration of the act is vested in the State Building Commission composed of Director Earl Lee Kelly of the Department of Public Works; Director of Finance Arlin E. Stockburger; Director of Institutions Harry Lutgens and two members to be appointed by the Governor.

WORK FOR 4705 MEN

All construction work will be under the supervision of the Department of Public Works and the Division of Architecture will prepare all plans and specifications and see that the work is carried out in accordance with the contracts as awarded by Director Earl Lee Kelly.

The projects contemplated are located in all sections of the state and will afford considerable relief for unemployment. It is estimated by the Department of Public Works that 4705 men will be employed on these projects for a year in addition to the vast amount of building materials and other services that will be required.

Funds in the Governor's budget and tentative allotment of money from the proceeds of the bond issue provide for buildings and construction at Pacific Colony near Pomona, Mendocino State Hospital at Ukiah, Agnews State Hospital near San Jose, Napa State Hospital at Napa, Patton State Hospital near San Bernardino, Camarillo State Hospital near Ventura, Norwalk State Hospital at Norwalk, Stockton State Hospital at Stockton, Sonoma State Home at Eldridge, and a new prison in southern California.

LARGE BUILDING PROGRAM

At Pacific Colony seven new ward buildings with accommodations for 560 beds are planned at a cost of $560,000 in addition to water development and additions to heating plant, school and industrial units, making a total of $765,500.

At Mendocino State Hospital a custodial unit accommodating 334 patients is contemplated, together with two ward buildings for 540 patients and other minor units which will total $595,000.

At Agnews State Hospital two ward buildings are contemplated for a capacity of 800 patients, heating plant and water system and a treatment building for 100 patients at a total cost of $870,000.

At Napa State Hospital it is proposed to build a receiving and medical unit with accommodations for 125 patients, two ward buildings with accommodations for 200 patients, and a ward group for 400 patients, with additions to the heating plant, at a cost of approximately $900,000.

RELIEF FOR STATE HOSPITALS

At Patton State Hospital ward buildings at the main institution and the farm colony are proposed, together with a receiving and medical unit and employees' quarters, at a cost of approximately $775,000.

At Camarillo State Hospital the male custodial group will be completed to accommodate 1100 patients, together with the female custodial unit to accommodate 1500 patients, a medical unit with 100 beds, together with industrial buildings, dining room, employees' quarters, farming units, heating, refrigeration, laundry and other facilities amounting to approximately $4,000,000.

At Norwalk State Hospital a new ward building and treatment unit, together with boiler piping, etc., to accommodate 220 patients at a cost of $330,000 is contemplated.

At Stockton State Hospital eight new ward buildings at the farm to accommodate 960 patients will be constructed, together with additional kitchen, dining room and other facilities, employees' quarters, heating and sewage plant and kitchen and bakery, at a cost of $1,089,000.

At Sonoma State Home proposed plans call for seven new ward buildings to accommodate 560 patients, together with a water and sewage plant, at a total cost of $575,000.

NEW PRISON IN SOUTH

In addition to this building program in state institutions the bond issue provides for an item of $5,500,000 for the purchase of a site and construction of a new prison in southern California. It is hoped to amplify this amount from federal funds, making a total of $6,000,000 available.

The population of the state's mental hos-

INSANITARY DILAPIDATED WOODEN SHACKS, known as the Dozier cottages, built in 1907 as temporary structures at Napa Hospital, still house 386 women mental patients, including tuberculosis cases.

PATIENTS SLEEP ON FLOOR in H. ward, Napa State Hospital, where overcrowding of semi-violent mental cases has reached the point where beds are laid down in hallways.

pitals is mounting day by day. As of June 30 the number of persons in these institutions was 19,437. They are crowded into buildings that were built to accommodate but 14,325.

This makes an excess population as of June 30, of 5112 or 35.69 per cent. These figures mean that the Department of Institutions has been forced to use every available bit of space in the institutions for beds. Wards that were built to accommodate 30 patients have in many instances more than double that number. Basements have been converted into wards as well as attics. Day rooms built for patients' recreational centers are being utilized for sleeping quarters and temporary beds are placed in the corridors at night.

The result of this overcrowding and makeshift bed arrangement has an extremely detrimental effect upon the improvement or recovery of the patient. In addition the sanitary conditions are not conducive to the patients' health and the additional burden placed upon

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Increased Hospital Facilities Needed for Past 5 Years

(Continued from page 9)

the personnel of the institutions results in greatly reduced efficiency.

The population of California's mental hospitals has been increasing at the rate of one thousand persons a year during the past five years. During that time no new buildings have been put into occupancy for patients and that is the cause of the situation which now confronts the people of this state.

While the average of mental patients per 100,000 population in California is slightly in excess of that throughout the United States that is not the reason for our great increase in mental hospital population. The increase is in direct ratio to the influx of new residents and increased population of the state.

Therefore, as our state grows, the financial responsibility in caring for the state's wards grows.

Governor Frank F. Merriam and members of both houses of the legislature realize the critical situation which confronts the state in the care of its mental patients and inmates of state prisons and it is through their efforts that this issue is being presented directly to the people.

The adoption of this building program will enable the state to participate in the Federal works program so that the amount provided may be increased materially by Federal funds.

The Division of Architecture of the Department of Public Works, has estimated that the building involved will require a total of 9,410,000 man-hours of direct and indirect labor which would be equal to the steady employment for one year of 4705 men.

The following table shows the location, cost and man-hours of labor required for each project:

Location	Allocated amount	Direct Const. man-hours	Indirect shop-etc. man-hours	Total man-hours
Patton State Hospital	$395,000	178,000	98,000	276,000
Stockton State Hospital	40,000	18,000	10,000	28,000
Camarillo State Hospital	3,879,000	1,745,000	970,000	2,715,000
Norwalk State Hospital	200,000	90,000	50,000	140,000
Mendocino State Hospital	595,000	268,000	148,000	416,000
Agnews State Hospital	1,140,000	513,000	285,000	798,000
Napa State Hospital	910,500	410,000	227,000	637,000
Sonoma State Home	575,000	258,000	143,000	401,000
Pacific Colony	765,500	344,000	191,000	535,000
New Prison, So. Calif.	3,500,000*	1,350,000	750,000	2,100,000
Capitol Ext., Sacramento	950,000	427,000	237,000	664,000
Office Bldg., Los Angeles	1,000,000	450,000	250,000	700,000
Totals	$13,950,000	6,051,000	3,359,000	9,410,000

Estimated total man-hours—9,410,000.

* $500,000 allocated for site.

Santa Monica Tunnel Being Constructed by Open Cut Method

(Continued from page 6)

treatment at the tunnel portals will be pleasing in appearance.

OPEN CUT METHOD

Although the usual practice in the construction of tunnels is to burrow through the hill, in the case of this tunnel it was found cheaper to make an open cut and build the barrel as a culvert and then replace the dirt, park and streets above. A portion of the street will be almost flush with the crown of the tunnel arch.

The Pacific Electric tracks cross over the tunnel. It was found that railway service could not well be interrupted. A temporary trestle was therefore constructed to carry the rail traffic over the construction and the tunnel will be built beneath the tracks. When the trestle is finally removed, concrete will be used to plug the holes in the barrel in places previously occupied by trestle underpinning.

In connection with the building of the tunnel it has been necessary to shift or alter numerous interfering pole and pipe lines, reconstruct the street drainage system, provide accommodation across the closed streets for the crowds of pedestrians proceeding to and from the beach and also safeguard existing buildings. It was found desirable to remove an existing arch bridge adjacent to the work and backfill the area with tunnel excavation.

The plans for the project were prepared by the Division of Highways and approved by the U. S. Bureau of Public Roads since federal aid is being employed to help defray the cost. The city of Santa Monica, making use of its own funds and labor furnished by the Federal government, is cooperating in part of the street improvement and the park work.

As in the case of all state highway contracts, a resident engineer employed by the state is continuously on the job during construction to insure that the structure is built strictly in accordance with contract plans and specifications.

This $200,000 project is progressing on schedule and it is expected that the work will be completed and traffic will be enjoying the use of the new tunnel road shortly after Christmas.

Two Federal Aid Arterials Widened in San Francisco

(Continued from page 4)

wires and risers, and new and adjusted manholes, catch basins and many other minor items were included in the contract.

The contract was carried on at the same time that a number of other city and private contracts were under way on the street, these contracts covering placing of tracks, new high and low pressure water mains, a gas line and power and telephone lines.

Total cost of the contract was $145,352.

Fell street, from Van Ness avenue to Market street, and Tenth street, from Market street to Division street, a total of 0.9 mile, were widened five feet on each side, with portland cement concrete, and the remainder of the roadway resurfaced with asphalt concrete. Net widths of 48 feet 9 inches and 60 feet respectively were obtained.

Contract for this portion was et in May, 1934. Major contract items included 5146 tons of crusher run base, 5728 tons of asphalt concrete, 1184 cubic yards of portland cement concrete pavement, 7346 lineal feet of granite curbs being reset, and 616 feet of new curb placed. The approximate cost was $71,000.

These two projects, as completed, are splendid examples of wide highways in cities; and, with the comprehensive system of traffic stripes and markers as placed (a broad, double stripe in the center), safely and easily guide traffic to the south of Market business area, with the terminus adjacent to the Civic Center, allowing of diffusion of traffic to north of Market business area and the various residence districts.

The construction of these two projects completes the Bay Shore Highway system connection to San Francisco, and the projects now under way, namely, Bryant and Harrison streets, Fifth street to Tenth street, Fifth street from Bryant street to Harrison street, and the San Francisco approach, Fifth street to the San Francisco-Oakland Bay Bridge, will provide broad and easy connection to the bridge and East Bay cities.

Don't feel flattered when people call you a good egg. A good egg is the kind you can use.

"My wife has been nursing a grouch all the week."

"Been laid up, have you?"—*Christian Science Monitor.*

QUIT YOUR GROUCHIN'

BY FRANK M. COLVILLE

Assistant Editor, Right of Way

Cut out the grumblin' an' cussin',
An give your old jaw bones a rest,
Maybe the fellow you're naggin'
Is doin' his dead level best;
And you hain't a goin' to help him
By proddin', or askin' him why
He wasn't workin' lots faster?
Just 'cause you're standin' near by.

There's danger in too much complainin'
And sometimes things go all to smash,
Just' cause the big guy, that's a bossin',
Gets up in the air and acts rash;
For the fellow that's doin' the diggin'
Likes a boost, or occasional smile,
And better results will sure follow
If you jolly him once in a while.

There's nothin' to gain by fault-findin',
An' sometimes it sure comes to pass,
That you'll find some conspicuous blunders
If you look at yourself in the glass.
If you try to be pleasant an' human,
Folks are apt to be decent to you;
If you're kindly, an' white, an' obligin',
You'll find others honest and true.

So cut out the rough stuff, quit ballin',
Get your face limbered up for a smile,
Spill out great gobs of contentment,
Go light on the wormwood an' bile;
Don't act like a savage, or cave-man,
In his sort of half-civilized day.
It costs to be ugly and grouchy,
It pays to be cheerful an' gay.

District Engineer Wallace Wins Praise

District Engineer E. E. Wallace, of District XI, Division of Highways, with headquarters in San Diego, has won the commendation of State Highway Engineer C. H. Purcell for his "initiative and success in securing the passage of parallel parking ordinances in towns on the Coast Highway (State Route No. 2) between the Orange County line and the city limits of San Diego."

Anticipating a greatly increased traffic over the highways in his district, on account of the San Diego Exposition, Mr. Wallace sought the cooperation of the City Council of Oceanside and the San Diego County supervisors and succeeded in having parallel parking established in all towns, both incorporated and unincorporated, on over 70 miles of the heavily traveled Coast Route.

The original knee-action vehicle was the bicycle.

Eight Contracts Completed on State Street Project in Long Beach Area

By **JULIEN D. ROUSSEL,** Secretary, California Highway Commission

CONSTRUCTION of the State street project, as the new section of the Coast Highway in Los Angeles County between Redondo Beach and the east city limits of Long Beach is known, has progressed so satisfactorily that at present there are only two comparatively short sections of this highly important arterial highway which are not either completed or under contract by the State Division of Highways.

With construction started only a year and a half ago, remarkable progress is being made on one of the most complex highway problems in the entire state. Its consummation will add another great link to the already long chain of improvements on the Coast Highway (State Sign Route No. 3), extending from Oxnard on the north along a large portion of the coast line of Ventura, Los Angeles and Orange counties to San Juan Capistrano, and involving expenditure by the state of several millions of dollars.

CONGESTED AREAS BY-PASSED

The importance of this project to the motoring public can hardly be exaggerated since it will provide an arterial by-pass for through traffic around the built-up traffic congested beach areas of Wilmington and Long Beach in place of the series of narrow county roads and city streets over which traffic has been routed.

Built to meet the latest standards of alignment and grade, in general, the pavement will be 40 feet wide providing four lanes of traffic with curbs 74 to 76 feet apart, so that as traffic continues to increase the pavement can be readily widened to the full width between curbs to provide six traffic lanes and two parking strips 7 to 8 feet wide adjacent to the curbs.

The State street project fills a definite gap in the Coast Highway, connecting at Redondo Beach with a series of highway units recently completed through Redondo Beach, Manhattan Beach, Hermosa Beach, El Segundo, and entering Santa Monica via Lincoln boulevard.

With the completion of projects now under contract or shortly to be let to contract in Santa Monica and along the Los Angeles and Ventura County coast northwest of Santa Monica, the route will be adequately improved for present day traffic from Wilmington to Oxnard.

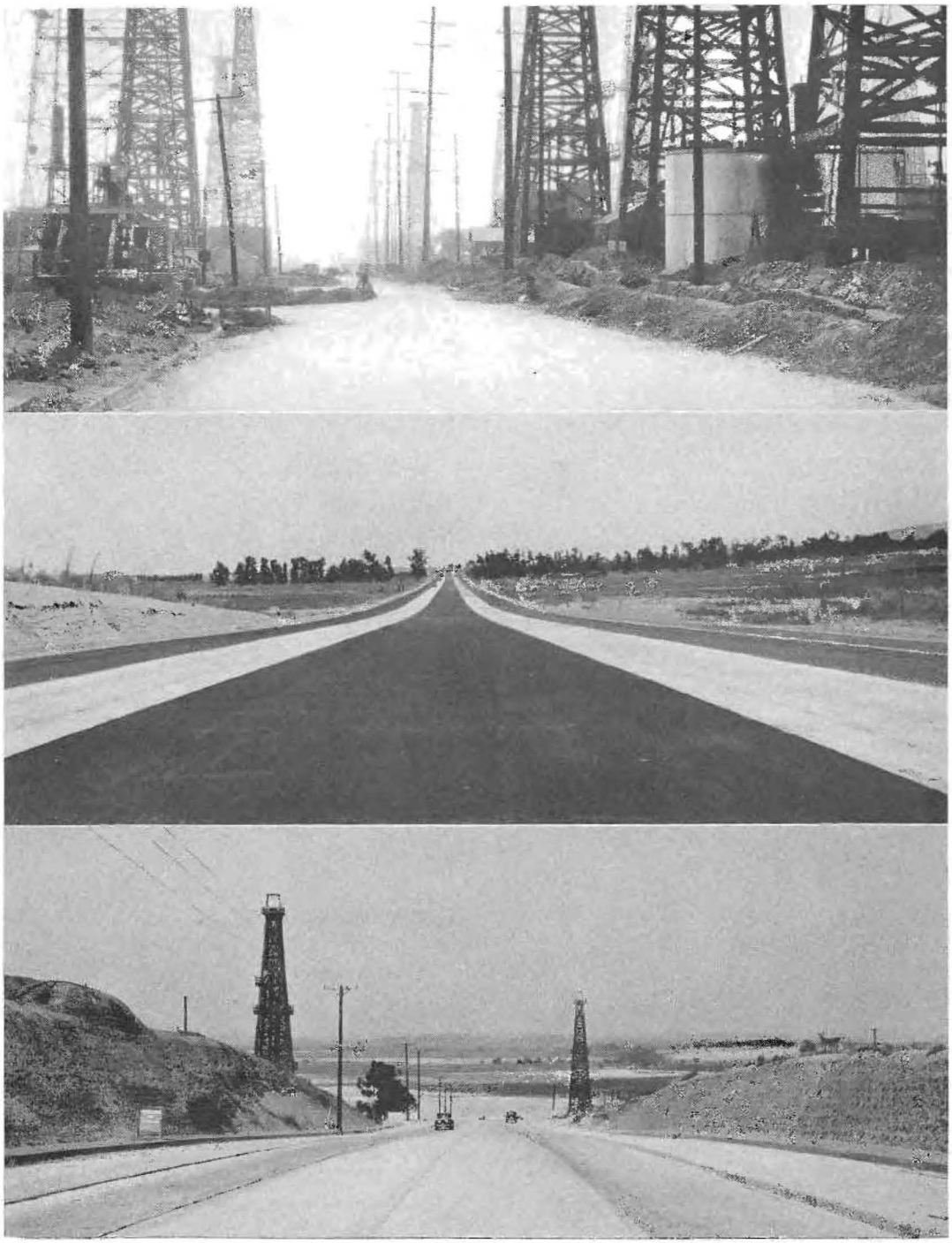
JULIEN D. ROUSSEL

CLOSES COAST GAP

At Long Beach, State street connects with the northwesterly end of the Hathaway avenue unit of the Coast Highway constructed about two years ago which extends to Seal Beach. Thus, with the completion of the State street project, a continuous, modern highway will extend along the coast from Oxnard to San Juan Capistrano.

The first contract to be awarded was from the east city limits of Los Angeles to Pacific avenue in January, 1934, a length of 1.8 miles. Following this, in rapid succession contracts were let from east city limits of Los Angeles to Alameda street (0.79 miles); from Wilmington to Redondo Beach (4.96 miles); from west city limits of Los Angeles to Wilmington boulevard (1.96 miles; from Pacific avenue to Olive avenue in Long Beach (0.50

(Continued on page 14)



STATE STREET PROJECT extending between Redondo and Long Beach involved setting back power and oil lines to increase road width particularly through the Signal Hill oil district, where the roadway was narrow as shown in top picture. Below is a section of the new highway between Wilmington and Redondo—two 10-foot strips of concrete separated by a 20-foot strip of asphaltic concrete. Bottom picture shows a completed portion in the Signal Hill area widened to provide a six-lane arterial.

Flood Problem on State Street Unit

(Continued from page 12)

miles); and from Stanley avenue to Loma avenue in Long Beach (0.71 miles), covering a total of 11.30 miles.

Nigger Slough bridge, a vehicular tunnel and some smaller structures have been built under a separate contract.

Pavement on these contracts has been constructed 40 feet wide or more throughout with wide oiled shoulders. Curbs were placed in general throughout the projects either 74 feet or 76 feet apart so that the entire width can be used as a traveled way.

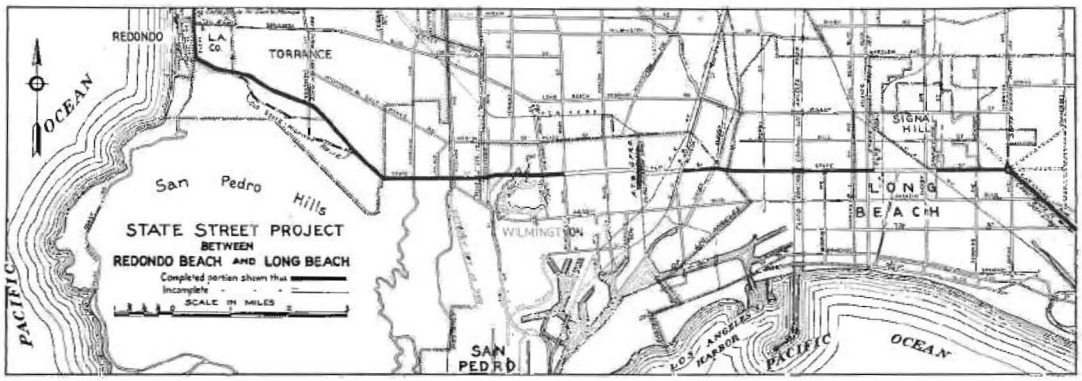
Between Redondo Beach and west city limits of Los Angeles the alignment has been greatly improved, effecting a half-mile saving in distance over the old county road which followed streets previously dedicated to highway purposes through subdivisions. On the portion from west city limits of Los Angeles to Wilmington boulevard, the new highway crosses Bixby Slough, which involved a difficult construction problem of compacting the fill across this marshy formation and also the problem of protecting the fill slopes from erosion by the water in this slough. Embankments were protected by the planting of willow trees to check erosion by the waves.

TWO INCOMPLETED SECTIONS

Both of these contracts were completed during June and the last of the series of contracts (the section from Stanley avenue to Loma avenue in Long Beach) which has been awarded should be completed by September 1st, leaving only two uncompleted sections on the project.

From Olive avenue to Stanley avenue in Long Beach, one of the uncompleted sections, the existing street is narrow, being only 36 feet between curbs. A portion of this 1.25 mile section is subject to inundation during extremely heavy rains. The Los Angeles County Flood Control District and the city of Long Beach engineering department are now engaged in preparing plans for properly draining this portion of the city, and it is anticipated that construction of storm drains for this area will begin in the very near future.

Storm water control for this area is estimated to cost over $600,000. The State Highway Commission has voted $100,000 toward the drainage of the state highway through this low area and will cooperate with the city and the flood control district up to this amount when it is definitely determined that a plan has been worked out which will free the State highway from danger of inundation.



The widening and improvement of this section of highway in the city of Long Beach should be postponed until storm water hazards are adequately provided for.

GRADE SEPARATION NECESSARY

The other section not yet under contract is the two mile length from Wilmington boulevard to Alameda street. Difficult right of way problems as well as the necessity of constructing a grade separation across the Atchison, Topeka and Santa Fe freight classification yard have delayed this construction.

(Continued on page 29)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

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

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

Vol. 13 JULY, 1935 No. 7

IMPORTANCE OF SEEING

The need for seeing on the highway has not been given due consideration in the past when regarding the developments and facilities for highway travel. Whether by day or night, seeing, in order to provide safety, must be done quickly and with certainty. Time intervals of less than one second duration may mean the difference between "life or death." The past decade has seen the birth of a new science—the Science of Seeing—which is now affording a new approach to highway safety. We now are able to obtain a new conception of visibility, which shows a definite need for greater factors of safety. Today, we realize that the eye is but a tool to be combined with light and lighting; that the human being as a seeing machine has certain definite limitations which, when not taken into account, materially increase the toll of traffic accidents.

In the past, the engineer has interpreted vision and visibility in the customary manner but now we realize that the word "SEEING" is the total act of recognizing objects. It involves the so-called visibility of the object and the capability and sense capacity of the human seeing machine. This yields a new conception of visibility because this must deal with more than the physical characteristics of the object and its background, such as size, color and brightness. Visibility of an object must also include the ability of the human seeing machine, which in turn involves obvious factors, such as eyes and time and less obvious ones, such as distractions, available sense, capacity, bodily, neural and mental states."—*Arnold H. Vey, New Jersey State Traffic Engineer in American Highways.*

Impressions of an Office Man After 5 Days in the Field

THE following expurgated excerpts from a letter addressed to a friend in the central office are the impressions of an office man after five days work in the field on construction:

Dear Garry:

Well, here we are, safely hidden away in the quiet little town of Madusa. Everybody is happy, sunburned and hot as hell.

Son, before you decide to go in the field ask yourself these quesions:

1. When A. C. leaves the plant at 350° F. on a day when the temperature is 105° F. in the shade, what are you going to feel like after bumping it with a five-foot straightedge until 7 p.m.?

2. When the gosh dinged weigher is pulling the batch weights short and you stand on the platform to watch the indicator with Erhlenite boiling out of the elevator in a dense fog, what does that make you? (Note to Pete: The dust mask is out on this job, you might as well show up with a pansy in your lapel.)

BUMPED BY PENCIL

Think those over and while so doing pass these words along:

Tell Ed Waite that when this district comes in with their next request for an "S" work order not to whittle it down, but remember their overhead has increased, I'm here now.

Do you suppose that you could reason with Cush to buy something besides this blasted No. 737 yellow crayon pencil that breaks every time you go to mark A. C., and bends your finger nails back on your knuckles? The street is just one chorus of yowls when the boys are marking bumps. If he wants names, places and dates I'll be only too happy to supply them.

Note to Sal: Thanks for the going away shower. I haven't gnawed the big plug yet but am bearing in mind that men who chew are men who do.

AN ECONOMY SUGGESTION

Note to Bill: Why waste tracing cloth on plans? All you need is a title sheet and a resident engineer.

Note to Cush: How about that gosh danged No. 737 yellow crayon?

To Joe: Only five days and what a different slant on specs.

To Rod: What I couldn't tell you about pay rolls!

I would like to write to everyone, but this must do for separate greetings.

I have no complaints at all exceept that damned No. 737 yellow crayon.

Panama is to spend approximately $1,000,000 on the construction of highways during 1935 and 1936.

Parent, concluding the recital of his exploits: "And that, my boy, is what I did in the Great War."

Son: "But, Daddy, why did they want so many other men besides you?"—*Montreal Star.*

State Built 100 Bridges in Biennium Contributing Over 4500 Man-years' Work

By **F. W. PANHORST**, Acting Bridge Engineer

MOTORISTS traversing modern highways comfortably settled in deep cushioned seats, controlling almost without effort the power of a hundred horses in guiding the courses of their one to two ton vehicles, give but little thought as a rule to the construction features of roadways and structures over which they pass. Attention is on their own paths—pavement lanes bounded on the left by a glistening white traffic stripe and on the right by a smooth shoulder and a blur of shrubs, fences, trees and telephone poles.

With nearly a mile of roadway to be scanned each minute, between eighty and ninety feet per second, there is naturally little opportunity for, or interest in, appraising the character or safety of the bridges and trestles on the way.

The roadway may be elevated to afford free rapid passage over busy railroad yards, or may round a shoulder of a mountain side to cross at one hundred or two hundred feet above a rocky canyon, but as long as the road is reasonably smooth and wide and the curves not too sharp, the motorist will likely have little conception of the structures on the route. A $100 or $500,000 bridge is only a flash of gray-white railing.

F. W. PANHORST

WORK OF BRAIN, BRAWN, MILLS

To perhaps one of every thousand passing by, the high curved ribs and tall columns of a concrete arch or the long slender trusses of a steel bridge signify something more than a link between solid earth on two hillsides. To the thousandth man they are perhaps somewhat of a monument to the efforts of the designers who have spent hours over drafting tables, a pencil in one hand and a slide-rule in the other; of the laborers who have spent hours clearing, mucking, blasting, picking, shovelling their way down to solid foundations; of cement mills and rock plants grinding out tons of concrete materials.

He visions steel mills thousands of miles away shaping the steel; ships loading at east coast ports and unloading at fabricating plants for the cutting, punching, fitting and riveting; long truck hauls, partly over narrow mountain roads; then highlines picking heavy girders and trusses and easing them gently into place; surefooted steel workers fitting, bolting and riveting—all before placing the concrete deck and rail which to the average traveler, if noticed at all, is the bridge.

PROGRESSIVE POLICY FOLLOWED

Economical bridge building requires a very considerable preliminary work in the way of foundation investigation, study in the matter of type selection and more work and study in the design of adequate members in order that the structures may be pleasing in appearance and practical in construction.

In so far as feasible, standards have been developed to reduce design costs and to secure uniformity in appearance. However, with new developments in materials available and improvements in fabrication continual changes are necessary to take full advantage of changing conditions. The policy of the bridge department has been one of conservative and progressive improvement rather than

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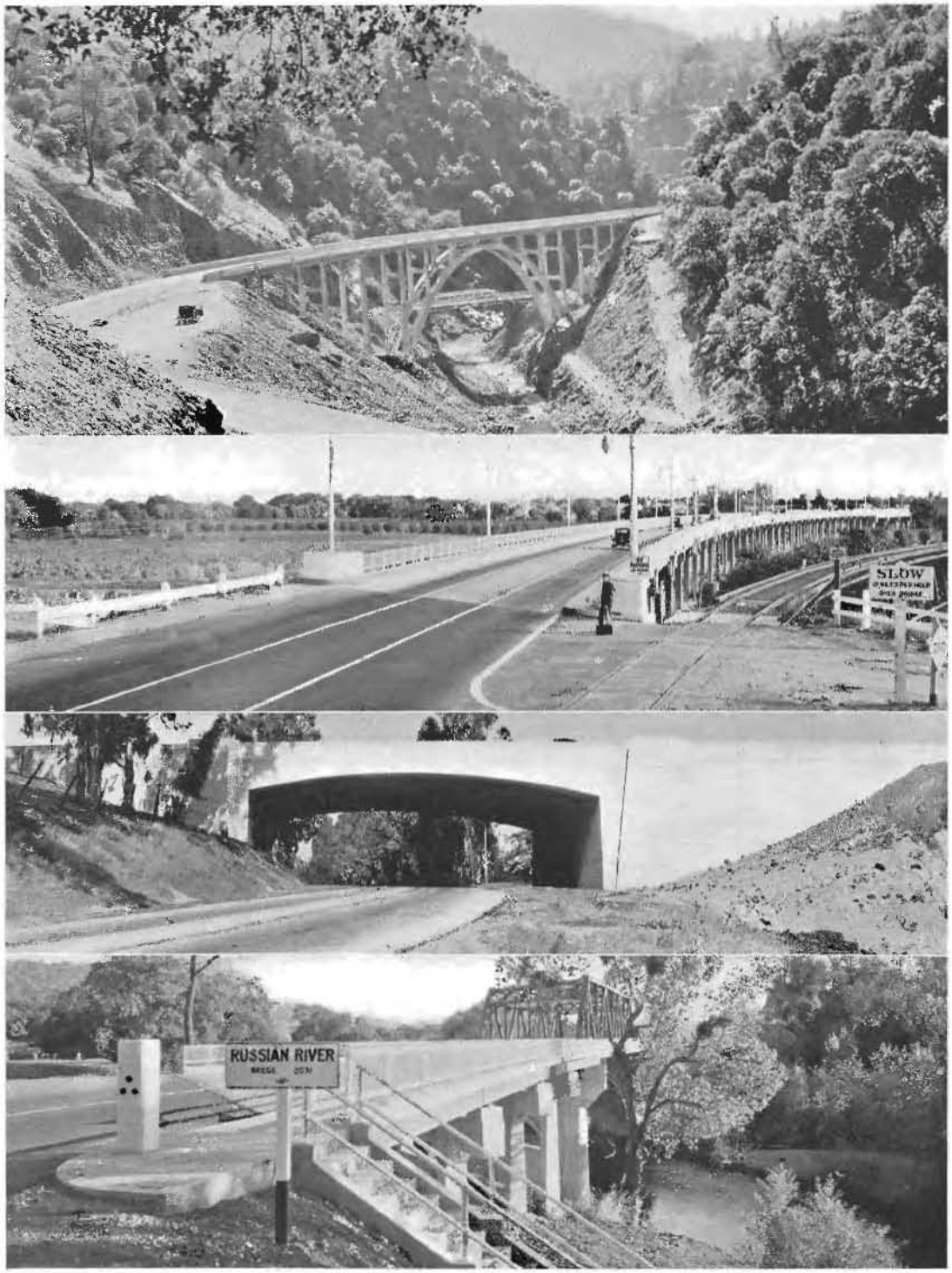


SOME BRIDGES BUILT IN BIENNIUM—At top, 500-foot bridge with 150-foot concrete arch across west branch of Feather River on State Highway 21. Below, 2050-foot steel girder and concrete bridge across Tuolumne River on Golden State Highway near Modesto, and the Monterey Pass Overhead, a concrete rigid frame structure on State Route 26. At bottom, a 150-foot steel truss structure across the Russian River on the Redwood Highway near Preston in Sonoma County.

Bridges in Biennium Total $5,000,000

(Continued from page 16)

stagnant standardization in organization methods or design and construction practice.

During the last two years the department has designed and built about one hundred structures of various types varying from small timber bridges to large steel and concrete bridges and varying from $10,000 to nearly $1,000,000 in cost.

Accompanying pictures illustrate several types of construction. The underpass at Goshen Junction, about forty miles south of Fresno, is typical of a number of undercrossings with railroads. Mt. Vernon Avenue overhead crossing, costing about $250,000, is one of the larger structures built to carry highway traffic over railroads. A less expensive type of overhead was used for the lighter traffic on Route 20 in Redding, shown as the Eureka way overhead.

ECONOMY IN DESIGNS

The concrete arch bridge across the west branch of the Feather River was selected to fit in well with the surroundings. Likewise, the structure built to separate the grades of Monterey Pass road and the new Los Angeles-San Bernardino, Route 26, was chosen to harmonize with the locality. The latter is one of several rigid frame concrete bridges developed for economy in clearance and to provide a pleasing appearance.

Dolan Creek Bridge, a three hinged timber arch, has been described in previous articles. In this bridge, as in a number of others, toothed and split ring connectors have been used to develop the full strength of the timber and effect economy in amount of lumber required.

The south fork of the Eel River Bridge at Smith Point is typical of a number of continuous steel girder bridges. This bridge was given honorable mention by the judges in the annual contest of the American Institute of Steel Construction for the most beautiful steel bridge built during the year. The Sacramento River Bridge at Redding and the Oil Junction overhead crossing at Bakersfield are of similar design.

EXTENSIVE INSPECTION SERVICE

The M Street Bridge at the west entrance to Sacramento, also more fully described in earlier articles, is the largest single project on the bridge department program for the last two years. It is expected that traffic will be able to use the bridge in October.

In addition to new construction, an important phase of the department's work is the frequent inspection of the 3500 bridges on the state highway system. Repairs and minor improvements run upwards of a quarter million dollars every year.

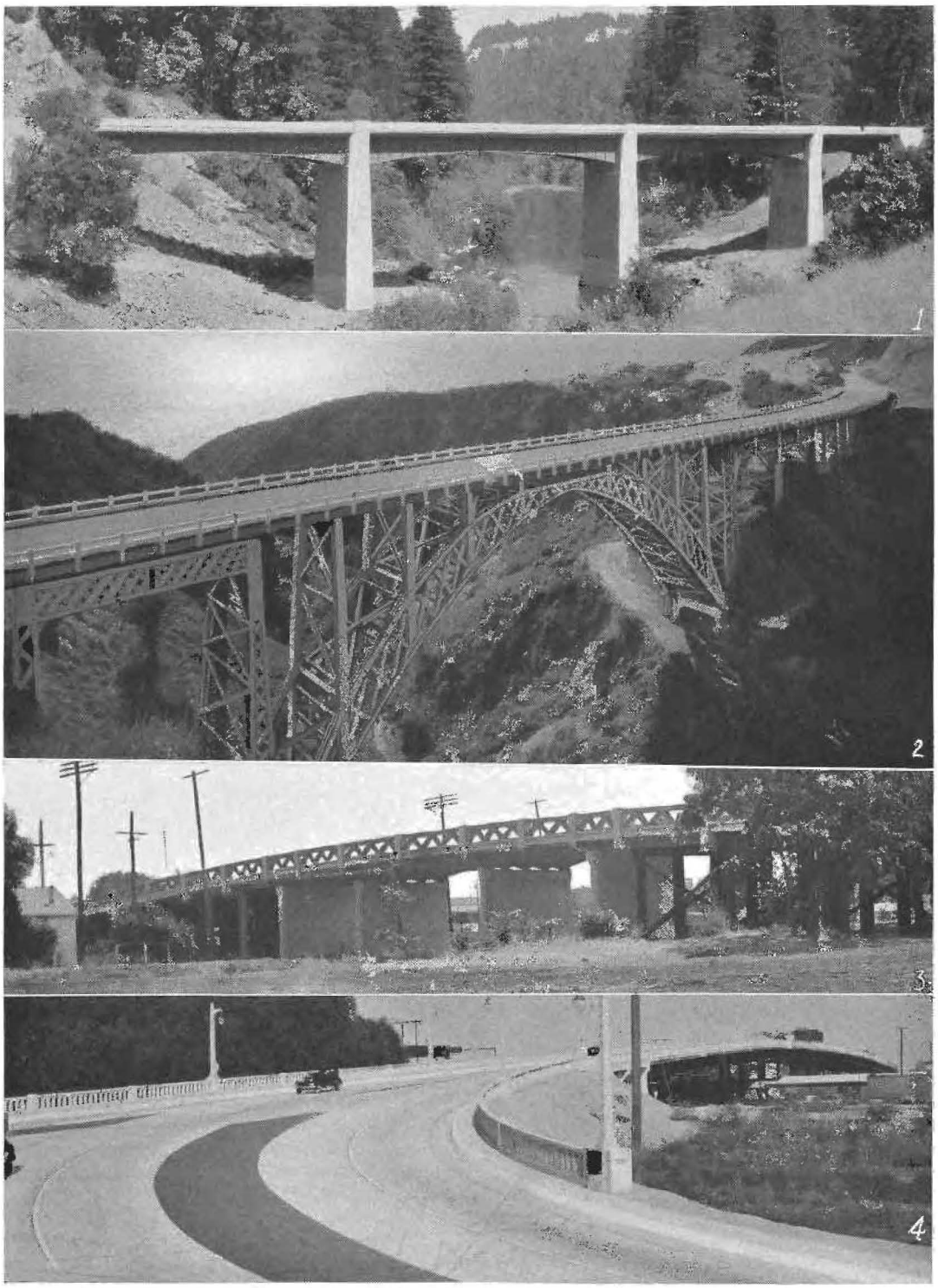
The bridges mentioned and pictured are only a very few typical cases of the hundred or more built during the last two years at a total cost of about $5,000,000. With the expenditure of this money, the motorists have been provided with a number of substantial bridges over streams, the hazards have been reduced by grade separations, direct employment on the jobs has given to local labor over $1,500,000 or about 1500 man-years of work, and labor in shops and mills has benefited to the extent of 3000 man-years of work and over $3,000,000.

Autoists Seek End of Federal Gas Tax

Passed by Congress in 1932 as a temporary measure for one year only but twice extended, the Federal gasoline tax of one cent per gallon reached its latest expiration date, June 30. Nationwide efforts against any further extension of the tax are in progress, according to a statement by the Automobile Club of Southern California. The motorists' organization is urging members of the California delegation in Congress to lend their support to the movement for abolition of the tax.

That the Federal tax was intended only as a temporary measure is declared by the club to be substantiated by the fact that it was adopted reluctantly in the face of widespread opposition and for only one year, whereas all other taxes imposed under the Revenue Act were for two years. The statement also emphasizes that the Federal gasoline tax is the only universal duplicating tax in existence, all the states having imposed a gasoline tax long before the Federal government entered the field.

Diner: "I see that tips are forbidden here."
Waiter: "So was apples in Eden."



SOME STATE BRIDGES BUILT IN LAST BIENNIUM. No. 1. Prize winning Eel River bridge at Smith Point on Redwood Highway. No. 2. Dolan Creek Timber Arch structure on Carmel-San Simeon Highway. No. 3. Eureka Way overhead in Redding. No. 4. Vernon Avenue overhead in San Bernardino.

Indio Cutoff Recently Opened to Public Avoids Dangers of Box Canyon

By **W. L. McFADDEN,** Resident Engineer.

THE new highway known as the Indio Cutoff road in Riverside County was opened to public traffic last month.

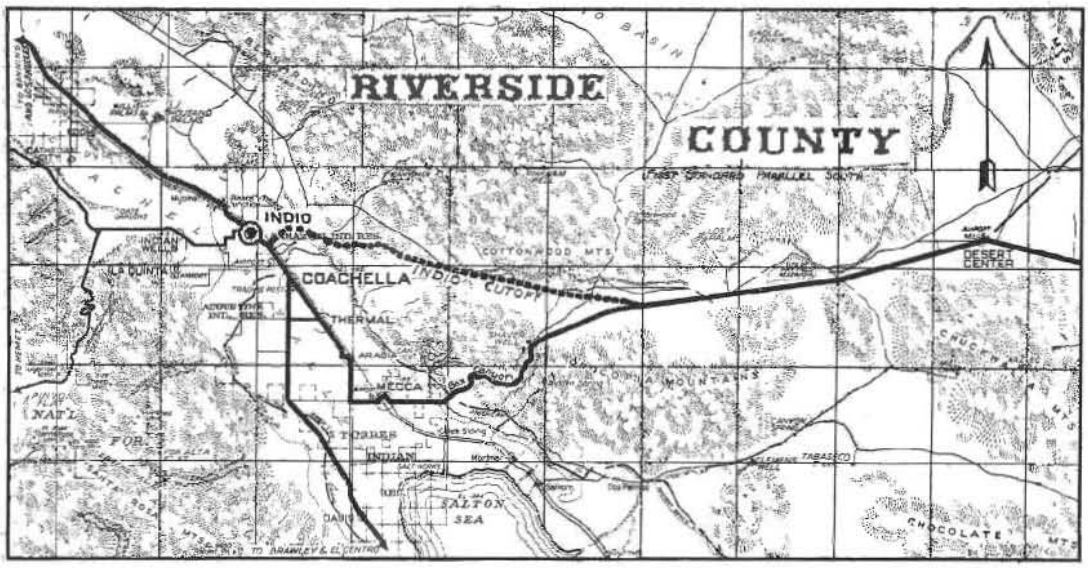
This cutoff will be used by transcontinental and interstate travel between the Colorado River near Blythe and Indio where it connects with U. S. Highway No. 99, leading thence on to the Los Angeles area.

The tourists who use the highway and the local residents will welcome the completion of the new section. The old route through Box Canyon, on which it was necessary to travel prior to the completion of the new highway, traverses a country much eroded by the action of cloudbursts and wind storms, and while the road through Box Canyon has been improved by oiling of the surface, it is still subject to cloudburst action and extremely hazardous during the season of the year in which these storms occur.

The new road is 24.3 miles in length and represents a saving of 9 miles in travel over the old route. There are 18 curves in the new routing with a minimum radius of 1600 feet. In elevation the road rises from 47 feet below sea level near Indio to 1688 feet above at the summit. The maximum grade is 6.3 per cent for a short distance only.

Drainage conditions are taken care of by the use of 15 timber bridges varying from 19 feet to 266 feet in length. The total cost of the project will amount to approximately $482,000.

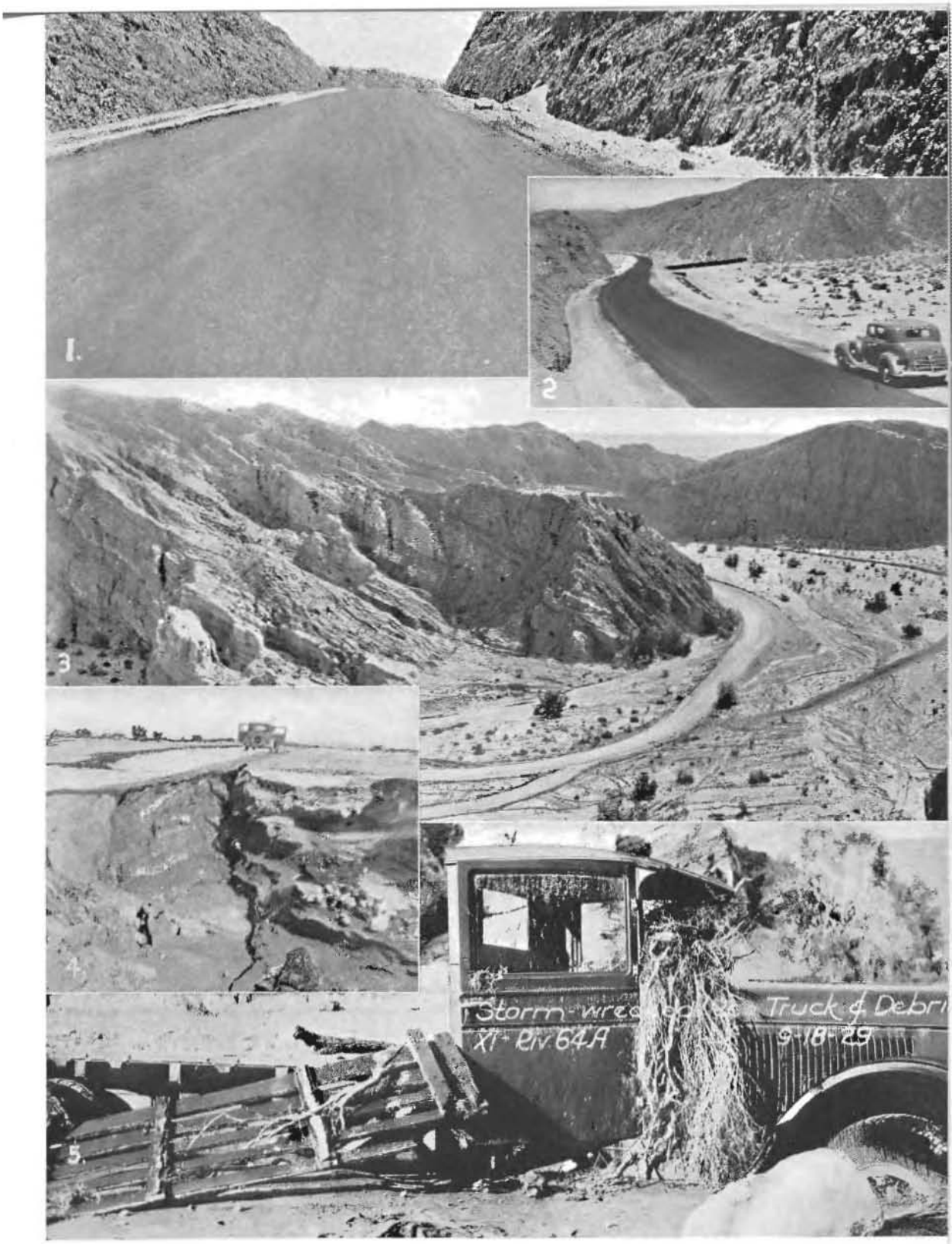
The project has given employment to approximately 100 men on an average for the period of construction which has been from May 14, 1934, to June 15, 1935. The actual date for completion of this road was set for November 7, 1935, but the contractor so scheduled his work that the job has been finished five months ahead of the completion date.



NEW EQUIPMENT DEVELOPED

Work on this project has developed some new equipment for use in desert road construction.

Another state highway project to the east which connects the Indio Cutoff road with the completed highway at Shavers Summit will be finished early in the summer and will mark the completion of the whole route between Blythe and Indio to modern standards.



INDIO CUTOFF COMPLETED and opened to traffic removes U. S. 60 on State Route 64 from the storm damage and hazards of travel on old Box Canyon route. Nos. 1 and 2 show sections of the new cutoff. No. 3. Old winding road between precipitous rock walls in bottom of Box Canyon. No. 4. Example of storm damage on old route. No. 5. Truck caught and wrecked in Box Canyon flood.

New Machine Developed for Striping 7500 Miles of Highway Traffic Lanes

By **W. A. SMITH**, Assistant Maintenance Engineer

BIDS having been secured and awards made by the Bureau of Purchases for the materials required it is proposed to have the traffic striping program for the state highways under way by August 15 in order that this safety feature may be renewed for the protection and guidance of traffic particularly during the wet and foggy season.

There is, perhaps, no other single item of highway safety work which receives the favorable comment accorded the traffic stripe. Those whose business requires that they travel the highways at all hours and seasons would frequently find themselves in difficulties except for this white guide line.

From a small beginning in the fall of 1926 —when one single striping machine was sent out to cover the state-wide program—this phase of maintenance work has expanded until at the present time each of the eleven highway districts is equipped with a modern outfit and the Los Angeles and San Francisco crews are operatqing practically continuously. Some 5000 miles of the highways are now striped with a total of 7500 stripe miles.

NOT A SIMPLE MATTER

The placing of the stripe would appear to be a simple mechanical matter, but on the contrary a considerable amount of study and experiment have been required to develop satisfactory material, equipment and methods to secure a true, uniform, enduring, and economical stripe.

The cost of the lacquer is a very considerable item, and since the service to which this material is subjected is severe, it follows that a nice balance must be maintained in the formula to insure a reasonable service life at a minimum cost. The preparation of specifications for the lacquer now used was developed by the materials and research laboratory of the Division of Highways following considerable experiment and testing.

The work requires that the lacquer dry without tracking within fifteen to thirty minutes. It must give a satisfactory coverage, resist discoloration when placed on an asphaltic surface, flow readily through the spray machine, adhere strongly to the surfaces on which applied, and endure extremes of weather as well as the abrasion of traffic.

The inspection of the raw materials used, as well as all processes of manufacture, is under the supervision of a representative of the Materials and Research Engineer. During the past two years an unusually uniform and satisfactory material has been thus insured.

The first machine assigned to the work consisted of a paint tank and small compressor mounted on a small carriage. It was hand propelled. The paint tank held about eight gallons and the delays incident to mixing the lacquer and filling the machine were so great that only from three to five miles of stripe could be placed in a day.

PAINT CAPACITY INCREASED

As shown by the accompanying photographs, the new equipment as developed by the Equipment Department of the Division of Highways is a great improvement over the old. The paint tank and compressor have been removed from the spray machine proper and placed in the body of the truck tender. Ample air and paint capacity have been provided. Large wheels have been placed on the spray unit; the wheelbase lengthened; and an easily controlled pointer or guide provided to insure a true, uniform line.

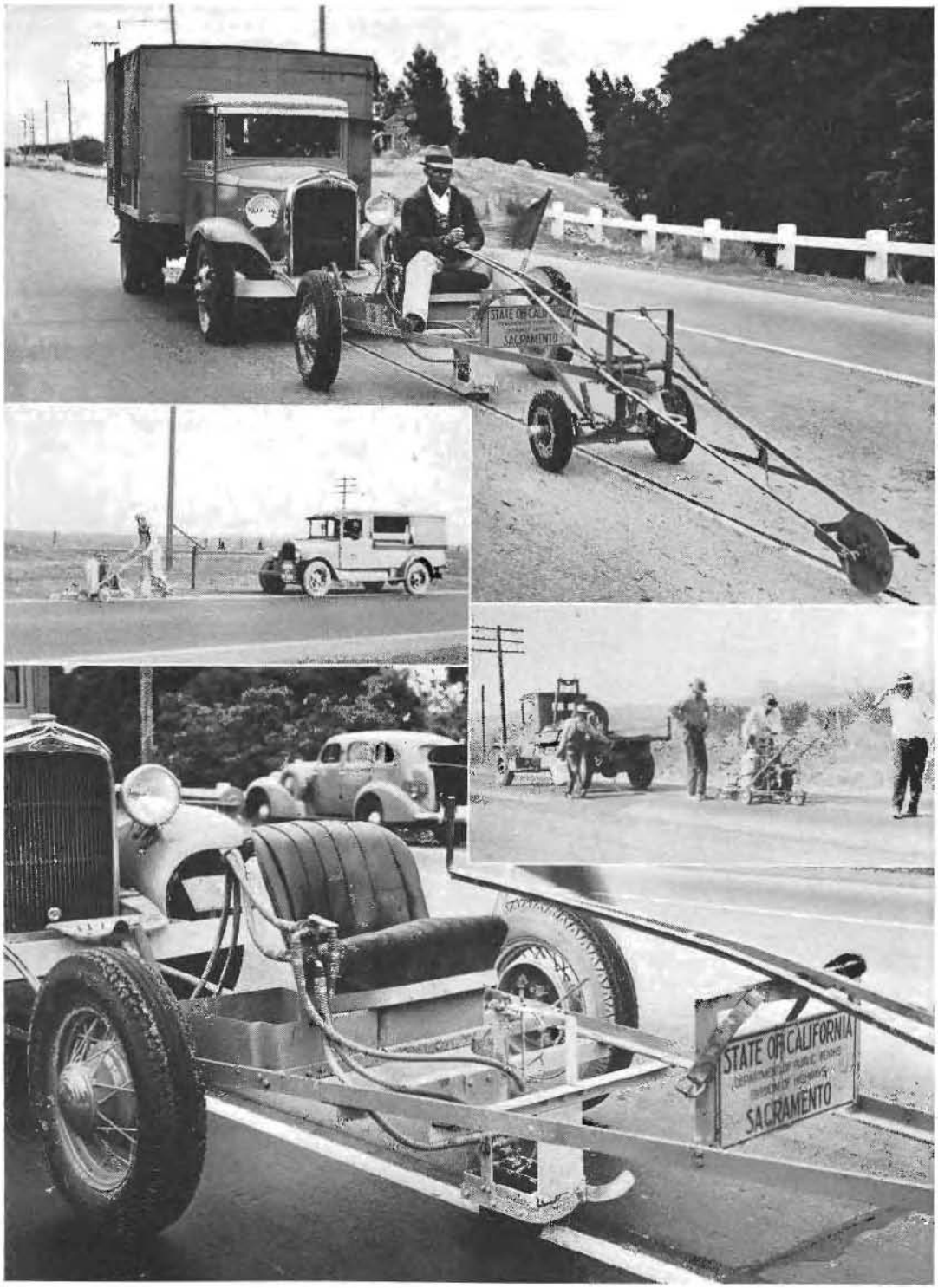
Provision is made to permit cleaning the pavement surface with compressed air in advance of striping, and in some cases a small pump is provided to salvage the excess lacquer blown against the slide plates or discs which govern the width of line.

The fresh line is protected while drying by small markers consisting of a coiled wire carrying a red flag. These markers are placed from the rear of the tender truck as the work progresses and are picked up from a light car when the line is dried sufficiently.

On sections of road not previously striped and on curves where the line has been obliterated, care is taken to spot the center line in advance of striping to insure a true, even appearing line.

A considerable mileage has been let out to contract from time to time and several contractors have developed outfits which are

(Continued on page 29)



NEW TRAFFIC STRIPING EQUIPMENT, developed by Division of Highway shops, averages 18 miles of four inch stripe per day. It is propelled by truck tender which carries lacquer paint tank and air compressor connected by pipe lines with the spray unit. Latter has easily controlled pointer and flow lever to insure uniform line. Old hand propelled machine, shown in the smaller pictures, had eight gallon capacity and averaged three to five miles of stripe per day.

Highway Damage by Slides and Surface Failures Caused by Abnormal Winter

By **C. F. WOODIN**, Assistant Maintenance Engineer

CALIFORNIA'S highways have experienced varying amounts of damage this past winter and spring through slides and pavement surface failures. Frost damage and abnormal rain and snow accounted in large measure for these conditions.

Mountain roads carrying heavy truck traffic suffered the greatest damage. Normally in these areas the ground is frozen before the first snowfall. During the past winter, much of the snowfall occurred before the ground was frozen, which allowed the moisture to seep into the surface and later freeze, with detrimental effect both to the base and surface of the pavement.

During the past several years, precipitation has been below normal. Roads which served traffic during these relatively dry years failed to stand up during the past winter. In the forest areas, the stimulation of logging added a heavy burden of trucking not anticipated when these roads were constructed.

LIGHT SURFACES SUFFERED

Certain types of construction suffered more than others. Light oil tops and bituminous macadam surfaces, when not water-tight, disintegrated under the frost action. The seal, once broken, permitted the infiltration of water to the base, reducing its supporting power and offering little resistance to the pounding of heavy loads.

Damage has also been caused by insufficient drainage facilities. Intermittent springs under the roadway are usually evident only in years of heavy precipitation. During the past winter, springs developed which were otherwise inactive. In several instances, oil surfaces completed in late fall did not have a sufficient period for sealing and were badly broken up through seepage and subsequent frost action.

Slides interfered with drainage, covering pipe inlets and filling gutter drains. Water thus intercepted flooded small areas and saturated the subgrade with detrimental effect to the surfacing.

Swollen rivers and streams threatened the fill slopes and in some cases forced bridges from their foundations.

All of the damage occurred to the highways throughout the State within a relatively short period and caused a heavy drain on the funds and facilities available for maintenance purposes.

Damage in the south was confined mainly to slides. Heavy cut slopes on new construction furnished the bulk of the slide material. Fill settlements on the new Ridge Route Alternate were of such magnitude as to require the placement of new surfacing material over the original pavement to restore the section to its former grade.

The Ventura-Maricopa lateral sustained heavy damage from slides. In the Sespe Gorge where the highway traverses deep cuts through thick concentric layers of shale and sandstone, heavy rains dissolved the material between the sandstone layers, precipitating great slabs of rock into the highway.

ROADWAY RELOCATED

Some 30,000 cubic yards of this material was utilized to widen the roadbed at the base of the slide, thus permitting a shifting of the roadway to a location no longer endangered by future slides.

The Roosevelt Highway along the coast north of Santa Monica likewise suffered from large slides.

Mud flows on the coast route near the Ventura-Santa Barbara County line interfered with traffic during various periods of heavy rains.

Extremely high tides and heavy ground swells deposited quantities of sand and gravel to a depth of 6 to 18 inches on the highway. As soon as the waters receded the deposited material was removed from the pavement with grading equipment.

In the north, damage was sustained through the action of frost, moisture and heavy truck traffic on weak bases. Slides also exacted their toll as well as erosion from streams both small and large.

Slides involving the movement of 15,000 to 20,000 cubic yards of material blocked the Rumsey-Lake County road.

Spring Floods Damaged River Roads

(Continued from preceding page)

On the Redwood Highway some 200,000 cubic yards were removed from a slide near San Rafael. In the vicinity of Garberville and Crescent City other large slides and roadway slipouts occurred. Skyline boulevard south of San Francisco, the coast route between Carmel and San Simeon, the Feather River road, and the Placerville road to Lake Tahoe likewise contributed generously to the burden of slide removal.

Slides were confined principally to the roads of comparatively recent construction, although some of the older highways were thus obstructed.

Spring high water washed away portions of the fill slopes and roadway at several locations.

The Sacramento-Antioch Highway along the Sacramento River has been threatened at various locations by river currents dissolving the toes of the sandy fill slopes of the levee, which the route traverses. A contract was let prior to highwater for the placing of rip-rap for bank protection. This has been completed but new washes have developed during the past spring and will require the extension of this protection work.

DAMAGE BY CLOUDBURSTS

Cow Creek near Ingot, Shasta County, washed away portions of the new grade following storms of cloudburst proportions.

Similar storms resulted in washes west of Red Bluff on the new lateral to Alton, and at Hastings Creek on the Mother Lode Highway south of Auburn.

WASHED OUT DETOUR BRIDGE over Kings River east of Centerville on State Route 41.

SLIP-OUT on the Feather River Canyon Highway on State Route 21 in Butte County.

SURFACE FAILURE on State Highway No. 83 due to frost and heavy traffic.

Roadway surfaces suffered the most serious damage, the cause of which may be charged to an extensive season of rain and snow, sometimes augmented with frost action and the pounding of heavy truck traffic which, in some cases, was not anticipated.

(Continued on page 30)

Federal Work Relief Restrictions Holding Up Construction Program

By R. H. WILSON, Office Engineer, Division of Highways

THE Emergency Relief Apportionment Act of 1935 which provided for the appropriation of $4,800,000,000 for the relief of unemployment throughout the nation during the coming year was approved by President Roosevelt on April 8.

Of this huge sum being supplied by the federal government for expenditure in the several states, some $200,000,000 has been apportioned for various phases of relief work in California, and of this $200,000,000 an amount totaling $15,234,290 was apportioned on June 3 for work on the roads and highways of the state, with the limitations that $7,747,928 be expended for highway construction and $7,486,362 be used in the elimination of hazards at railroad grade crossings.

FOR UNEMPLOYMENT RELIEF

The Emergency Relief Apportionment Act of 1935 was designed for unemployment relief as the primary consideration and the public works to be performed by the use of the federal funds as a secondary consideration. On this basis, the limitations which are being placed upon the use of the funds by the federal government are important factors in determining the work which can be done and in setting up a possible construction program.

The Division of Highways has been only partially informed by the federal authorities as to the regulations which will apply to the work, but those regulations of which the state has been advised as this article is written are so drastic that it is indicated an entirely new type of construction procedure must be adopted if the federal money is to be used in highway construction.

Definite rules and regulations in their entirety are expected in the near future from the U. S. Bureau of Public Roads and at that time a more definite conception of the problem may be obtained.

A DRASTIC RESTRICTION

A conception of the effect on construction practice of the regulations received to date may be gained from the fact that a maximum of $1,400 per year per man has been set as the total allowable expenditure for labor, materials, and incidentals on any project financed by these 1935 emergency relief funds.

Exhaustive studies conducted by engineers of the California Division of Highways on recent highway and bridge construction indicate that materials are such a large factor in the cost of construction, especially in the case of structures such as grade separations, that the cost per year per man is two and one-half to three times the limit set under the new federal requirements.

A further restrictive requirement is that 90 per cent of all labor employed on the work must be taken from the relief rolls of the vicinity wherein the work is performed, a condition which limits the amount of skilled labor which may be used.

Further still, and dependent upon this last requirement, projects must be selected from localities where relief labor is available.

EAGER TO START WORK

The Division of Highways is anxious to get the relief construction program for which these funds will provide, arranged and under way, and it is hoped that it may be possible to proceed with the work on the basis of federal limitations. However, the nature of highway and bridge construction is such that, of necessity, the materials which go into the work are as important as the labor and if the work is to be advanced, some provision must be made for their cost.

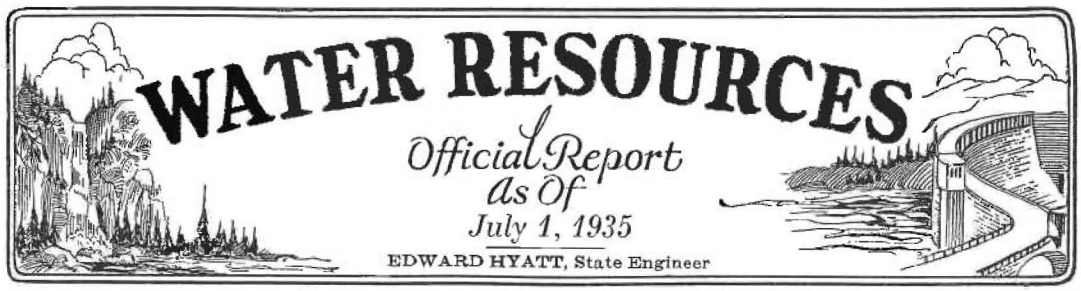
It is hoped the final regulations when received will provide methods whereby we may proceed with a program consistent with our usual practices and methods of construction.

"I turned the way I signaled," indignantly said the woman after the crash.

"I know it," sadly said the man, "that's what fooled me."

"All your fingers bound up? What have you done?"

"I bought my wife a potato peeler for her birthday, and when she said she couldn't make it work, I had to show her how simple it was."—*Fliegende Blaetter.*



Approval of refunding bonds and expenditures by various irrigation districts totaling $710,122 has been given by the Districts Securities Commission.

Scarcity of available men on relief has stopped work on relief projects in Sutter and Yuba counties till early fall.

Owing to the high summer stage of the San Joaquin River two levee breaks have occurred, one of which has flooded 4,000 acres and closed a county road.

Applications have been made for two dam construction projects at a total cost of $6,903,000.

Details of other activities of the Division of Water Resources are given in the monthly report of the State Engineer which follows:

DISTRICTS SECURITIES COMMISSION

Action on the petitions of various irrigation districts to the California Districts Securities Commission is shown in the following orders of approval issued by the commission:

El Dorado Irrigation District, El Dorado County—Validation of refunding bonds in the principal amount of $300,500.

Oakdale Irrigation District, Stanislaus County—Approval of expenditures in the amount of $15,122.31.

Santa Fe Irrigation District, San Diego County—Approval of the date of refunding bonds in the principal amount of $394,500.

Paradise Irrigation District, Butte County—Approval of filing of petition under the Federal Bankruptcy Act in connection with the plans of the district for readjusting and refunding its indebtedness.

Imperial Irrigation District, Imperial County—Confirming the plan of the district for readjustment of its indebtedness.

Corcoran Irrigation District, Kings County—Approval of agreement to purchase water.

FLOOD CONTROL AND RECLAMATION

SERA Relief Work.

No relief work is now under way in Sutter or Yuba counties, owing to the scarcity of available men on relief. This condition may continue until early fall, when it is expected that sufficient men will be available to resume work actively.

In Sacramento County one SERA crew of 25 men is engaged in clearing the timber from the right bank of the Mokelumne River near New Hope Landing, and to date approximately 5,000 man-hours has been utilized.

Sacramento Flood Control Project.

During this period inspections have been made of a number of irrigation pipe installations in the project levees, being done under approved applications to the Reclamation Board.

San Joaquin River Floods.

Commencing on April 17th, the San Joaquin River has been flowing at a medium high summer stage and some difficulty has been experienced in protecting the banks and levees on the left bank from the Banta-Carbona intake to the State highway. A small break occurred on the left bank on the El Solyo ranch near Varnalis, but this break was promptly closed by the ranch company with the assistance of relief labor.

On May 31st a break occurred in the San Joaquin River levee of River Junction Reclamation District No. 2064, near the Durham Ferry bridge. This break has inundated approximately 4,000 acres, which are still under water. It has also made the county road from Manteca to Vernalis impassable. These conditions have been examined by this office, but the Division has not undertaken protective or repair work on account of lack of funds.

DAMS

Application was filed on June 7, 1935, for construction of the Peoples Weir dam located on the Kings River near Kingsburg at the site of the present timber diversion structure by the Peoples Ditch Company. The dam will consist of a concrete floor and abutments with concrete piers and timber flashboards, 13 feet in height and storing 120 acre feet and is estimated to cost $54,000.

Application for construction of the Cajalco dam was filed on June 14, 1935, by the Metropolitan Water District of Southern California. There are two structures required to impound the water in the reservoir. The main structure is to be an earthfill 194 feet in height and the auxiliary structure will be an earthfill dam 72 feet in height. The storage in the reservoir is estimated as 100,000 acre feet, and the estimated cost of the structure is $6,849,000. This reservoir is to serve for the storage of water delivered through the aqueduct from the Colorado River.

Application for the removal of the Holmes Lower Dam No. 1 was filed on June 14, 1935. Removal of this structure is necessary to clear the site of the

(Continued on page 28)

River Stages Higher Than Last Year

(Continued from page 27)

Cajalco Dam above referred to. The estimated cost of this work is $12,000.

Work of placing the fill in the main structure at Calero Dam of the Santa Clara Valley Water Conservation District is now progressing. At the other dams of this district work of stripping foundations, excavation of cut-offs and placing of outlet conduits is under way except at Vasona where work on the fill section is practically complete.

Work of preparing camps, etc., is under way preliminary to the starting of the work of enlargement of the O'Shaughnessy dam of the City of San Francisco.

Work has been resumed on the construction of the Del Rio Woods dam in the Russian River near Healdsburg and has sufficiently progressed to permit of storage for recreation purposes for the summer.

Maintenance inspections so far made reveal that although run-off during the spring has been exceptionally heavy a surprisingly small amount of maintenance work is required to again put the dams in first class condition. This work either is already under way or will be undertaken shortly.

Due to the heavy snowfall, many of the dams at higher elevations are not yet accessible. Inspection of these structures will be made, however, as soon as the roads are open in order that any work which may be found necessary can be completed during the short period available before they again become inaccessible.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

From a flow of 40,000 second-feet in the Sacramento River at Sacramento in the latter part of May, there has been a gradual drop to 17,000 second-feet on June 17. On June 17, 1934, the corresponding flow was only 3400 second-feet. During May and June all reservoirs serving the San Joaquin Valley filled and the flow of the San Joaquin River at Vernalis reached a peak of 24,000 second-feet on May 30th. This had dropped to 18,000 second-feet on June 10th. The corresponding flow on June 10, 1934, was 700 second-feet. With this flow to the Delta the lower channels and Suisun Bay itself have remained practically free of salinity as shown by the following tests for water samples taken on June 10, 1935, at some of the sixteen stations at which the sampling is permanently maintained.

Salinity at Upper Bay and Delta Stations on June 10, 1935

Station	*Salinity in parts of chlorine per 100,000*
Point Orient	940
Bulls Head	18
O and A Ferry	2
Collinsville	1
Emmaton	1
Antioch	3
Dutch Slough	1
Rindge Pump	1
Middle River	2

WATER RIGHTS

Supervision of Appropriation of Water.

Twenty-three applications to appropriate water were received in May; 27 were approved and one was denied. During this same period one permit was revoked and 28 passed to license.

Inspections of projects covered by permits, and other field investigations were conducted during the month in San Diego, Riverside, San Bernardino, Los Angeles, Napa, Sonoma, Lake, Humboldt, Trinity, Del Norte, Siskiyou, Modoc and Shasta counties.

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Final sheets of the Seal Beach and Harvester quadrangles appeared during the month. The Seal Beach quadrangle covers an area in Orange County which was surveyed in 1932 by the U. S. Geological Survey in cooperation with this office. The final sheet is published on a scale of 1:31,680 with a contour interval of 5 feet. The Harvester quadrangle covers an area in Kings County which was surveyed in 1931 by the U. S. Geological Survey in cooperation with this office. It is published on a scale of 1:31,680 with a contour interval of 5 feet.

Field work was carried on during the month on the Paynes Creek and Burney quadrangles. These are federal projects.

WATER RESOURCES

South Coastal Basin.

Work on the South Coastal Basin investigation continued along routine lines during the month. Study is now being made of the shortage and surplus of water in the various basins.

Central Valley Project.

Final action has not been taken on the financing of the Central Valley Project by federal authorities in Washington, D. C. However, indications are that the project will receive federal approval and that an initial amount will be made available for the first year's work. The State Engineer is at present in Washington, D. C., following the matter closely, and is hopeful that a definite decision will be reached shortly regarding the financing and construction of the project.

Young Bride—I have a wonderful husband!
Divorcee—Beginner's luck!

"Dad," said John, "what is a superhuman?"

"He's one, my son," replied his Dad, "who can still think of it as a pleasure car while changing a tire in the pouring rain."

Eight State Street Project Contracts Will Total $912,000

(Continued from page 14)

At present there are six tracks in the classification yard crossing the State street location, but the railroad company considers this yard, which has direct access to the harbor district, so important and the necessity for providing for expansion of their facilities so great, that the grade separation should be designed to bridge 20 tracks.

Altogether, on the eight contracts completed or under way between Redondo Beach and Long Beach, a total of $912,000 is being spent. Construction of the balance of this section will require another $575,000 which, with the $100,000 allotment voted by the Highway Commission for storm water control, will make a grand total of $1,587,000 either already spent or to be spent on this 14.5 mile project, not including costs for rights of way which are being secured by the cities of Long Beach and Los Angeles for the portions within their respective boundaries and by the state for the portion outside the cities.

In spite of the many and serious difficulties encountered, the highest construction and location standards are being maintained throughout the project. A full 100 foot width of right of way either has been or is being secured with the exception of portions through the highly developed oil property and business property in Long Beach and Signal Hill, and even through these sections where slightly narrower right of way width was accepted, the standard width of 76 feet between curbs is being maintained.

EXCHANGE OF PERSONNEL MADE IN FOUR DISTRICTS

An exchange of personnel between four highway district offices occurred last month.

C. H. Temby, office engineer of District III of the Division of Highways at Marysville, has been transferred to Stockton, District X, where he will take up similar duties.

B. W. Booker of Stockton, who has been office engineer there, has been transferred to Marysville to take up the duties of District Construction Engineer Clarence Clemens who has been transferred to District IX at Bishop.

J. B. Hardges of District II at Redding goes to Marysville to take Temby's place.

PUBLIC WORKS DAY AUGUST 3 AT SAN DIEGO; NEW OFFICE BUILDING TO BE DEDICATED

The California Pacific International Exposition at San Diego has designated August 3d as "State Department of Public Works Day."

On that date, the new office building for District XI of the Division of Highways, which is nearing completion in San Diego, will be dedicated by Governor Frank F. Merriam. Later, ceremonies befitting the occasion will be held in the state building on the fair grounds, where Director Earl Lee Kelly of the Department of Public Works will be the speaker of the day.

The Department of Public Works has an extensive exhibit in the state building. One of the interesting displays is a working model of the San Francisco-Oakland Bay bridge. The various divisions of the Department of Public Works, Highways, Water Resources and Architecture, having attractive exhibits.

State officials, headed by Governor Merriam, will go to San Diego to participate in the highway building dedication and ceremonies at the exposition grounds, arrangements for which are in the hands of Deputy Director of Public Works Edward J. Neron.

The new Division of Highways structure is located at the corner of Harbor and Ash streets, facing the site of the proposed San Diego Civic Center.

7500 MILES OF HIGHWAY STRIPED

(Continued from page 22)

equal to the state units. In the main, however, the striping work is handled by state forces due to the intermittent character and necessity of getting it under way promptly.

Whether handled by contract or by state forces, the same standards of work are adhered to. Lacquer is applied at the rate of from 8 to 12 gallons per mile of 4-inch stripe on restriping, and from 12 to 18 gallons per mile on new work, depending on the type and condition of surface.

An experienced crew will place from 10 to 25 miles of stripe per day with an average of about 18 miles per day. The cost ranges from $25 to $30 per mile, depending on conditions as to spotting, traffic, road alignment, etc.

In general, the stripes are renewed once a year, although on certain heavily traveled roads in the Los Angeles and San Francisco areas it is necessary to restripe about every six to nine months.

"Father bought a 'Reubens' when we were in Europe."

"Really, what horsepower?"

Roads Damaged by Storms and Slides

(Continued from page 25)

SURFACE BREAK west of Donner Summit caused by thawing and heavy trucking.

2000 YARD ROCK SLIDE on State Route 138 in Ventura County.

STORM SLIDES AND MUD blocked Route 162, San Gabriel Canyon.

The armor tops between Redding and Weaverville, the coast route in Marin County, various sections along the Eel River between Dublin and Niles and from Livermore to Mission San Jose were badly damaged and the failures may be charged in all cases to excessive rainfall during the past winter.

The river road between Sacramento and Woodland was inundated during highwater to a depth of five feet for a distance of one and one-half miles at the Yolo By-pass area. When the water receded, the road was reopened to traffic and the base, very much softened, became distorted under the action of traffic, resulting in extensive damage to the surface.

Along the Truckee River near the Nevada State line, a newly constructed bituminous macadam completed late in the fall of 1934 developed numerous failures. Frost action on the water which earlier seeped through the porous top, broke up the surface and softened the base when thawing occurred.

ROAD CLOSED TO TRUCKS

The Donner Pass road for about twelve miles west of Truckee was severely damaged by the combined action of frost, snow removal operations, poor drainage conditions, inadequate base, and heavy truck loads. The condition of the surface became so critical that it was necessary to close the road to

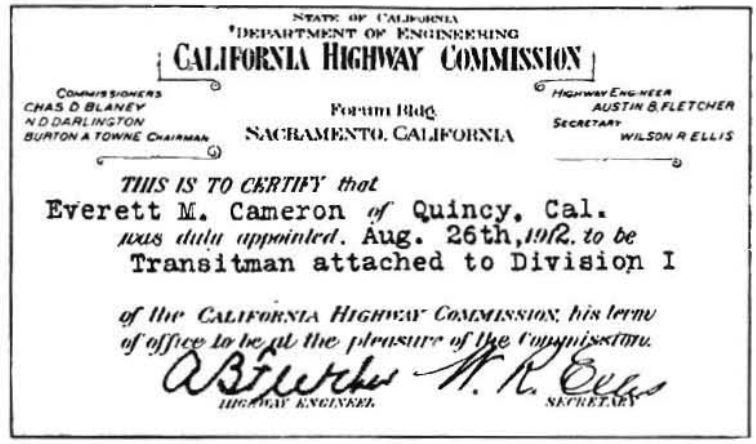
(Continued on page 32)

Old Timer, Do You Hold a Card to Beat This?

The first California Highway Commission was appointed late in 1911 and the first seven division engineers reported for duty January 2, 1912.

Every man appointed on the staff of a division engineer was given a card like the one at right certifying to his appointment by the commission and his rank in the service.

E. M. Cameron was appointed a transitman in Division I, August 26, 1912, twenty-three years ago. Recently the above card was found among some old District I papers and again presented to Mr. Cameron, who has risen through his ability to the position of District I Construction Engineer.



STATE OF CALIFORNIA
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION

COMMISSIONERS
CHAS D BLANEY
N D DARLINGTON
BURTON A TOWNE CHAIRMAN

Forum Bldg.
SACRAMENTO, CALIFORNIA

HIGHWAY ENGINEER
AUSTIN B FLETCHER
SECRETARY
WILSON R ELLIS

THIS IS TO CERTIFY that
Everett M. Cameron of Quincy, Cal.
was duly appointed. Aug. 26th, 1912. to be
Transitman attached to Division I

of the CALIFORNIA HIGHWAY COMMISSION. his term of office to be at the pleasure of the Commission.

HIGHWAY ENGINEER. SECRETARY

"At first," says District Engineer J. W. Vickrey, "Mr. Cameron had to walk over the job. Next a horse was furnished him and now he can cover more territory in an hour than a horse could travel in a working day."

Highway Bids and Awards for June

ALPINE COUNTY—Between Nevada State Line and 3.4 miles north of Woodfords, 2.8 miles; grade and surface. District X, Route 24, Section D. N. M. Ball-Larsen Bros., Berkeley, Sacramento, $55,752; A. Teichert & Son, Inc., Sacramento, $35,918; Isbell Const. Co., Reno, Nevada, $51,843. Contract awarded to Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, $35,554.10.

MENDOCINO COUNTY—At Red Mountain and McCoy Creek, 0.7 miles grade and surface and 2 timber bridges. District I, Route I, Section K. Hanrahan-Wilcox Corporation, San Francisco, $196,069; Granfield, Farrar & Carlin, San Francisco, $159,371. Contract awarded to C. W. Caletti & Co., San Rafael, $148,980.

MERCED COUNTY—In Merced between southerly boundary and R Street, about one mile to be graded and paved with asphalt concrete. District X, Route 4, Section Mer. Hanrahan-Wilcox Corporation, San Francisco, $55,887; Union Paving Co., San Francisco, $45,372; Pacific States Construction Co., San Francisco, $53,170; A. J. Raisch Company, San Jose, $54,876; Stewart & Nuss, Inc., and John Jurkovich, Fresno, $48,179. Contract awarded to Valley Paving and Construction Co., Fresno, $44,036.30.

MONO COUNTY—Between 1 mile north of Bodie Road and Point Ranch, about 2.1 mile to be graded and paved with select surface material. District IX, Route 23, Section I. Gogo & Rados, Los Angeles, $42,453; Basich Brothers, Torrance, $38,325; Bayshore Construction Company, Inc., San Francisco, $54,550. Contract awarded to Kennedy Construction Co., Oakland, $36,202.

MONTEREY COUNTY Between 33 and 38 miles south of Monterey, 2 Redwood timber bridges across Pfeiffer Canyon and Torre Canyon. District V, Route 56, Section E. F. C. Amoroso & Sons, San Francisco, $103,115; Harry J. Oser, San Francisco, $94,763; M. B. McGowan, Inc., San Francisco, $103,611; Rocca & Co., San Rafael, $106,194; R. R. Bishop, Long Beach, $106,585; Peninsula Paving Co., San Francisco, $103,930. Contract awarded to E. T. Lesure, Oakland, $92,728.

ORANGE COUNTY—Between Anaheim and Miraflores, 1.4 mile, grade and P. C. C. or A. C. pavement. District VII, Route 174, Section A. Griffiths Co., Los Angeles, $39,544; Oswald Bros., Los Angeles, $40,658; Sharp & Fellows Contracting Co., Los Angeles, $45,023. Contract awarded to C. O. Sparks, Los Angeles, $39,433.30.

SAN FRANCISCO COUNTY—Fifth Street, between Harrison and Bryant Streets, 0.1 mile, widen and P. C. C. and A. C. pave. District IV, Route 68, Section S.E. Pacific States Construction Co., San Francisco, $22,817; Union Paving Co., San Francisco, $21,591; The Fay Improvement Company, San Francisco, $22,629; A. G. Raisch, San Francisco, $22,912. Contract awarded to Chas. L. Harney, San Francisco, $20,936.13.

MONTEREY COUNTY—Between 38 and 43 miles north of San Simeon, 2 timber bridges, one across Limekiln Creek and one across Vicente Creek. District V, Route 56, Section C. Harry J. Oser, San Francisco, $97,427; Rocca & Co., San Rafael, $93,558; Alfred H. Vogt Co., Inc., San Francisco, $92,870; E. T. Lesure, Oakland, $92,043; M. B. McGowan, Inc., San Francisco, $92,256; F. C. Amorosa & Sons, San Francisco, $94,980; R. R. Bishop, Long Beach, $95,173. Contract awarded to Peninsula Paving Company, San Francisco, $88,683.75.

SIERRA COUNTY—Reinforced concrete bridge across the north fork of the north fork of Yuba River at Downieville, and road approaches graded. District III, Route 25, Section A. Lord & Bishop, Sacramento, $37,389; A. H. Siemer and John Carcano, San Anselmo, $38,364. Contract awarded to Chas. Kuppinger, Lakeport, $35,458.50.

Trailers Replacing Trucks on Highways State Survey Shows

HALF of the trucks operating on California highways are almost six years old, according to statistics compiled for Director of Public Works Earl Lee Kelly.

A similar proportion of trailers, which rapidly are supplanting trucks, are five years old. The reason that trailers are not as old as trucks is found in their growing use in recent years; for, since 1929, truck registrations have increased 31 per cent and trailer registrations 85 per cent.

A total of 288,409 motor freight vehicles was recorded last year and in a transportation survey the Division of Highways questioned the drivers of 32,400 trucks to obtain data on mileage, gasoline consumption and origin and nature of freight loads.

Freight vehicles weighing less than 3000 pounds constitute about 31 per cent of all freight vehicles. Considering only those vehicles over eight years of age, it develops that over half—52 per cent—are in the class of vehicles weighing less than 3000 pounds.

The average daily mileage produced by the old trucks is considerably less than the average of 78 miles per day for all trucks. The old group of vehicles, weighing less than 3000 pounds, averaged only 28 miles daily, and those over 3000 pounds averaged 55 miles per day.

Two questions on mileage were put to truck drivers, who were asked (a) the average miles traveled daily, and (b) the mileage on their speedometers. The average of miles traveled daily is typical of an average work day, but does not reflect the element of idle days. Since the speedometer mileage includes the results of both operation and inoperation, it was the basis used to compute total annual truck miles.

The average miles traveled daily by trucks without trailers was 78 miles, and trucks with trailers averaged 128.6 miles. In each instance the median was somewhat lower than the arithmetical average. For trucks without trailers the median mileage was 56.4; and for those with trailers, 117.3 per day. Annual mileage for all trucks averaged 9900 miles. It was noted that the annual mileage increases as the weight of the vehicle increases. Trucks of 10,000 pounds unladen weight and over make more than twice the annual mileage of trucks less than 3000 pounds.

In Memoriam

HENRY CALVIN WHITE, employed as an Equipment Operator-Laborer by District III, Division of Highways, was accidentally killed while on duty April 7, 1935, by a snowslide which buried the plow on which he was working between Bay View Rest and Eagle Falls at Lake Tahoe.

Mr. White was born at Applegate, Placer County, on April 2, 1910, and had spent his entire life in that section of the State.

Previous to working for the Division of Highways he had been employed by the Pacific Gas and Electric Company and the Pacific Telephone and Telegraph Company. He was first employed by the Division of Highways on August 27, 1934. Although only employed by the State for a few short months previous to his untimely death, "Buck" had become known among his fellow employees as a very hard, conscientious and congenial worker and his loss is felt by the entire district organization.

He is survived by four sisters: Rita, Dorothy and Josephine White of Applegate, and Mrs. L. J. Miller of Knights Landing, and six brothers: Guy, Albert, Harvey, Theodore, Francis and George, and by his mother, Mrs. Nellie White of Applegate.

STORM DAMAGE POINTS TO STAGE CONSTRUCTION POLICY

(Continued from page 30)

trucks until the spring storms abated and permitted the road to dry out.

The Red Bluff-Susanville lateral between Child's Meadow and Fredonia Pass, and the Alturas lateral in the vicinity of Adin, were similarly affected.

These experiences have not been without benefit. They point to the necessity of stage construction, building roads from the foundation. Under such a plan, carefully selected base of a desirable thickness should be laid so as to extend to the gutter or fill slopes, with gutters, underdrains and culverts at proper locations to adequately drain all water away from the subgrade.

The surface should be inexpensive, so that the failures which may occur can be repaired and reinforced at a nominal expense. Then, when it has been determined that the base is sufficiently stabilized, consideration may be given to the next stage—a surface which need not be excessively costly, but may be expected to give long and satisfactory service.

It tells a good deal about a man's home life if he orders rice pudding and home-made cake at a lunch counter.

STATE OF CALIFORNIA

Department of Public Works

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

FRANK F. MERRIAM.....Governor

EARL LEE KELLY.....Director

JUSTUS F. CRAEMER.....Assistant Director

EDWARD J. NERON.....Deputy Director

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
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HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
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FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent
ROBERT E. REED, General Right of Way Agent

DIVISION OF PORTS

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

CALIFORNIA STATE PRINTING OFFICE
GEORGE H. MOORE, STATE PRINTER
SACRAMENTO, 1935

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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM