

CALIFORNIA

HIGHWAYS AND PUBLIC WORKS

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1 2 3 4 5 6 7 8 9 10

inches

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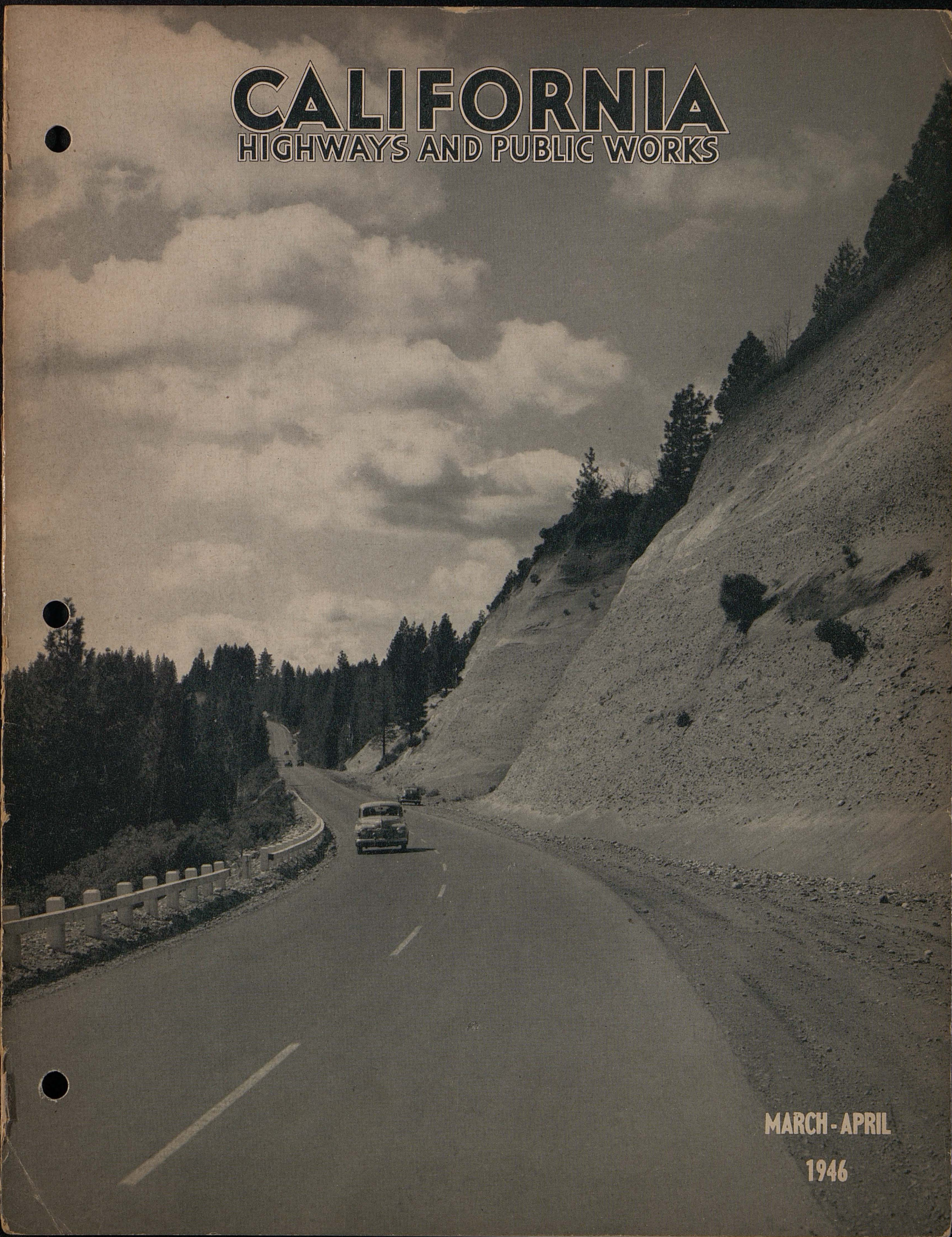
D50 Illuminant, 2 degree observer

Density

1	2	3	4	5	6	7	8	9	10	11 (A)	12	13	14	15
39.12	65.43	49.87	44.26	55.56	70.82	63.51	39.92	52.24	97.06	92.02	87.34	82.14	72.06	62.15
13.24	18.11	-4.34	-13.80	9.82	-33.43	34.26	11.81	48.55	-0.40	-0.60	-0.75	-1.06	-1.19	-1.07
15.07	18.72	-22.29	22.85	-24.49	59.60	-46.07	18.51	1.13	0.23	0.21	0.43	0.28	0.19	0.19
									0.04	0.09	0.15	0.22	0.36	0.51

Colors by Munsell Color Services Lab

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 (B)	19	20	21	22	23	24	25	26	27	28	29	30
38.12	65.43	49.87	44.26	55.56	70.82	63.51	39.92	52.24	97.06	92.02	87.34	82.14	72.06	62.15	49.25	36.62	28.86	16.19	8.29	3.44	3.14	72.46	72.95	29.37	54.91	43.96	82.74	52.79	50.87
13.24	18.11	-4.34	-13.80	9.82	-33.43	34.26	11.81	48.55	-0.40	-0.60	-0.75	-1.06	-1.19	-1.07	-0.16	-0.18	0.54	-0.05	-0.81	-0.23	20.98	-24.45	16.83	13.06	-38.91	52.00	3.45	50.88	-27.17
15.07	18.72	-22.29	22.85	-24.49	59.60	-46.07	18.51	1.13	0.23	0.21	0.43	0.28	0.19	0.19	0.01	-0.04	0.60	0.73	0.19	0.49	-19.43	55.93	66.80	-49.49	30.77	30.01	61.29	-12.72	-29.46
									0.04	0.09	0.15	0.22	0.36	0.51	0.75	0.98	1.24	1.67	2.04	2.42									



MARCH - APRIL

1946

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

PRINTED
IN U.S.A.

C. H. PURCELL, Director

GEORGE T. McCOY, State Highway Engineer

K. C. ADAMS, Editor

Published in the interest of highway development in California. Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request. Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California

Vol. 24

MARCH-APRIL 1946

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POSTWAR PROGRESS IN CALIFORNIA

By EARL WARREN, Governor of California

THROUGHOUT the war our State Government gave priority to the victory effort. It was obvious to all of us, however, that even while the war was going on we should be preparing for the reconversion years. The Department of Public Works and other agencies of State Government were directed back in 1943, therefore, to start developing a comprehensive public works program. The purpose was to be twofold: to create jobs during the postwar period and to enable the State to catch up with the needs of its hospitals, colleges, correctional institutions and other facilities—needs that of necessity had been neglected for 15 years.

The State had been unable to finance these needed improvements during the depression years. Manpower and materials were not available during the war. Our construction needs were such that they could not be financed with normal State revenues but, fortunately, State income increased during the war to a point where this needed construction could be financed. The Legislature and I agreed that the money which came into our treasury during the months of wartime industrial and commercial activity should be used to bring State institutions up to date and to make necessary provision for rendering services to our increased population.

PROGRAM STARTED IN 1943

We started in 1943 to develop our program. It was realized that if we were to proceed with public works projects promptly following the war, plans for them had to be prepared well ahead of time.

It became possible to do this because, for the first time in the history of our State, there was instituted in the Department of Public Works a policy of having highway surveys completed, rights of way purchased, and construction plans finished in advance of construction authorization. The same policy is applicable to the Division of Architecture in the construction of State buildings.

In line with this policy, we set aside, during the 1943 Session of the Legislature, \$1,500,000 for use by the Division of Highways in making surveys and preparing plans for postwar highway construction. The sum of \$10,-

500,000 was provided for rights of way. The plans were complete when V-J Day arrived, and the State was ready to launch a \$123,000,000 highway program. Construction is already well advanced. By the end of March, 1946, approximately \$20,000,000 worth of rights of way had been acquired, and contracts aggregating \$32,500,000 had been let.



EARL WARREN
Governor of California

In the years 1943-44 there also was appropriated \$3,250,000 to finance the preparation of plans and specifications for the new buildings required by State agencies. The Division of Architecture, on V-J Day, had completed plans for \$22,454,000 of these public building projects. The amount was brought to \$30,000,000 by March 31st, and the division is now engaged in preparing plans for an additional \$30,000,000 worth of new hospitals, correctional institutions, and other buildings. An omnibus appropriation for a total of \$154,000,000 was made at the 1946 Special Session for these and other State buildings, including \$31,000,000 to The Regents of the University of California, and their construction will enable our State institutions to handle the needs of our growing population up to the year 1950.

The State also extended assistance to the cities, counties and other local governmental units in planning postwar public works.

The 1943 Legislature appropriated \$1,500,000 to the counties toward the cost of surveying new county roads and preparing the plans for their construction. These plans are the basis of a potential \$58,000,000 construction program. At the 1945 session, \$12,000,000 was allocated to the counties of the State to enable them to match \$15,000,000 of Federal Aid secondary highway funds.

An appropriation of \$10,000,000 was made during a special session of the Legislature in 1944 to assist the cities of the State as well as the counties and various districts in acquiring sites and preparing plans and specifications for local public works projects. At the 1946 Special Session, the Legislature appropriated \$90,000,000 toward the construction of these local public works, including sewage disposal facilities, streets and highways, hospitals, detention homes, schools, flood control projects, fire protection and prevention facilities, and harbor facilities. To date, the cities and counties have applied for \$3,526,574 of the plans and sites money. The projects to be based on these plans would involve an aggregate expenditure of \$175,207,000.

PUBLIC WORKS PROJECTS

Figures compiled by the State Reconstruction and Reemployment Commission show that the cities, counties, and irrigation and similar districts have proposed public works projects for construction during the next three years calling for a total outlay of \$630,000,000. Local agencies have \$400,000,000 in cash on hand for these works, including the \$90,000,000 granted to them by the Legislature.

The aggregate of these several programs—State highway and buildings, county roads, and the public works of local agencies—exceeds \$950,000,000. When we include the plans of the Federal Government for water projects, and our own plans for beach and park improvements, construction of medical centers, and many other things, it will be seen that California has entered the postwar reconversion period with a truly comprehensive public works program.

Under the Water Resources Act passed by the 1945 Legislature, the State accepted financial responsibility for the local costs of water projects

which the Federal Government proposes to develop in California. On these water projects, the Federal Government expects to spend between \$400,000,000 and \$450,000,000. The local costs eventually will amount to \$32,000,000, toward which \$10,000,000 has been appropriated. The \$10,000,000 will take care of all the projects which can be built during the next several years.

OTHER APPROPRIATIONS

Appropriations totaling \$1,120,335 were made at the Special Session of 1946 to construct new fish hatcheries and game refuges. Construction of new facilities at our State parks and beaches was appropriated for in a total amount of \$2,249,600. Two million dollars was set aside for reforestation. The first units of our new state-wide trails system will be constructed under an appropriation of \$300,000 made at this session.

The omnibus appropriation bill included \$31,000,000 for our university and \$13,500,000 for the State colleges. In addition, bills were passed making \$11,000,000 available for medical centers at the university, and \$8,000,000 for dormitories to alleviate a severe shortage of student housing both at the several campuses of the university and at the State colleges. For the emergency housing of war veteran students returning to the university and State colleges, an appropriation of \$250,000 was made.

Designs have been drawn for new classroom and other facilities at the San Francisco, Fresno, San Jose, San Diego, Humboldt and Chico State Colleges to supply the needs of an enrollment which will probably exceed the prewar registration by 50 per cent or more.

MEDICAL CENTERS

Of the appropriation for medical centers, \$4,000,000 is for modernizing and completing that on the San Francisco campus of the university. Seven million dollars will enable us to establish a Medical Center on the campus of the University of California at Los Angeles.

The Department of Mental Hygiene was included in the omnibus appropriation for \$57,500,000. With the improvements this will make possible, we expect to move California out of the "asylum age" into the "hospital age."

A contract has already been let for construction at the Stockton State Hospital in the amount of \$1,383,307. This project will accommodate 1,000

patients in new and modern quarters. Contracts for the care and housing of 3,200 additional patients at Agnew, Napa, Norwalk and Camarillo State Hospitals and the Pacific Colony State Home will be let as promptly as possible, consistent with the availability of manpower and materials.

HOSPITAL IMPROVEMENTS

Plans were completed recently for psychiatric treatment groups at Camarillo and Napa to make effective a broad scale, scientific attack on the problem of mental illness. Each of these groups will accommodate 700 patients.

The construction program of the Department of Mental Hygiene includes a new hospital at Porterville exclusively for the treatment of epileptics. In the past, these unfortunates have been commingled with the insane and the mentally defective, a practice which is a relic of the dark ages.

New tubercular sanatoria have been designed by the Division of Architecture since the end of the war, providing for scientific segregation and treatment and the prevention of the spread of tuberculosis in State hospitals. These will be erected at Patton State Hospital at a cost of \$1,200,000 and at Sonoma State Home at a cost of \$506,000.

Plans are being drawn by the Division of Architecture for new housing to replace the obsolete quarters for the children living at the State Home for the Deaf in Berkeley. An appropriation of \$2,000,000 has been made for the purpose of establishing a similar institution in Southern California.

PRISON BETTERMENTS

For the Department of Corrections, plans for a new dormitory at the Chino Institution for Men, to house 300 prisoners, have been brought to completion in accordance with the program of prison reorganization launched two years ago. Designs for industrial shops at San Quentin Prison have been prepared and at Folsom Prison similar industrial facilities have been planned for construction. The omnibus bill includes \$12,200,000 for the Department of Corrections. This will finance the construction of a medical facility for 1,200 inmates, a new medium security prison for 1,600 men, and the general modernization program.

The California Youth Authority is included in the bill for \$7,000,000. This will provide a new industrial school for boys in the intermediate age

group. It will also modernize and complete the Los Guilucos School for Girls, and our other Youth Authority institutions. The designs for new dormitories at the Fricot School for Boys have already been completed.

VETERANS' HOME ENLARGED

To meet urgent needs at our Yountville Veterans' Home, a contract has already been awarded for improvements in the sum of \$458,285. A total of \$3,481,000 has been appropriated for this institution, including \$2,400,000 in the omnibus bill. A domiciliary barracks for women veterans, who have not heretofore been admitted to the home, is covered by this program.

Under the Veterans Bond Act of 1944, loans are being made to California veterans at the rate of nearly \$600,000 a month for the purchase of homes and farms. An additional bond issue of \$100,000,000 is being submitted to the vote of the people next November. The majority of the homes will involve new construction.

Emergency housing for war veterans and their families is being provided under a \$7,500,000 special session appropriation. These State funds are being distributed to cities and counties on a 90-10 matching basis to pay the local costs of rehabilitating and relocating surplus Federal housing.

REAPPRAISING HIGHWAY SYSTEM

One of the noteworthy wartime accomplishments of our Division of Highways was that, while engaged in the stupendous task of maintaining highway pavements damaged by heavy war traffic, it was able to construct \$30,746,000 worth of access roads for the Federal Government and \$2,270,000 of flight strips.

The 1945 Legislature created the Joint Legislative Committee on Highways, Streets and Bridges and has appropriated \$120,000 for a reappraisal and scientific study of the entire State Highway System by this fact-finding body. The work delegated to this committee is highly important and necessary. We must have more roads of all kinds. We need them to expedite the transportation of our crops and factory products. Main routes must be brought to higher standards. Better access to our recreational areas must be provided. The leadership of California in highway development must be reestablished.

HIGHWAY COMMISSION REORGANIZED

The State Highway Commission reorganized in 1943. Membership was

(Continued on page 13)

BAYSHORE FREEWAY WORK IS STARTED

By R. P. DUFFY, District Construction Engineer

WORK at a cost in excess of two and one-half million dollars has been placed under contract on the Bayshore Freeway in Santa Clara County between Santa Clara Street in San Jose and Ford Road 8.74 miles southerly thereof.

This project is the first unit to be placed under contract in District IV for a highway designed on freeway principle and will eventually extend from San Francisco to El Camino Real south of San Jose.

It will provide a route for through traffic, by-passing the congested area that now must be used through San Jose.

Four contracts have been awarded on this unit, three of which involve the construction of structures and one providing for grading and paving.

Two of the structure contracts, one for constructing a reinforced concrete bridge over Coyote Creek and an undercrossing at Coyote Road and one for constructing an undercrossing at Ford Road, were awarded to Contractor

Earl W. Heple of San Jose in December, 1945 at a cost totaling more than \$355,000.

The third structure contract for which bids were received on March 13, 1946, found Frederickson & Watson Construction Company of Oakland low bidder on the interchange structure at Santa Clara Street in San Jose with a bid of \$379,500.

These structure contracts are being supervised by the Bridge Department of the Division of Highways and on which Associate Bridge Engineer G. W. Thompson has been assigned as Resident Engineer.

The road contract, for which bids were received on December 12, 1945, was awarded to Contractor N. M. Ball Sons of Berkeley at a cost of \$1,269,000.

The project involves an entirely new location and traverses the gently sloping floor of the Santa Clara Valley except for a section, slightly less than two miles in length, in the vicinity of Coyote Creek where the line penetrates the foothills and from which source the

major portion of the embankment material is obtained.

The alignment, exclusive of the Ford Road interchange, contains only three curves involving a total curvature of $72^{\circ} 18'$ with a minimum radius of 3,000 feet. At the Ford Road connection to El Camino Real at the south end of the project the radii are 1,500 feet.

The maximum grade rate is 2.1 per cent except for the rise over the Ford Road undercrossing where there is a short piece of 4.2 per cent grade.

The maximum elevation reached on the project is 204 feet and the minimum elevation is 98 feet.

The new construction provides a four-lane Portland cement concrete pavement with two lanes in each direction of traffic divided by a 36 foot width division strip.

The pavement design is of 8 inches uniform thickness without expansion joints but with weakened plane joints on 15-foot centers. Contact joints will have $\frac{5}{8}$ inch x 15 inches tie bolt assemblies spaced at 30 inch centers.

Rock cut being excavated and hauled to fill. Smoke in background is from burning brush in clearing operations.





Here a Terra-Cobra with caterpillar dozer pusher is excavating rocky material

This pavement is placed on an average fill of about three feet above the original ground, the top foot of which is constructed of selected material from the roadway cuts.

The right of way provided for this unit is 180 feet in width with added

widths where necessary for present and future interchange structures at public road intersections. The approximate cost of this right of way is \$550,000.

The road contract proposal carries unit prices on 53 items of work, some of the major items being 660,000 cubic

yards of roadway excavation, 600,000 square yards of compaction of original ground, 43,000,000 station yards overhaul and 50,750 cubic yards of Portland cement concrete pavement.

The grading equipment now in use by the road contractor consists of a

(Continued on page 26)

This photograph, looking south, shows completed rough grade in side hill cut



Ground-Breaking Ceremony for Cabrillo Freeway in San Diego

By R. A. HAYLER, Senior Highway Traffic Engineer

CABRILLO Freeway, San Diego's first freeway was officially started with ground-breaking ceremonies on February 6, 1946. The California Highway Commission was represented by San Diego's member, C. Arnholt Smith, who acted as master of ceremonies.

Commissioner Smith briefly reviewed the events leading up to the construction of this milestone in San Diego's highway history and complimented various city and county officials

who, by their cooperation, have helped to make this dream of many years a reality.

Brief speeches were made by Donald Hanson, of the Highway Committee of the San Diego Chamber of Commerce, David Bird, Chairman of the Board of Supervisors, and Mayor Harley E. Knox. Mayor Knox officiated in turning the first shovelful of dirt at the ceremony and his efforts were contrasted to the work of three tractors and bulldozers a few minutes later,

which began the actual construction of the project.

E. E. Wallace, District Engineer of District XI, was introduced by Commissioner Smith and gave a brief resume of the project. Preliminary plans were begun in 1938 on this freeway which connects downtown San Diego with the residential sections, and also serves as a more direct connection for US 395, the Inland Highway leading to Riverside and San Bernardino. In March, 1941, the people of San Diego voted eight to one to set aside a 200-foot width of right of way through Balboa Park for highway purposes. With this fine start, plans were rapidly taking shape when the beginning of the war put a temporary stop to this work.

From 1942 to 1944 the project was at various times considered as a possible access road, connecting various military establishments in the vicinity of San Diego but was finally set aside for other access roads which were considered more necessary. In 1944 the freeway was included as Postwar Project No. 116 in the State's Postwar Program of construction. Plans were completed in 1945 and at the close of the war preparations were made for advertising various units of this freeway at an early date.

CONTRACTS AWARDED

At the present time two bridge contracts have been awarded; one for overhead structures at Date, Quince and Upas streets in Balboa Park to M. H. Golden Construction Company, and the other for a bridge across the San Diego River, to Harry L. Foster.

The first unit of the roadway contracts, covering construction from A Street to 0.4 miles south of Mission Valley, was awarded to Mitty Brothers on a bid of \$1,338,000. This involves 2.9 miles of grading and paving with Portland cement concrete. The typical section through Balboa Park will be a four-lane divided highway with 36-foot center dividing strip, planted with trees and shrubs. Included in the roadway contract is a

While Highway Commissioner C. Arnholt Smith (right) looks on, Mayor Harley Knox of San Diego breaks ground for the new Cabrillo Freeway





Cabrillo Freeway traverses the Eleventh Avenue Canyon through Balboa Park. This view is looking north from Laurel Street Bridge
Beginning grading operations on Cabrillo Freeway. Looking north from Washington Street toward Mission Valley





Cabrillo Bridge in Balboa Park which will span new Cabrillo Freeway

complete sprinkler system which has been installed in order to aid in the landscaping and roadside treatment which will be done by the State to blend the roadway with its natural surroundings.

As most of the freeway follows a natural drainage channel, it will be necessary to construct a storm drain system with pipes ranging in size from 24 inches to 60 inches in diameter.

The State is represented on this first roadway contract by J. Frank Jorgensen, as Resident Engineer.

The second unit of roadway construction is from 0.4 miles south of Mission Valley to 0.4 miles north of San Diego's North City Limits. It is estimated that the entire project will be completed late in 1947. A total of 10 grade separation structures, included

in the present construction, together with existing Robinson Avenue and Washington Street Bridges previously constructed by the State, will give a continuous roadway from Eleventh and Ash Streets, San Diego, to Kearney Mesa, free of intersecting traffic.

TOTAL COST

The total cost of the entire project of seven miles of Freeway, will be approximately \$4,000,000 including landscaping work. Over 1,650,000 cubic yards of dirt will be moved, involving approximately 30,000,000 station yards of overhaul. The project is financed from gas tax funds appropriated by the California Highway Commission, together with \$500,000 supplied from one-fourth cent gas tax funds for State

Service Charge on Bay Bridge Reduces Traffic Halts 51%

DURING the first 45 days, February 15th to March 31st, of the imposition of a \$5 service charge for refueling automobiles stalled on the San Francisco-Oakland Bay Bridge for lack of gasoline, traffic stoppages on the span due to such causes were reduced approximately 51 per cent, according to Director of Public Works C. H. Purcell.

From January 1st to February 14th, inclusive, a 45-day period during which the new regulation was not in effect, there were 506 vehicles stalled on the bridge because of lack of gasoline.

Beginning February 15th and ending March 31st, a 45-day period there were 247 stalled cars, a reduction of 51 per cent.

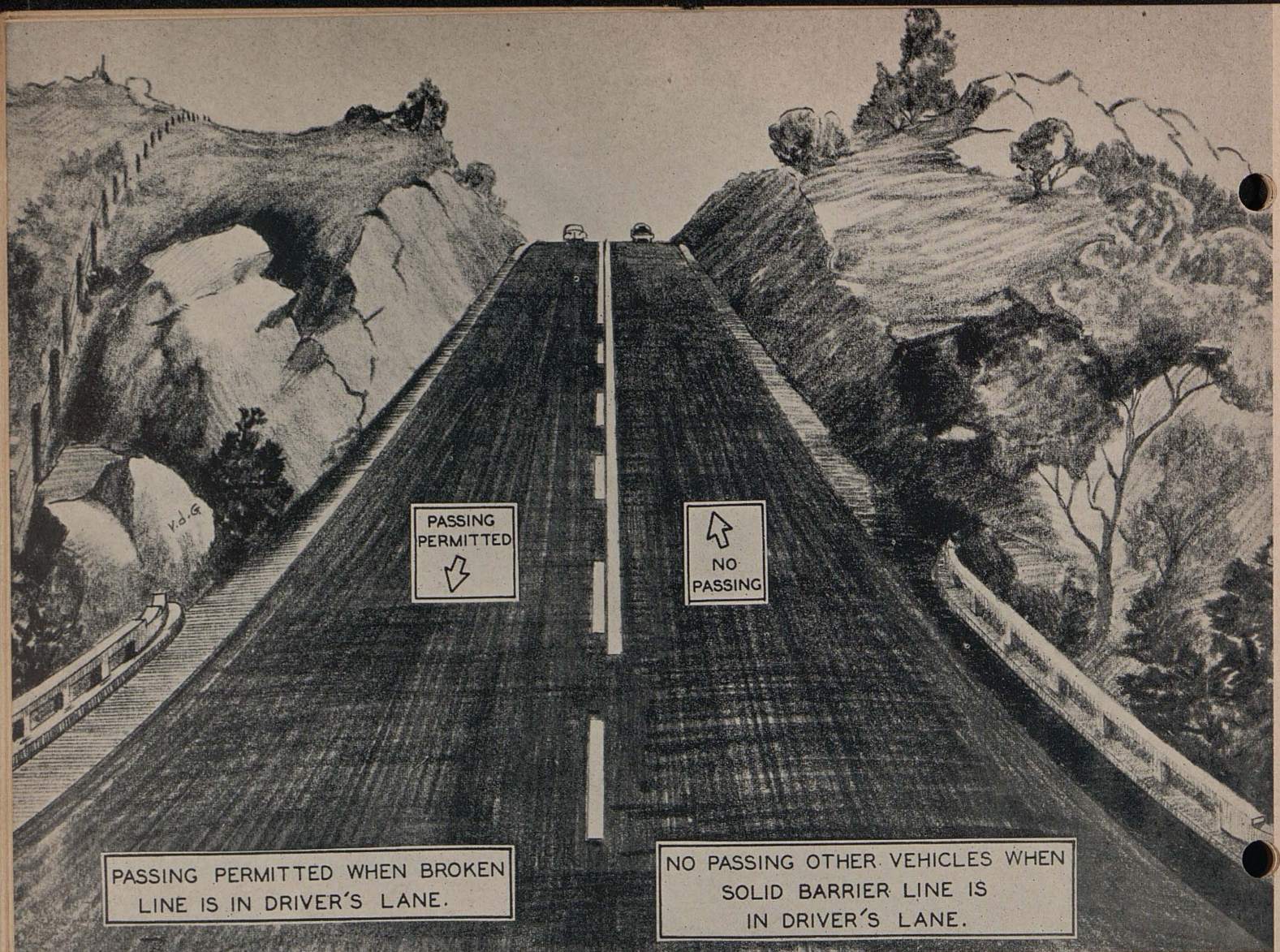
During the period January 1st to February 14th, an average of 11.24 vehicles per day ran out of gas, in each case halting traffic. During the ensuing 45 days, February 15th to March 31st, 5.49 vehicles per day were stalled for lack of fuel.

"These figures," Purcell said, "are impressive when it is considered that numerous rear-end collisions and other accidents are caused by stalled cars. In view of the large decrease in the number of traffic stoppages occasioned by fuelless motor vehicles on the bridge, the imposition of a \$5 service charge appears to be fully justified. The Department of Public Works appreciates the cooperation it is receiving from motorists."

Motorists whose automobiles stop on the bridge for lack of gas are charged 20 cents per gallon for a maximum of three gallons of gasoline in addition to the service charge.

highways through cities, and matched with Federal funds for postwar highway construction.

The improvement when completed will provide a much-needed arterial for U. S. Highway 395 on parkway standards, connecting the business section of San Diego with the inland communities to the north.



YELLOW "NO PASSING" LINE DOOMED

THE yellow "No Passing" traffic line so familiar to California motorists traveling over State highways is on its way out. Director of Public Works C. H. Purcell, pursuant to authority vested in the Department of Public Works by law and in conformity with the Federal Aid Highway Act of 1944 designed to effect, among other things, a uniform National system of highway signs and traffic control devices, has executed the required legal order to the Division of Highways calling for the immediate marking of "No Passing" zones with two continuous or solid parallel white lines where overtaking and passing slower moving vehicles is prohibited, and a combination solid and broken white line when passing is restricted to one direction for vehicles approaching a blind crest of grade.

A solid white or barrier line on the right of the broken line and in the driver's lane will indicate "No Passing."

A driver may overtake and pass a slower moving vehicle if the broken line is in the driver's lane, providing the way ahead is clear.

The California Vehicle Code provides for a distinctive pavement marking for "No Passing" zones. These zones are designated where either the volume of traffic or the vertical or horizontal curvature of the roadway renders it hazardous to attempt to drive to the left of such markings.

"It will require several months" Purcell said, "to change the markings at all 'No Passing' zones and eliminate the yellow line now used to indicate 'No Passing.' There will be a transition period during which both the present new type of markings will be in place and must legally be observed."

Report on Progress and Records in Pavement Construction During 1945

By EARL WITHYCOMBE, Assistant Construction Engineer

THE year 1945 marks the smallest mileage of high type pavement constructed by the Division of Highways since 1924. Out of a total of 427.3 miles of highway construction, only 11.5 miles were built of portland cement concrete or asphalt concrete.

The total mileage of Federal access road construction was also greatly reduced in 1945. The entire program totaled 51.0 miles, of which 7.4 miles was high type pavement, and the remainder was low type bituminous construction.

The expenditure of State funds went almost exclusively to finance the repair of existing pavements with low type bituminous surfaces. Some 416.4 miles of this work were constructed, of which 337.5 miles were plant-mixed and 4.7 miles were armor coat, the remainder being road-mixed bituminous construction. Increasing amounts of cushion courses were used to cover concrete pavements which are subject to rocking and pumping action.

The performance of thin bituminous blankets laid in the past directly on such pavements has demonstrated the need of an insulating course between the bituminous blanket and the moving foundation. Selected rocky granular material, crushed rock and crusher run are used for these cushion courses and are generally six inches thick. This type of construction has been under traffic in heavily traveled sections for a period of three years, and in no in-

stance has the result of the rocking slabs been transferred through the cushion course sufficiently to crack the bituminous surface.

Portland Cement Concrete

Information gained from the study of California pavements now in progress under the supervision of the Materials and Research Department, and from experience with experimental sections installed in this and other States, has led the department to make a radical departure from the conventional design of concrete pavements. In the future expansion joints will be eliminated entirely except for the junction of pavement and bridge end. The practice of construction in single lane widths will be continued, and the longitudinal joint will be provided with load transfer by means of tongue and groove with tie bolts at 30-inch intervals. This same construction type will be used at transverse contact joints. To facilitate installation in the separate slabs, the tie bolts will be joined together along the joint face by means of threaded couplers imbedded in the first strip poured. Transverse weakened plane joints will be installed at 15-foot intervals. The slab will be of uniform thickness with an 8-inch minimum depth, and the concrete will carry five sacks of cement to the cubic yard.

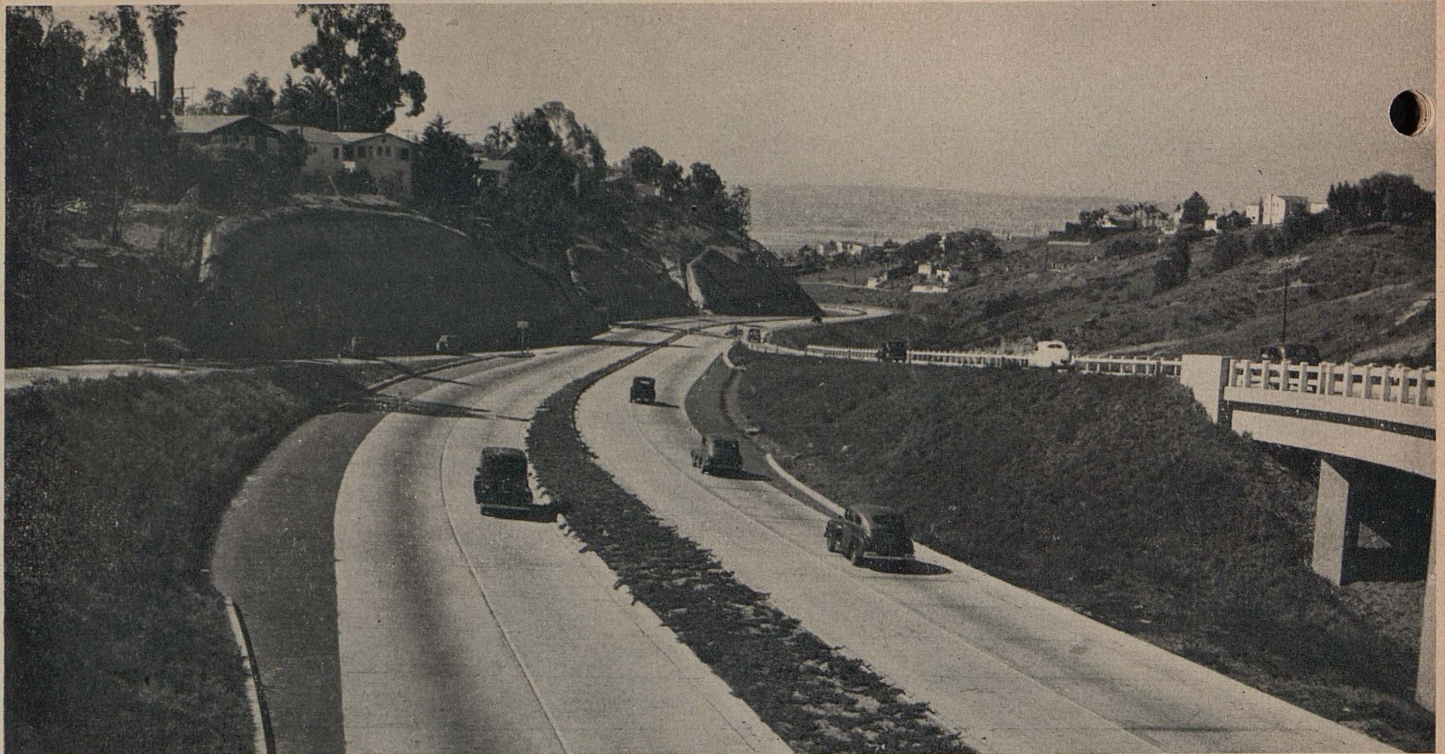
During 1945 the design adopted in 1942, which consisted of eliminating steel and dowels, and by thickening slab at expansion joints, for war construction, was used, except that the largest project for the season, in San Diego County, was constructed without expansion joints.

The principal portland cement concrete pavement laid during 1945 was in San Diego County, being a 4.5-mile access project between Palm Avenue and Coronado, Contract 11AXC4-P. Basich Bros. were the contractors, H. F. Caton, resident engineer, and W. Cattell, the street assistant. This contract had the **highest average daily output** of concrete during the year, 371.7 cubic yards per 8-hour day, the **highest average compressive strength** of concrete, 4,428 pounds per square inch, and the **smoothest riding quality** of surface with an average roughness index of 7.2 inches per mile.

There were three other small concrete projects completed during the year, totaling 1.7 miles. The average daily concrete output for the State in 1945 was 236.1 cubic yards, as compared to 425.8 cubic yards in 1944. The average strength of 28-day breaks was 4101 pounds per square inch in 1945, compared to 3876 pounds in 1944. The average surface smoothness for concrete pavement was 14.2 inches per mile in 1945 compared to 10.1 inches in 1944.

PORTLAND CEMENT CONCRETE PAVEMENT RECORDS FOR 1945

Location	Contractor	Resident Engineer	Street Assistant	Average cu. yds. laid per day	Average strength, 28 days, lbs. per sq. inch	Roughness index, inches per mile
Marin, Entrance to Hamilton Field	A. G. Raisch Co.	W. A. Rice	D. N. Sapp	146.2	3991	27.3
Alameda, University Ave.-El Cerrito Hill Overhead, Berkeley, Albany	Lee J. Immel	F. W. Montell	L. G. Marshall	119.6	3245	17.7
San Diego, Palm Ave.-Coronado (por.)	Basich Bros. Const. Co.	H. F. Caton	W. Cattell	371.7	4428	7.2
San Diego, Pacific Highway-Washington St.	Ralph O. Dixson	J. F. Jorgensen	G. S. Kibby	172.3	3713	42.7
			Averages	236.1	4101	14.2



Two 23-foot lanes of Portland cement concrete pavement on Douglass Street extension in San Diego

Asphalt Concrete

The total mileage of asphalt concrete pavements constructed during 1945 was but 4.7 miles, spread over seven short sections from 0.2 mile to 1.4 miles in length. All of the 1945 construction was laid by means of self-propelled finishing machines of the type not requiring the use of side forms.

An experimental section 0.7 mile in length was laid on Contract 5VC4, Zaca to Pismo Beach, over rocking concrete slabs, using a 2-inch course of open-graded mix similar to the old binder course formerly used under sheet asphalt pavement, and topped with a 2-inch course of asphalt concrete. Asphalt with a penetration of 85 to 100 was used in both courses. It was thought that this construction might prevent cracking and spalling of

the surface course from foundation movement.

The highest average daily output of asphalt concrete during 1945 was on Contract 10ANC10, Tennessee and Georgia Streets in Vallejo, where an average of 666.6 tons per 8-hour day were laid by Sheldon Oil Company, contractor, G. R. Hubbard, resident engineer, and G. R. Barry, street assistant. The average daily output for

ASPHALT CONCRETE PAVEMENT RECORDS FOR 1945

Location	Contractor	Resident Engineer	Street Assistant	Average tons laid per day	Average stability of surf. mix in %	Roughness index, inches per mile
Marin, Entrance to Hamilton Field	A. G. Raisch Co.	W. A. Rice	D. N. Sapp	295.8	48	50.0
San Mateo, San Bruno, Sneath Lane-Forest Lane	Union Paving Co.	W. G. Remington	E. J. Carter	359.2	51	22.2
Alameda, University Ave.-El Cerrito Hill Overhead, Berkeley, Albany	Lee J. Immel	F. W. Montell	W. Hegy	490.2	30	15.0
Alameda, Contra Costa-El Cerrito Hill Overhead-Rte. 14, Albany, Richmond	Louis Biasotti & Son	G. L. Beckwith	C. Hamma	243.9	39	14.5
Santa Barbara, San Luis Obispo-Zaca-Pismo Beach	Brown, Doko & Baun	J. C. Adams	M. Chapman	298.7	43	20.2
Solano, Tennessee and Georgia Sts., Vallejo-Route 7	Sheldon Oil Co.	G. R. Hubbard	G. R. Barry	666.6	35	42.2
San Diego, Pacific Highway-Washington St.	Ralph O. Dixon	J. F. Jorgensen	M. C. Barron	200.0	47	41.7
			Averages	341.2	39	20.4

the State was 341.2 tons, compared to 392 tons in 1944.

The **highest stability of surface mixture** was obtained on Contract ATC3, Sneath Lane to Forest Lane, with an average of 51 per cent. Union Paving Company was the contractor, W. G. Remington, resident engineer, and C. W. Snyder, plant assistant. The State average was 39 per cent, compared to 42.8 per cent in 1944.

The record for **surface smoothness** was made on Contract 4WMC5, El Cerrito Overhead to Route 14, with an **average roughness index** of 14.5 inches per mile. Louis Biasotti and Son were contractors, G. L. Beckwith, resident engineer, and C. Hamma, street assistant. The average for the State was 24.7 inches, as compared to 18.2 inches in 1944.

Bituminous Treated Surfaces

A total of 416.4 miles of this type of construction was laid in 1945, of which 411.7 miles was the mixed type

and 4.7 miles, armor coat. Of the mixed type, only 18 per cent was constructed by the road-mixed method, and 82 per cent was mixed through a plant.

Of the 337.5 miles of plant-mixed bituminous surfacing laid in 1945, 28.5 per cent was constructed with open-graded mix. This mix is somewhat new to the Division of Highways, although it has been used by other road-building agencies in California for some years. It consists of practically the same grading of coarse aggregate as the dense-graded mixtures, with the material finer than the No. 8 sieve reduced to a negligible amount. The amount of asphalt is approximately the same in both mixes. The cost of producing aggregate for the open-graded mix is somewhat greater than for the dense-graded mixture, but the bids for open-graded mix in 1945 averaged only 110 per cent of the average cost for dense-graded mix.

The 1945 record for **smoothness of riding surface on plant-mixed surfacing** was shared by two projects: Contract 7KC5, Carmenita Road to

Orangethorpe Avenue, Griffith Company, contractor, C. P. Montgomery, resident engineer; and Contract 9VC2, Mojave to Cinco, Oilfields Trucking Company, contractor, R. F. Johnson, resident engineer; each contract having an average of 9.7 inches per mile. The average for the State was 19.5 inches per mile, compared to 16.8 in 1944.

The record for **smoothness of riding surface on road-mixed surfacing** was obtained on Contract 8ASC5, 2.5 miles north of Victorville to Victorville Airport, Basich Bros. Construction Company, contractor, E. A. Bannister, resident engineer, with 17.4 inches per mile. The average for the State in 1945 was 31.2 inches per mile, as compared to 32.9 inches in 1944.

The record for **armor coat surfaces** was made on Contract 1TC9, Longvale to Laytonville, A. R. McEwen, contractor, E. F. Richardson, resident engineer, with an average of 37.8 inches per mile. The State average in 1945 was 70.4 inches per mile, as compared to 48.3 inches in 1944.

Two 21-foot lanes of asphalt concrete pavement on U. S. 40 in Alameda County, near El Cerrito Overhead



BITUMINOUS TREATED SURFACES—RECORDS FOR 1945

PLANT-MIX

Location	Contractor	Resident Engineer	Roughness Index Inches per Mile
Lassen, Horse Lake Road-Madeline	A. A. Tieslau & Harms Bros.	F. S. Saunders	19.6
Shasta, Girvan-Hospital Road	State Forces	A. A. Bigelow	15.5
Placer, Roseville-Lincoln	R. A. Westbrook	E. L. Miller	19.6
Placer, Auburn-Bear River	R. A. Westbrook	E. L. Miller	38.4
Sacramento-Yolo, North Sacto.-2 Mi. E., 1 Mi. E. of Davis-Swingle	A. Teichert & Co.	H. A. Towne	17.4
Yuba-Sutter, Morrison Crossing-Linda Corner, Yuba City-Lomo, Sutter Bypass-Tudor Road	Lester L. Rice	F. D. Hillebrand	17.9
Yolo, Davis Wye-Willow Slough, Cache Creek-3 Mi. N., Woodland-1.3 Mi. N.	N. M. Ball Sons	E. Hay	13.4
Nevada, Truckee-Farad	Harms Bros.	E. L. Miller	17.6
Glenn, Oak St., Willows-Orland	E. B. Bishop	A. C. Irish	27.9
Sacramento, Isleton-Sacramento	Sheldon Oil Co.	A. C. Irish	47.9
Yolo, Rte. 99, 0.5 Mi. S.-2.25 Mi. N. of Arcade Station, Rte. 6, Yolo Causeway-1 Mi. W. of Washington Underpass	A. Teichert & Co.	H. A. Towne	25.3
Placer-Nevada, Gold Run-Kingvale	Clements & Co.	H. A. Towne	23.0
Yolo-Colusa, Bretona-Genevra	N. M. Ball Sons	E. Hay	25.8
Colusa, Williams-2.8 Mi. East	Harms Bros.	E. L. Miller	20.1
Yuba, Wheatland-Morrison Crossing	Lester L. Rice	F. D. Hillebrand	14.4
Alameda, Oakland Airport, Maitland Drive-Earhart Road, Aux. Naval Air Station	Frederickson & Watson Const. Co.	F. W. Montell	21.1
Contra Costa, Concord-Ohmer	Lee J. Immel	G. L. Beckwith	14.9
Alameda, Mission San Jose-Warm Springs	A. S. Jones	J. H. Creed	35.1
Santa Clara, Gilroy-4 Miles southerly	Granite Construction Co.	J. H. Creed	29.1
Alameda, Warm Springs-Centerville	A. S. Jones	A. Walsh	21.2
Contra Costa, Brentwood-4 Miles southeasterly	Frederickson Bros.	H. H. Deardorff	27.4
Sonoma, Beltane-Aqua Caliente	Louis Biasotti & Son	H. A. Simard	30.3
Santa Clara, Four sections on Rtes. 5, 42 and 114	A. J. Raisch Co.	W. G. Remington	20.9
Alameda, S. J. Co. Line-Livermore, and Niles-Sunol	Clements & Co.	E. Carlstad	53.7
Napa-Sonoma, Rte. 49, Napa-Oakville, Rte. 51, Santa Rosa-Beltane	A. A. Tieslau & Son	H. A. Simard	23.6
Monterey, San Ardo-King City	A. Teichert & Co.	J. C. Adams	15.7
Santa Barbara-San Luis Obispo, Zaca-Pismo Beach	Brown, Doko & Baun	J. C. Adams	13.0
San Luis Obispo, 0.8 Mi. West of Pennington Cr.-Rte. 125	Brown, Doko & Baun	V. E. Pearson	13.4
Monterey, 2 Mi. East of Monterey-El Toro	Granite Construction Co.	G. H. Hamlin	21.0
San Luis Obispo, Various locations on Rtes. 2 and 33	Granite Construction Co.	V. E. Pearson	19.4
Madera, 6.7 Mi. N. of Madera-Merced Co. Line	W. C. Railing	R. Windele	10.0
Tulare, Quail Station-6.5 Mi. N. of Goshen	Brown, Doko & Baun	C. F. Oliphant	20.5
Kern, 1.2 Mi. S. of Famosa-1.0 Mi. N. of Famosa	Griffith Company	J. W. Cole	13.5
Tulare, 6.5 Mi.-9.5 Mi. N. of Goshen	Brown, Doko & Baun	C. F. Oliphant	20.6
Kern, 14.8 Mi.-17.8 Mi. E. of Maricopa, and 2.8 Mi.-3.8 Mi. N. of Rte. 140	Griffith Company	J. W. Cole	10.5
Kings-Tulare, Hanford-Route 4	Brown, Doko & Baun	C. F. Oliphant	11.0
Orange, At Irvine, Rte. 2, on Central Ave., and Central Ave.-Marine Base	Lewis Construction Co.	C. L. Gildersleeve	17.7
Los Angeles, El Segundo Blvd., Main St.-Sepulveda Blvd.	Vido Kovacevich Co.	W. D. Eaton	18.1
Los Angeles, Latigo Canyon-1 Mi. W. of Malibu Cr.	Schroeder & Co.	G. H. Lamb	16.5
Ventura, 0.6 Mi. N.W. of Hueneme Road-Calleguas Creek	Griffith Company	C. P. Montgomery	12.2
Ventura, City of Ventura-Ojai	Oswald Bros.	C. P. Montgomery	14.8
Los Angeles-Orange, Carmenita Road-Orangethorpe Ave.	Griffith Company	C. P. Montgomery	9.7
San Bernardino, Tippecanoe Ave., 3d St.-Base Line Rd.	George Herz & Co.	E. A. Bannister	26.4
San Bernardino, California Institution for Men at Chino	George Herz & Co.	J. M. Hollister	17.4
San Bernardino, Barstow-Field	Schroeder & Co.	B. Nelson	13.8
Riverside-San Bernardino, Riverside-Colton	George Herz & Co.	J. M. Hollister	13.3
San Bernardino, Daggett-Hector	Tanner Construction Co.	E. A. Bannister	21.8
Kern, Rte. 23-8 Mi. East of Inyokern Airport	Lewis Construction Co.	R. F. Johnson	18.9
Kern, Mojave-Cinco	Oilfields Trucking Co.	R. F. Johnson	9.7
Inyo, Fish Creek-Bishop	Basich Bros. Construction Co.	A. T. Moore	17.6
San Joaquin, Stockton-Rough and Ready Island	George French, Jr.	R. K. Wells	16.9
San Joaquin, Rte. 5, 2.5 Mi. E. of Tracy-2.0 Mi. southerly	Louis Biasotti & Son	R. K. Wells	24.8
Stanislaus, Franklyn St., Modesto-Stone Ave.	M. J. Ruddy & Son	E. L. Craun	18.3
Merced, 1.7 Mi. E. of San Luis Cr.-Los Banos, 1.7 Mi. N. of Romero School-Los Banos	Louis Biasotti & Son	E. L. Craun	14.6
San Joaquin, Stanislaus River-Manteca	A. Teichert & Co.	G. R. Hubbard	26.1
San Diego, Bay Blvd., bet. I St., Chula Vista, and Harbor Drive at 7th St., National City	Basich Bros. Construction Co.	R. C. Payne	33.6
San Diego, Orange Ave., 4th St.-1st St.	V. R. Dennis Co.	W. T. Rhodes	27.1
San Diego, Broadway-Torrey Pines Grade, Rosecrans St., Lytton St.-Canon St.	Griffith Company	W. T. Rhodes	13.2
San Diego, N.C.L. Chula Vista-S. Limits National City	R. E. Hazard Co.	M. C. Barron	21.1
Average			19.5

ROAD MIX

Location	Contractor	Resident Engineer	Roughness Index, Inches per Mile
Yuba, Yolo Co. Line-Grimes	R. A. Westbrook	F. D. Hillebrand	75.6
Kern, Lost Hills-Wasco	Oilfields Trucking Co.	J. W. Cole	47.4
San Bernardino, 2.5 Mi. N. of Victorville-Victorville Airfield	Basich Bros. Construction Co.	E. A. Bannister	17.4
Kern, Rte. 145 near Rademacher-Inyokern-Trona Road	Arthur A. Johnson	R. F. Johnson	35.6
Kern, San Bernardino Co. Line-1.5 Mi. N. of Inyokern	Clyde W. Wood	R. F. Johnson	40.0
Inyo, Beatty Road-East Boundary Death Valley National Monument	A. S. Vinnell Co.	D. J. Bouch	34.0
Inyo-Mono, Alabama Gates-Whiskey Canyon	A. S. Vinnell Co.	A. T. Moore	26.6
Imperial, S. Gate Seeley Airport-Rte. 12, Route 187-Holtville Airport	Arthur A. Johnson	R. C. Payne	33.6
Imperial, Rte. 26 N. of Calexico-Calipatria	Norman I. Fadel	R. C. Payne	23.0
Riverside, Imperial Co. Line-5.9 Mi. N. of Route 64	Arthur A. Johnson	M. C. Barron	21.9
Riverside, Desert Center-Black Butte	R. R. Hensler	M. C. Barron	29.5
Average			31.2

ARMOR COAT

Mendocino, Longvale-Laytonville	A. R. McEwen	E. F. Richardson	37.8
Napa, Veteran's Home, Yountville	Lee J. Immel	E. Carlstad	123.9
Average			70.5



This photograph shows a plant-mix surface repair project north of Buellton in Santa Barbara County

POSTWAR PROGRESS IN CALIFORNIA

(Continued from page 2)

increased from five to seven. Appointments are now made for overlapping terms, so that there will be continuity of policy in the future. The Director of Public Works became an ex officio member of the commission and its chairman. This plan was approved by the Legislature, and the State of California was fortunate to obtain the services of Mr. Charles H. Purcell as Director.

Motorists who use the San Francisco-Oakland Bay Bridge are participating in a \$5,000,000 saving which will result from refinancing of the original bond issue for this project. The interest rate on these bonds was reduced from 4 per cent to 1.9 per cent. The California Toll Bridge Authority has also paid off the bonded indebtedness of the Carquinez and Antioch Bridges, and these spans are now toll free.

Public works projects are not the solution of unemployment problems. They are, however, an important factor in any program to develop jobs. State Government may well be proud of the progress that has been made in its highway construction and public building programs and of its record of assistance to other agencies in a position to make similar plans which will produce jobs.

CALIFORNIA MISSIONS

By KENNETH C. ADAMS, Editor

San Jose de Guadalupe June 11, 1797

IN the heart of almost unknown land east of San Francisco Bay inhabited by treacherous Indians, Mission San Jose de Guadalupe was established on Trinity Sunday, June 11, 1797, and dedicated to the foster-father of Christ, San Jose.

It will be recalled that in November, 1794, the padres of Mission Santa Clara petitioned the commandante at the presidio of San Francisco for permission to go into this country in search of converts. Their request was refused on the ground that the natives were perverse and the adventure too hazardous.

However, on November 15, 1795, Ensign Hermenegildo Sal set out from Monterey with a detail of leather-jacket soldiers and accompanied by Fr. Antonio Danti to locate sites for missionary stations between Mission San Carlos and Mission Santa Clara and between Santa Clara and San Francisco. On the 17th they fixed upon a spot for Mission San Juan Bautista and then proceeded to Santa Clara where they were joined by Ensign Raimundo Carrillo.

On November 22d, they passed Alameda Creek, which Fr. Danti named Arroyo de San Clemente, and went to a point east of San Francisco Bay where, from an elevation, they could see Mission Dolores in San Francisco and Yerba Buena Island in mid-bay. Here Fr. Danti set up a cross on the elevation which he called San Francisco Solano.

NEW MISSION APPROVED

Fr. Fermin Francisco de Lasuen, Presidente of the Missions, on January 12, 1796, recommended to Governor Borica that a mission be established on Fr. Danti's site and in February the Governor forwarded Fr. Lasuen's recommendation to Viceroy Branciforte in Mexico City together with a petition for authority to found four other missions.

The Viceroy gave his approval on August 19, 1796, an appropriation was made from the Pious Fund for the five additional stations and 10 friars vol-

Mission Meccas

California's famous old missions with their historical and romantic background annually attract thousands of visitors. Twenty-one Franciscan missions were founded by the Reverend Fray Junipero Serra and his colleagues, extending from San Diego to Sonoma. On his way north from San Diego, Father Serra and the mission padres who came after him followed a course which became known as El Camino Real, "The King's Highway." El Camino Real retains to this day its original name and is designated U. S. 101. Along this highway and short distances from it, the founding padres established their missions. U. S. 101, the old "King's Highway," now extends from the Mexican border into northern Washington.

Present day State highways lead to all the mission sites. Now that the war is ended, California looks forward to again welcoming tourists from all over the world. With the resumption of normal automobile travel, it is believed that the missions will be popular meccas for visitors to the Golden State.

Anticipating this traffic, the Division of Highways is publishing in California Highways and Public Works brief histories of the missions with directions on how to reach them over State highways. For the purpose of this series, the missions are taken up in the order of their locations from south to north, rather than in the sequence of their founding.

This is the tenth of the series.

unteered for California service. On May 5, 1797, Fr. Lasuen informed Borica that the new missionaries were on their way and that the work of founding the missions might begin.

Says Fr. Zephyrin Engelhardt, mission historian:

"The Governor immediately directed the commandante at San Francisco to detail Corporal Alejo Miranda and five men for the new mission of San Jose. On June 9th, Fr. Lasuen and Sergeant Pedro Amador with a party of soldiers started out from Santa Clara for the spot known as San Francisco Solano. Here on Trinity Sunday, June 11th, he raised and blessed the cross. In a shelter of boughs he celebrated Holy Mass, and thus dedicated the mission in honor of the foster-father of Christ, San Jose. On the same day Fr. Lasuen returned to Santa Clara and reported the event to the Governor. The first missionaries appointed for San Jose were Fr. Isidoro Barcenilla and Fr. Augustin Merino."

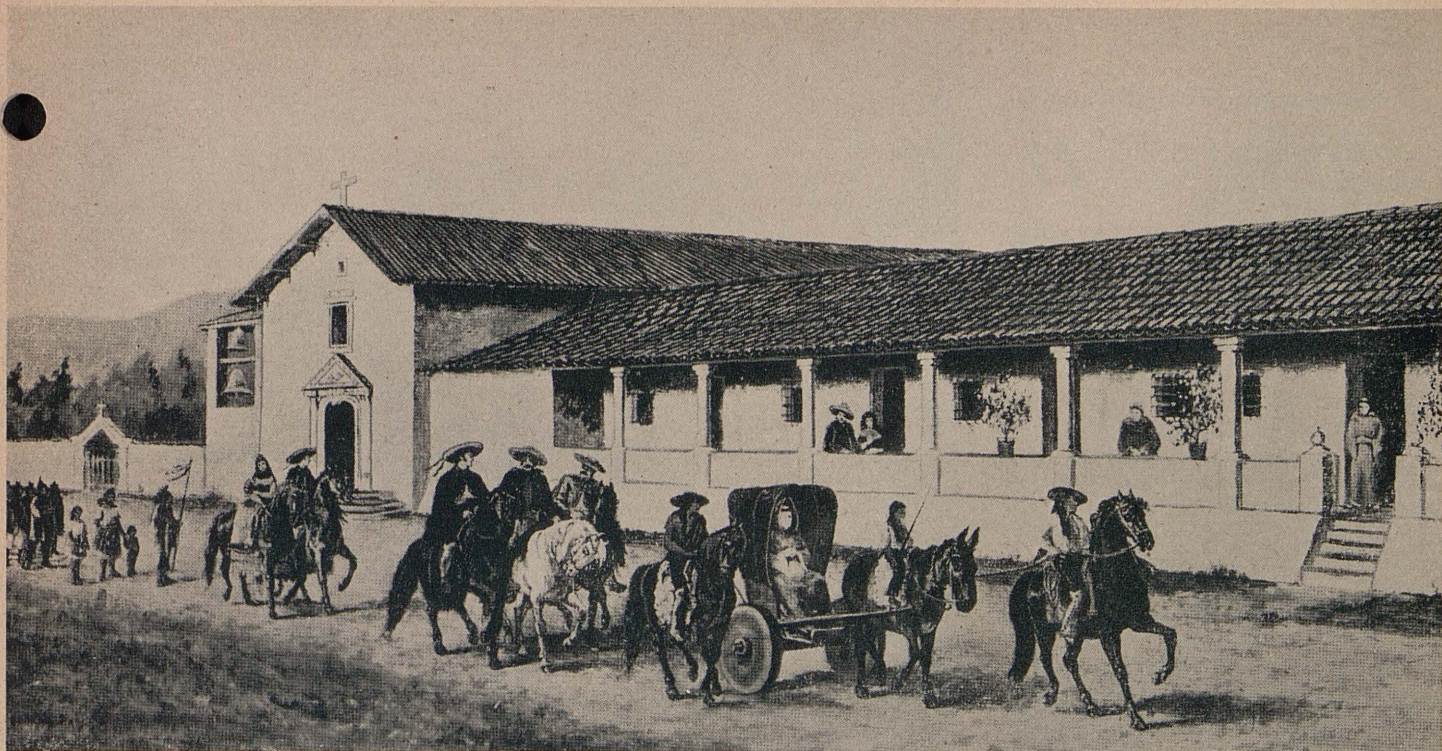
UNRULY INDIANS

While it never grew to extensive proportions, Mission San Jose in 1831 had the greatest number of neophytes of any other California mission with the exception of San Luis Rey. It had 1,866 persons on its rolls. Crops averaged 1,630 bushels annually during the period of its existence from 1797 to 1834. Its total number of baptisms during that time was 6,737; marriages numbered 1,984 and there were 5,109 burials.

In nine years' time, the mission furnished \$15,125 worth of supplies to the San Francisco presidio.

George Wharton James says that the mountain Indians near San Jose did not like the presence of the missionaries, consequently the padres were apprehensive of trouble from the start. However, there was no serious trouble until January, 1805, when Fr. Cueva was called upon to visit some sick neophytes on a rancharia some 15 miles east of the mission. He went to see them escorted by Major-domo Higuera and two soldiers. The party was set upon by hostile natives. Higuera was killed, a soldier badly wounded, three neophytes and the expedition's horses killed and Fr. Cueva was badly beaten up, barely escaping with his life.

The remaining soldier killed one of the Indians and managed to get the padre back to the mission. A report



This was Mission San Jose de Guadalupe in the days when peace and prosperity reigned. Reproduction of an old etching

of the affair was sent to San Francisco and an armed force under Sergeant Peralta, reinforced by 34 settlers from San Jose, pursued the fleeing Indians, killed 11 of them and captured 30, mostly women. Peralta made another foray in February, but found the natives submissive and repentant. One chief came from as far away as the San Joaquin River to tell the sergeant that he and his people had taken no part in the attack on Fr. Cueva.

EXPLORE INTERIOR

Von Langsdorff in his "Voyages," published in London in 1814, tells of a visit he made to Mission San Jose in April, 1806. He wrote:

"Every year military expeditions are sent out to obtain a more exact knowledge of the interior of the country, with a view, if possible, of establishing, by degrees, a land communication between Santa Fe and the north-west coast of America. While I was at the Mission of St. Joseph, 13 soldiers, with a sergeant and corporal, arrived there on their return from one of these expeditions. These people asserted that they had penetrated between 80 and 90 leagues into the country, and had arrived in the neighborhood of a high and widely extended chain of hills, covered with eternal snow; this chain is known to the Spaniards under the name of the

Sierra Nevada, or Snowy Mountains. The river, or rivers of St. Francisco and another stream which flows into the sea near St. Michael, must have their sources in these mountains.

"Individual inhabitants of the Sierra Nevada affirm that three or four days journey eastward of this chain, they have seen men with blue and red clothing, who entirely resembled the Spaniards of California; they were very probably soldiers of Santa Fe, who had been sent on a similar expedition from the Eastern Coast, to examine the interior of the country westwards.

"According to this information, the Spaniards, between the thirty-fifth and thirty-eighth degrees of latitude on the different sides of the continent, must have come pretty near to each other; a probability is thus afforded, that, in time, a regular inland communication may be established between Santa Fe and St. Francisco."

PROSPEROUS TIMES

Of the mission buildings, Langsdorff wrote:

"Although it is only eight years since they were begun, they are already of very considerable extent: the quantity of corn in the granaries far exceeded my expectations . . . The kitchen garden is well laid out, and kept in very good order; the soil is

everywhere rich and fertile, and yields ample returns. The fruit-trees are still very young, but their produce is as good as could be expected. A small rivulet runs through the garden, which preserves a constant moisture. Some vineyards have been planted within a few years, which yield excellent wine, sweet and resembling malaga.

"The situation of the mission is admirably chosen, and according to the universal opinion, this mission will in a few years be the richest and best in New California. The only disadvantage is, that there are no large trees very near. . . . To compensate this disadvantage, there are in the neighborhood of the mission chalkhills, and excellent brick earth so that most of their buildings are of brick. The organization of the institution is entirely the same as at San Francisco. The habitations for the Indians, las rancherias, are not yet finished, so that at present they live chiefly in straw huts of a conical form."

EXPEDITION UP SAN JOAQUIN

The new church at Mission San Jose was completed on April 23, 1809, and Fr. Presidente Estevan Tapis, who had succeeded Fr. Lasuen, blessed it. The following day he preached an inspired sermon and Fr. Arroyo de la Cuesta said mass before a gathering of priests,

soldiers, citizens of the pueblo of San Jose and a large congregation of neophytes.

The zealous padres of the mission, Fr. Fortuni and Fr. Abella in 1811 went on a trip of exploration to the Sacramento and San Joaquin Valleys. They found the Indians peaceful and recommended that a mission be established on the shores of the Sacramento. This never was done.

In 1817 an expedition under Sergeant Soto with 100 neophytes from the mission and 12 soldiers from San Francisco went in pursuit of hostile Indians who had fled up the San Joaquin River. Soto reported that they encountered a thousand natives on an island in the river who immediately attacked them. Soto's forces killed many of them and lost only one neophyte.

James tells of the expedition against Chief Estanislao in 1826. He wrote:

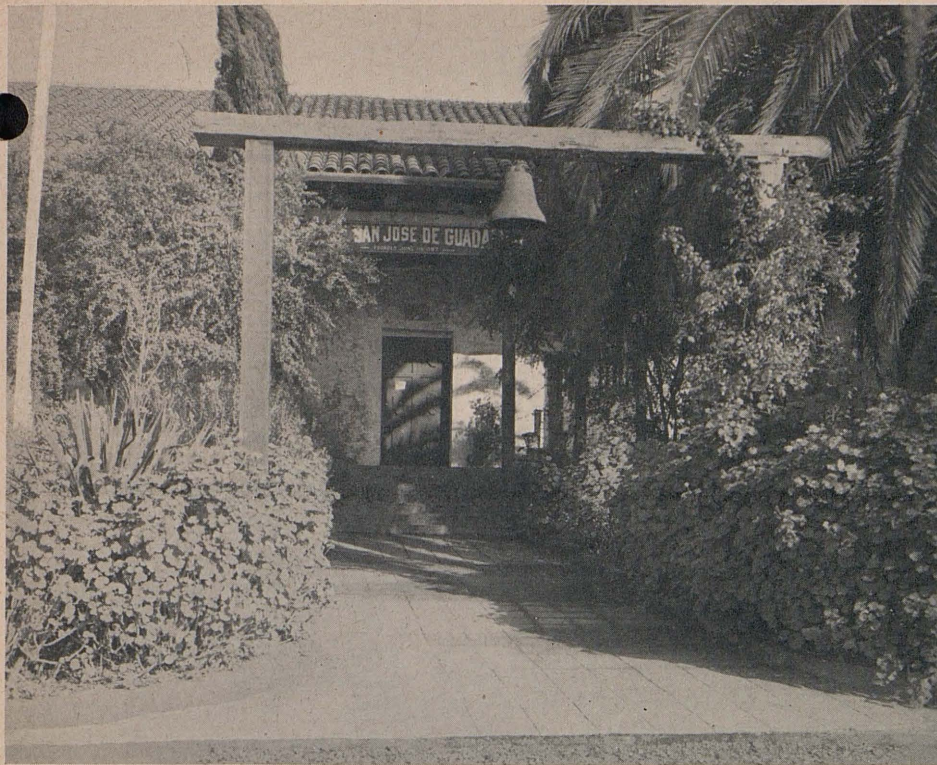
"Owing to its situation, being the first mission reached by trappers, etc., from the East, and also being the nearest to the valleys of the Sacramento

and San Joaquin, which afforded good retreats for fugitives, San Jose had an exciting history. In 1826 there was an expedition against the Cosumnes, in which 40 Indians were killed, a rancharia destroyed, and 40 captives taken. In 1829 the famous campaign against Estanislao, who has given his name to both a river and county (Stanislaus), took place. This Indian was a neophyte of San Jose, and being of more than usual ability and smartness was made alcalde. In 1827 or early in 1828 he ran away, and with a companion, Cipriano, and a large following, soon made himself the terror of the rancheros of the neighborhood. One expedition sent against him resulted disastrously, owing to insufficient equipment, so a determined effort under M. G. Vallejo, who was now the commander-in-chief of the whole California Army, was made. May 29th he and his forces crossed the San Joaquin River on rafts, and arrived the next day at the scene of the former battle. With taunts, yells of defiance and a shower of arrows, Estanislao met the

coming army, he and his forces hidden in the fancied security of an impenetrable forest. Vallejo at once set men to work in different directions to fire the wood, which brought some of the Indians to the edge, where they were slain. As evening came on 25 men and an officer entered the wood and fought until dusk, retiring with three men wounded. Next morning Vallejo, with 37 soldiers, entered the wood, where he found pits, ditches, and barricades arranged with considerable skill. Nothing but fire could have dislodged the enemy. They had fled under cover of night. Vallejo set off in pursuit, and when two days later he surrounded them declared they would die rather than surrender. A road was cut through the chaparral with axes, along which the field piece and muskets were pressed forward and discharged. The Indians retreated slowly, wounding eight soldiers. When the cannon was close to the enemies' intrenchments the ammunition gave out, and this fact and the heat of the burning thicket compelled retreat. During the night the

Mission San Jose as it is today, restored and an attraction to Californians and out-of-State visitors alike





One enters Mission San Jose under this vine-covered arbor

Indians endeavored to escape, one by one, but most of them were killed by the watchful guards. The next day nothing but the dead and three living women were found."

JEDEDIAH SMITH ARRIVES

In 1826, Jedediah Smith came to California from Great Salt Lake and was received with suspicion by the officials of California, who resented the intrusion of outsiders. Smith finally arrived at Mission San Jose and later was accused by Fr. Duran of enticing 400 of his neophytes to run away. The charge was not substantiated. Smith, as history records, returned across the Sierras to Salt Lake, the first to make the trip. His party was compelled to eat all its horses to escape starvation.

The mission was secularized in 1836-37 and M. G. Vallejo was named administrator, serving until 1840, when he was succeeded by Jose Maria Amador. An inventory placed a value of \$155,000 upon the mission property, not including the church and church ornaments. When Governor Micheltorena returned the missions to the Franciscans in 1843 the padres made an effort to recover their herds of cattle and horses and other assets, but failed. The fields were overrun with weeds and neglected. The missionaries were sur-

rounded by devastation and asked to be relieved. On May 5, 1846, Governor Pio Pico, who sold all but one of the missions to private individuals and friends, disposed of Mission San Jose to Andres Pico and J. B. Alvarado for \$12,000.

An earthquake destroyed the chapel in 1868. The new chapel was built on the foundations of the old, but in no way resembled it. A portion of the old monastery remains and efforts have been made at restoration. In 1884 an orphanage was erected for young men who wished to study for the priesthood and in 1891 a modern orphanage took its place and is conducted by the Dominican Sisters. Some of the old olive trees planted by the early padres remain.

Mission San Jose is about 15 miles north of the city of that name and is easily reached by auto or bus. The visitor may go from Oakland over a splendid State highway, U. S. 101 E, or from San Francisco to Redwood City, thence to Niles and four miles southwest to the mission. Or by Southern Pacific from San Francisco to Irvington and thence by bus to the mission. San Joaquin Valley visitors will go from Stockton to Livermore thence on State Highway No. 5 and southwest on State Route 108 to the mission.

San Francisco de Assisi October 9, 1776

WHILE historians generally use October 9, 1776, as the date of the founding of Mission San Francisco de Assisi, better known as Mission Dolores, Fr. Zephrin Engelhardt, noted mission historian, fixes June 29, 1776, as the day on which this, the sixth of the early Franciscan missionary stations, was established and seemingly proves it by old records, as we shall see.

Fr. Engelhardt says that divine Providence appears to have singled out the region around the great inland harbor of northern California for the scene of Indian missionary activity under the patronage of the Seraphic St. Francis. The story of the discovery of San Francisco Bay reads like fiction. It first was related by Fr. Francisco Palou, the biographer of Fr. Junipero Serra, who wrote in his diary:

"When, late in 1768, the venerable Fr. Junipero Serra consulted the Inspector General, Don Jose de Galvez, on the first three missions which Galvez had directed him to establish in Upper California and observed the names of the patron saints that were to be assigned, he said to him: 'Is there then to be no mission for our Father San Francisco?' Don Jose de Galvez replied: 'If San Francisco wants a mission, let him cause his port to be discovered, and it will be placed there.'"

PORTOLA EXPEDITION

Fr. Palou tells of the expedition of Gaspar Portola which, after the founding of Mission San Diego in July, 1769, went north in search of Monterey Bay. Says Fr. Palou:

"The expedition went up; it reached the port of Monterey; it halted and planted a cross there, yet not one of those who went along recognized it, although they made out all the landmarks in the history. They continued forty leagues farther; came to the Port of San Francisco; and at once all recognized it from the conformity with the description which they had brought along. In view of this what else must we say than that our holy Father wanted a mission at this port."

However, the famous bay discovered by Portola was not the Port of San Francisco known to Galvez. It was entirely unknown to the Spaniards. In 1595, Sebastian Rodriguez Cerme-



Chapel structure of old Mission San Francisco de Assisi, now known as Mission Dolores, which, in restored condition, is a part of the present day Mission

non, a Portuguese navigator, set sail from Manila under royal Spanish orders to explore the coast of California and on November 6 of that year he cast anchor in a little bay behind a point of land later called Punta de los Reyes and gave to it the name of Bahía de San Francisco in honor of Saint Francis of Assisi.

SAN FRANCISCO BAY

Of the present San Francisco Bay nothing was known to the world till 173 years later. When the members of the Portola expedition sighted it on October 31, 1769, they believed it to be the bay Cermenon had discovered. Some years later, after a number of explorations had been made on the San Francisco peninsula and through what now are Alameda, Contra Costa and Marin counties, the Spaniards transferred the name San Francisco from the little bay at Point Reyes to the world-renowned body of water that now is San Francisco Bay and on its western shore established Mission Dolores.

Monterey Bay having been located in May, 1770, by Portola's second land expedition and a sea expedition of which Fr. Serra was a member, Viceroy Carlos Francisco de Croix of Mexico ordered a survey of San Francisco Bay region in order to find a site for a mission. Portola had turned military control of California over to Lieutenant Pedro Fages and in March, 1772, Fages and Fr. Crespi left Monterey for San Francisco. After wandering over considerable territory, the party returned to Monterey.

On November 23, 1774, a second exploring force under command of Captain Fernando Rivera y Moncada and accompanied by Fr. Palou set out from Monterey for San Francisco. On December 4th the Spaniards camped on the side of a hill at the foot of which ran a stream which formed a lake that extended to the ocean beach, and was called Lake Merced.

DISCOVER POINT LOBOS

"An hour later," says Fr. Engelhardt, "Captain Rivera, Fr. Palou and

four soldiers went toward the northwest over hills and dales and with difficulty waded through sand dunes down to the shore. Thence they went northward until, in sight of the now famous Seal Rocks, they were stopped by a steep hill, which is identical with the present Sutro Heights. They ascended, and after a while found themselves on the summit of Point Lobos and in full view of the Golden Gate or channel to San Francisco. Observing that the steep declivity was at the very entrance of the channel and that no Spaniard or Christian ever had set foot on its summit, Rivera and Fr. Palou resolved to plant the Standard of the Cross there. It was accordingly constructed of strong round timber and raised on the spot where it could be seen from the shore. Thereupon the little party returned to camp."

The expedition retraced its march to Monterey arriving there on December 13, 1774.

That same month, the Viceroy ordered Captain Juan Bautista de

Anza to proceed overland from Sonora, Mexico, to Monterey, there recruit troops and take them and their families to San Francisco to colonize that region and protect the mission it was proposed to found there. Fr. Pedro Font accompanied the party. Fr. Font recorded in his diary that the expedition upon arriving at San Francisco came upon a lovely creek which, because it was Friday, the feast of our Lady of Sorrows—Nuestra Senora de los Dolores—was named the Arroyo de los Dolores.

In May, 1776, Lieutenant Jose Joaquin Moraga was ordered to proceed to San Francisco from Monterey with a party of colonists and Fr. Serra sent Fr. Palou and Fr. Cambon with him.

Fr. Engelhardt quotes from Fr. Palou's diary as follows: "On June 27th the expedition arrived near its

destination. The commander ordered camp to be pitched on the bank of a lagoon which Senor Anza had named Nuestra Senora de los Dolores. * * *

On the day after our arrival, the commander ordered an enramada (arbor) to be constructed which was to serve as a chapel for celebrating the holy Sacrifice of the Mass. On an altar erected within I celebrated the first holy mass on June 29th, the feast of the great holy Apostles St. Peter and St. Paul. My companion missionary celebrated holy mass immediately after, and we continued celebrating holy mass there every day for an entire month until the camp of soldiers was transferred to a site near the landing place."

"Hence," says Fr. Engelhardt, "June 29, 1776, five days before the Declaration of Independence of the

United States, was really the date of the founding of the Mission Dolores or San Francisco de Assisi, although officially other dates are reported."

On July 26th, the troops and colonists removed to a site selected by Colonel Anza and immediately began to build barracks and houses. On July 28th, Fr. Palou celebrated the first holy Mass on the military site, "which day, therefore," says Fr. Engelhardt, "might be regarded as the date of the founding of the Presidio of San Francisco."

Sailors from the San Carlos, which had arrived from Mexico with supplies, were assigned to help the padres to erect the mission building. The chapel was blessed on October 3d and on October 9th the ceremony of formally opening the mission was performed.

(Continued on page 29)

San Franciscans are prideful of their Mission Dolores which is shown in this recent photograph



Bridge Maintenance Practice On California Highway System

By O. M. UHL, Associate Bridge Engineer

THERE are 4,636 bridges on the California State Highway System, omitting culverts. Of this number 3,142 are built of steel and concrete, 1,394 of timber or steel with timber approaches and 100 are steel bridges with timber deck systems. The estimated value of these bridges exclusive of State-owned toll bridges is \$125,000,000.

The protection of this investment and the maintenance of the bridges in such condition that they will best serve the traveling public is a duty of the Bridge Department of the Division of Highways. Within the Bridge Department, maintenance work is handled directly by the Maintenance and Research Section. Methods of repair and maintenance as developed and field tested by this section over a number of years have included several practices that are worthy of note and should be of interest to the engineers and construction men engaged in this work throughout the Country.

There will be no attempt made to enumerate all maintenance problems encountered, but the more important features of the work, with illustrations, will be covered in a series of articles, of which this is the ninth. It deals with Concrete Disintegration.

THE disintegration of concrete on California bridges located at high altitudes is presenting an aggravating and difficult bridge maintenance problem. Generally, it has been found that railings and curbs are more seriously affected than other bridge members. Efforts to preserve and repair these members have been quite discouraging thus far; a forthright solution of the problem has not been obtained.

The States of Oregon, Nevada and others have reported similar evidences of deterioration due to weathering at high altitudes. Mr. F. H. Jackson of the Public Roads Administration has written a very inter-

esting and comprehensive article covering this subject in the 1945 April-May-June issue of *Public Roads*. His illustrations of failures in neighboring Western States are similar to those experienced on California bridges.

Failures due to cement alkali-aggregate reaction will be referred to only briefly in this article. Mr. T. E. Stanton, Materials and Research Engineer of the California Division of Highways, has made exhaustive studies* in connection with this type of disintegration which has occurred in various locations in California.

* See *Proceedings of the American Society of Civil Engineers*, dated December, 1940.

The subject of concrete deterioration will be discussed under the following headings:

- (a) Experiences on California bridges.
- (b) Repair of deteriorated surfaces.
- (c) Problem of weathering.
- (d) Recommendations for new bridges.
- (e) Use of air-entraining cement.
- (f) Conclusion.

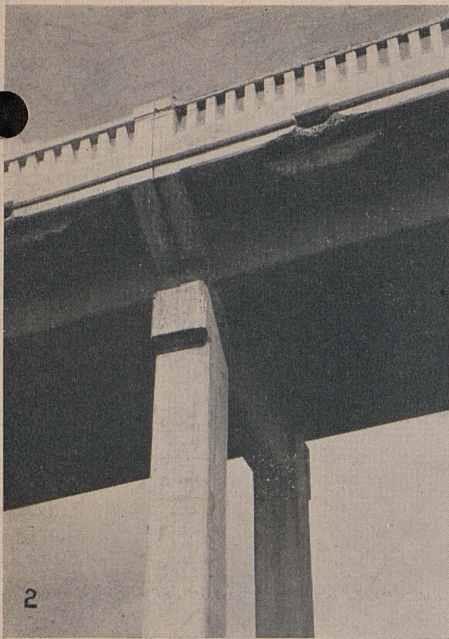
EXPERIENCES ON CALIFORNIA BRIDGES

Concrete disintegration due to freezing and thawing frequently occurs in the higher altitudes of the State and is common to most concrete aggregates regardless of source. Efforts have been made to trace the cause to reactive aggregates, but this is believed to be only one of the contributory factors in this type of deterioration.

A climatic study covering a period of 26 years at Truckee shows the temperature to have varied from -28 degrees to 101 degrees F. The average annual precipitation was about 26 inches. At Soda Springs, which is three miles west of Donner Summit, it was nearly 46 inches over a 40-year period. Truckee and Soda Springs are at 5,818 feet and 6,752 feet elevation, respectively. In 1938 there were 178 days at Soda Springs, during which the temperature rose to at least 38 degrees F. and dropped below 32 degrees F. This represented 178 cycles of freezing and thawing during one year. Frost occurs as late as June 20th and as early as August 20th,

Truckee River Bridge near Polaris on U. S. Highway 40





Chipped edge of curb of Polaris Bridge may be seen under railing

which gives some indication of the problem of construction relative to the freezing of green concrete at these high altitudes.

POLARIS BRIDGE

Among the first bridges to require treatment and repairs caused by weathering aggravated by reactive aggregates, was the Polaris bridge over the Truckee River (Photo No. 1). It is located on U. S. Highway Route 40 about four miles east of Truckee. The structure was designed and constructed under State supervision and completed in 1925. During 1937 repairs to the railings and curbs became necessary due to weathering. The spalled edges of the curbs and railings were chipped off and replaced with mortar, and the scuppers were plugged (Photo No. 2). However, shrinkage cracks soon appeared in these patches, and in other cases, the old concrete failed on the sides and behind the patches. The concrete in the curbs and railings closely resembles chalk, has a light grey color, and a moderate blow with a prospector's pick will sink about one-half inch into the distressed concrete.

During more recent years the concrete deterioration on the Polaris bridge has advanced considerably (Photo No. 3). Portions of the arch ribs (Photo No. 4), particularly at the construction joints, and edges and corners of the columns and caps, have

disintegrated rapidly. Last year major repairs were proposed for all distressed members, but this work was postponed on account of the war. It is now planned to perform this work during the summer of 1946.

EXAMPLES OF DISTRESS

Examples of distress and failures in concrete railings on other bridges at high altitudes are shown in Photographs Nos. 5, 6, 7 and 8. These railings have now been treated with proprietary cement paints, with the exception of the Donner Creek bridge railing which was replaced with a timber railing. The proprietary cement paints were applied in 1944 and 1945, and sufficient time has not elapsed in which to draw accurate conclusions as to the effectiveness of such paints.

REPAIR OF DETERIORATED SURFACES

Numerous methods have been proposed and several of these have been applied, in the attempt to seal surfaces affected by pattern checking and minor crazing. A listing and discussion of some of these treatments follows:

1. Use of gunitite or shotcrete.
2. Sealing of surfaces with cement paints.
3. Impregnation with bituminous and related products.
4. Protection with linseed oil, water glass and oil base paints.

(1) Gunitite has been used extensively for repairing and preserving concrete structures damaged by all types of disintegration, but it has not

been used on California bridges subjected to failures brought on by weathering. It has not been used to repair railings and curbs due to the small sections found in such members. Bringing in equipment and setting it up on a small bridge, together with the excessive waste of materials generally, makes the cost of this method of repair relatively high.

CEMENT PAINTS

(2) Cement paints, where they have been applied to date, have been rather unsatisfactory in repelling the effects of severe weathering on concrete surfaces. Several such paints were applied during 1945 and first observations of results will be made this spring and summer. Those applied earlier have not given the satisfaction expected. Cleaning of deteriorated surfaces, before application of these paints, is very important. It usually requires sandblasting (as recommended by manufacturers of most proprietary paints) to insure proper adhesion to the old surfaces. When acids and caustics are used for cleaning purposes, the thorough removal of the residues which are formed is imperative to insure effective results.

The use of a proper brush is important in the application of cement-water paints. Wide paint brushes or white-wash brushes may be used to obtain satisfactory results for paint applications. In order to obtain good appearance, care should be exercised in applying the final coat.

ADEQUATE CURING

Provisions for adequate curing are essential. Burlap may be draped over the surfaces, after the initial set has

This photo shows concrete deterioration on Polaris Bridge



been attained, and water-saturated as required by prevailing atmospheric conditions. Approved colorless curing membranes are also available and are satisfactory if properly applied.

There are a great many proprietary admixtures available for use with cement-water and mortar paints. A number of these admixtures have been used on our bridges, but have not thus far lived up to expectations.

The U. S. Department of Commerce has published a report (BMS 95) which gives results of a series of permeability tests made on waterproofing products for masonry walls. A large number of different types of paints were tested in this series of experiments, among which were cement coatings (with and without admixtures), proprietary products and asphaltic membranes.

WATERPROOFING CONCRETE

(3) Petroleum products may be used for waterproofing concrete. They have been used by the Bridge Department, particularly for sealing the top surfaces of subway slabs. There are products of bituminous rubber composition which possess: (a) Elasticity; (b) noncracking qualities when subjected to variations in temperature; and (c) resistance to flow at relatively high temperatures. Federal specification SS-F-336 has been written to cover these products.

(4) The Oregon State Highway Department has had success with applications of linseed oil,* and standard white lead and oil paints on deteriorated concrete surfaces. A reference to this treatment may be found in the Public Roads magazine mentioned earlier in this article. Here, again, the need of thorough cleaning can not be over-emphasized. All loose materials, dust, old paint, etc., must be completely removed to insure success.

The State Maintenance Department has used lacquers and standard guard rail (white lead and oil) paints frequently on bridge end posts, tops of railings, and curbs. However, the primary object for its use is visibility. These paints weather rapidly and soon flake off. The problem of renewing them requires a large amount of cleaning and is relatively expensive.

USE OF SODIUM SILICATE

Sodium silicate (water glass) and lacquer have been used for the protec-

* First suggested by Portland Cement Association.



Portions of arch ribs of Polaris Bridge have disintegrated

tion of concrete with hair checks and incipient disintegration. After cleaning, the surfaces were treated with five coats of sodium silicate diluted with water in a ratio of 1:5 for the first coat and gradually decreased to a ratio of 1:2 for the last coat. These coats were applied after successive intervals of 24 hours. Finally, the surfaces were painted with white traffic lacquer. This method fails to provide a sufficiently adequate seal. The lacquer

must be renewed about every three years.

PROBLEM OF WEATHERING

The problem of weathering of concrete is controversial; many solutions and explanations have been advanced regarding it. The disparity between the effects of weathering of railings and curbs, as compared with other bridge members is a subject of even greater speculation. The reasons why

certain aggregates have failed at high altitudes, and on the other hand, have proved satisfactory in localities with milder climates, have not been definitely proved. There are bridges at high altitudes which are old and have not suffered from weathering. Why the design and fabrication of these structures, and the aggregates used in them, have resulted in greater permanency is problematical.

Some of the reasons for the disparity referred to in the last paragraph are:

CURBS MORE EXPOSED

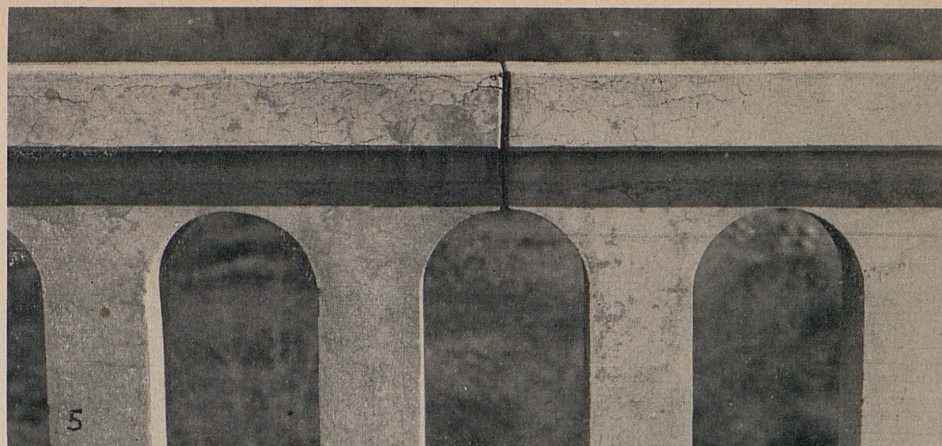
(1) The members of handrails and curbs are more exposed to the elements, are thin, and have a larger surface area per unit volume than other bridge members. Therefore, the elements have a greater and freer opportunity to attack them.

(2) Early specifications often required a richer concrete mix in railings. Seven sack, and sometimes even richer mixes were used to promote workability and permit the use of higher slumps. Naturally, concrete of these rich mixes promoted shrinkage, checking and more serious retrogression. This type of deterioration has been particularly severe at high altitudes.

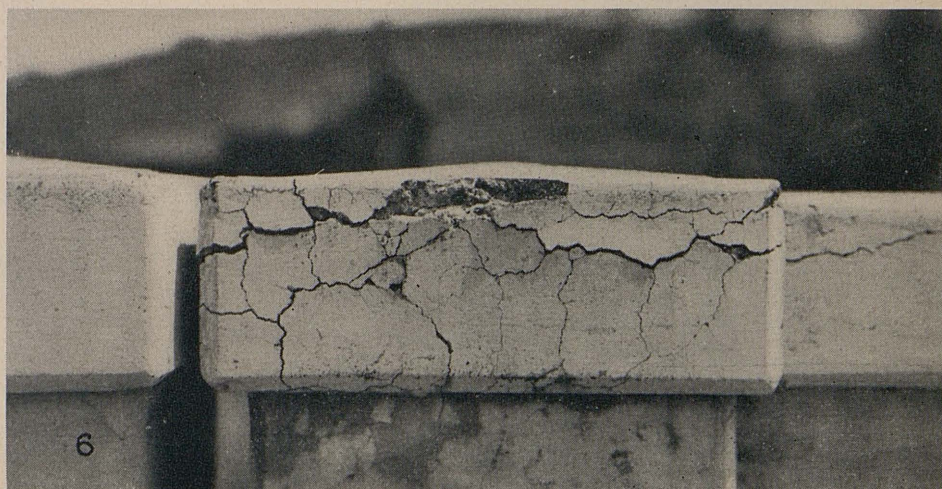
(3) The surfaces of concrete railings and curbs receive special hand finishes which alter the surface texture and result in nonuniformity. This causes differentials in volume changes, due to moisture absorption and temperature variations, and leads to pattern checking and crazing. In this regard, it is interesting to observe that certain prefabricated railings (diamond-shaped) on a number of old bridges have withstood the effects of weathering remarkably well. Examination of such railings shows that their surfaces have a uniform, rough, sandy texture. This is striking proof of the need of uniformity and elimination of unnecessary troweling and over working of concrete.

COMMON METHODS OF CURING

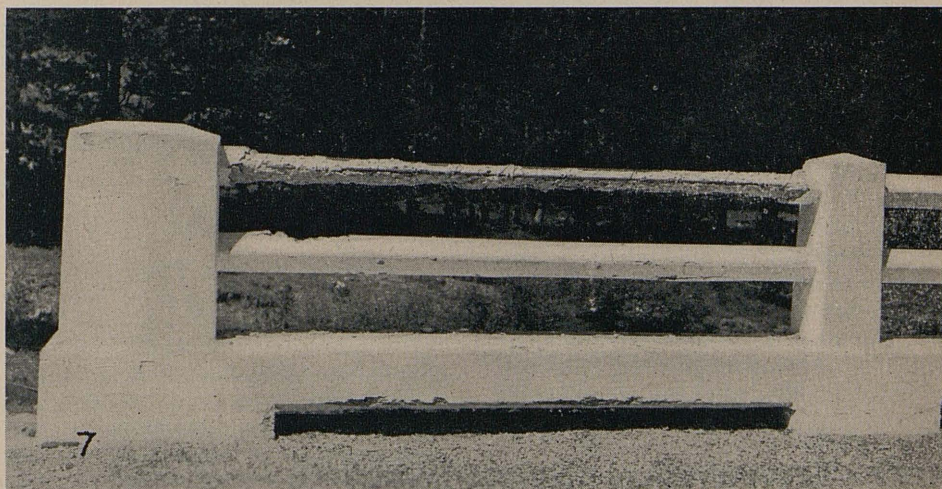
The common methods of curing railings and curbs is generally inferior to that used for roadway slabs, girders, piers and abutments. Slabs on bridges are usually kept continuously wet by ponding or other approved methods. Forms are allowed to remain on the faces of girders, piers, etc., for stipulated periods to provide proper curing. Railings and curbs usually do not receive equally effective curing.



Shasta River Bridge on U. S. Highway 99 in Siskiyou County



Ash Creek Bridge on U. S. Route 299 in Modoc County



Donner Creek Bridge on State Route 38 in Nevada County

(4) Concrete cast in handrails is designed from smaller sized aggregates than that used in heavier sections. This leads to larger proportions of sand and higher water-cement

ratios. These sacrifices in the design of concrete mixes result in inferior concrete, other factors being equal.

(5) As stated earlier in this article, the probability of encountering freez-

ing weather at high altitudes during construction is very likely. Even the best and most carefully prepared construction schedules oftentimes can not be maintained for reasons beyond the control of the engineer and the contractor. Consequently, some of our bridges constructed by the various public agencies* may have had failures caused by the freezing of green concrete. As curbs and railings are frequently poured late in the fall, they are particularly vulnerable to this condition. Precautions should be taken to protect them, especially the railings.

RECOMMENDATIONS FOR NEW BRIDGES

As a result of past experiences, it is apparent that the following precautions and improvements should be adopted for concrete placed at high altitudes:

(1) Provide better uniformity. Do not over vibrate and work concrete excessively. Avoid special surface finishes, unnecessary troweling and flushing of mortar to surfaces.

Mr. F. R. McMillan of the Portland Cement Association has made a pertinent suggestion in regard to placing concrete at the tops of construction joints, which will produce more durable concrete in these locations. He suggests pouring the concrete several inches above the pouring strip and allowing it to remain in this position a short time. This will allow excess moisture and laitance to rise to the surface. When the excess concrete is removed it will eliminate the porous and segregated concrete which is usually found in these locations. The added expense caused by this technique should provide cheap insurance for structural permanency.**

(2) Provide better curing technique for curbs and railings. The use of approved, colorless, curing membranes, uniformly applied, offers one solution to this problem.

(3) Use as large a coarse aggregate as consistent with size of members and workability.

(4) Keep reinforcing steel full distance from all surfaces. A minimum coverage of two bar diameters should be carefully maintained.

* The Public Roads Administration and some Counties have all had similar concrete failures.

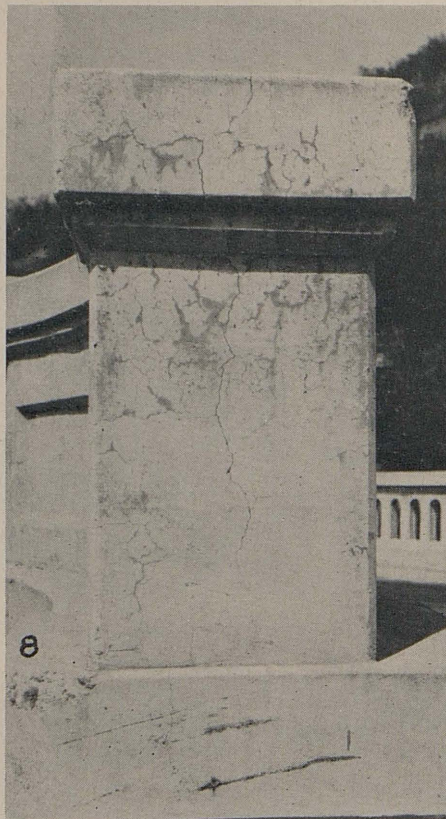
** Mr. Jackson has discussed and recommended this procedure.

(5) Specify cements with low alkali contents.

(6) Use air-entraining cements.

(7) Maintain a construction schedule which will eliminate the possibility of freezing green concrete.

In addition to the above improved techniques, laboratory studies regarding the causes and elimination of failures experienced on existing bridges are being made. Studies of preservation and repair of deteriorated concrete surfaces are being coordinated by field and laboratory work.



Bear Creek Bridge on State Route 140 in Mariposa County

USE OF AIR-ENTRAINING CEMENT

To date, concrete containing air-entraining agents or other means of increasing resistance to freezing and thawing, with the possible exception of pozzolana, have not been used on California highways. Air entrainment promises the best solution to the problem of obtaining weather resistant concrete.

Approved air-entraining agents consist of animal fats, vegetable oils or resins. These substances react with the alkalis in cements, in the presence of water, to form soap. Dur-

ing the mixing of the concrete the soap creates a maze of microscopic air particles which are believed to act as lubricants for the aggregates in the concrete. When moisture enters the concrete, condenses, and freezes, these minute particles of air form effective cushions which prevent the breakdown of the structural elements, particularly the fine aggregates.

TWO METHODS

There are two methods of adding air-entraining agents to concrete: (a) Intergrinding the agent with the cement clinker; (b) adding the agent at the mixer.

It is claimed the former method of adding the agent is objectionable, as it does not offer proper field control for air entrainment. Requirements vary with water-cement ratio, cements, aggregates and time of mixing. Variable proportions of air content are required by different jobs and specifications. For these reasons it would seem more satisfactory to add the agent when the concrete is being mixed in the field. Samples can be weighed by the engineer and the desired air content obtained.

It has been demonstrated by field experience that the optimum percentage of air content, for durability, varies from 3 to 5 per cent. Ordinary concrete contains slightly more than one per cent of air. This, again, shows the need of close field control of air entrainment. These percentages of dispersed air result in a loss in weight of the concrete of from about 4 to 7 pounds per cubic foot. Corresponding losses in flexural strength of the concrete may vary from 8 to 20 per cent. It has also been shown that the qualities of air entrainment are not as effective with both lean and comparatively rich concrete, as it is with mixes of moderate proportions. Specifically, the optimum effects are attained with mixes designed for 5- to 6-sack concrete.

The American Society of Testing Materials has recognized two products, Vinsol resin and Darex AEA,* which may be used for air entrainment. Vinsol resin itself is nonsoluble in water and requires a catalyst to make it active. The manufacturer now produces a neutralized (saponified) Vinsol resin which avoids the necessity of using caustics to saponify

* Vinsol resin and Darex AEA are manufactured by the Hercules Powder Company and Dewey and Almy Chemical Company, respectively.

(Continued on page 31)

Work on New Santa Ana Freeway in Los Angeles Is Well Under Way

By A. N. GEORGE, District Construction Engineer

CONSTRUCTION work on that section of the new Santa Ana Freeway extending from Kearney Street to Soto Street in Los Angeles is well under way.

This freeway will connect with the Ramona Freeway just east of the Aliso Street Bridge over the Los Angeles River and the traffic from the two freeways will cross the river on the Aliso Street Bridge and reach the Civic Center via Aliso Street. The Aliso Street Bridge was built by WPA forces, the nonlabor costs being furnished jointly by the Union Pacific Railway, The Atchison, Topeka & Santa Fe Railway, the Pacific Electric Railway, the City of Los Angeles, the County of Los Angeles, and the State Division of Highways.

BIDS OPENED

Bids were opened on that section of the Santa Ana Freeway extending from Kearney Street to Soto Street, on December 6, 1945, together with bids for the construction of the bridges to carry Fourth Street and Seventh Street over this freeway. Peter Kiewit Sons' Co. was the low bidder on the road work and Byerts & Dunn was the low bidder on both bridges.

When completed, the Santa Ana Freeway will extend from the Civic Center of Los Angeles to Santa Ana. Considerable time will necessarily elapse before funds can be made available to complete the entire freeway but it is hoped that it will be possible to carry the freeway outside of the most congested portion of Los Angeles with the funds now in sight.

The portion of the freeway now under contract is to have three 12-foot traffic lanes in each direction, with a dividing island in the center. Both cut and fill slopes are being made flatter than required by previous standard, and the contract calls for the installation of sprinkling systems on the slopes and for top-soil to be distributed over all of the areas of the right of way not occupied by pavement and shoulders, that planting can be made to flourish.



Looking south from existing Sixth Street Bridge, showing a fill in process of construction

AID GIVEN TENANTS

The award of the contract for the road work was delayed until January 23, 1946, due to the number of tenants living on the right of way who would have to be moved in order to make way for construction. The housing situation in Los Angeles is so serious that a real hardship would have been placed on these people if they had been forced to move without being given help in locating new quarters.

The Right of Way Department went to work to assist the families whose living quarters had to be moved or demolished. Arrangements were made with the Los Angeles City and the Federal housing authorities for the use

of a number of federally-owned house-trailers and many families moved into these. Arrangements were also made whereby the tenants in many other buildings were allowed to occupy the buildings while they were being moved to a new site and for at least six months thereafter. In other cases, houses were sold to be moved, with the provision that the purchaser would provide other rental quarters for the tenants for at least six months. In this way all of the 210 families affected were located in new quarters and the State made no arbitrary evictions.

CONTRACTS TOTAL \$1,820,350

The contract allotment, including all contract items, supplemental work and



Looking northerly from Sixth Street Bridge. In foreground reinforcing of an existing storm drain which will be under quite a high fill is in progress

contingency fund, for the road-work project amounts to \$1,435,325.12.

The contract allotment for the Fourth Street Bridge amounts to \$145,204.50; and the allotment for the Seventh Street Bridge amounts to \$239,821.05.

Work was started on the Fourth Street Bridge on January 22, 1946, and on the roadway on January 31, 1946. Both projects are proceeding at an excellent rate of progress.

One of the interesting features of the work consists of the jacking of a 36-inch reinforced concrete pipe under three tracks of the Union Pacific Railroad Company's main line and under a warehouse. This work was subcontracted to the Armeo Drainage & Metal Products, Inc., and is approaching completion, the work having been

carried on in a remarkably smooth manner, cooperation between the contractor and the Union Pacific being excellent.

ROUTE SKIRTS PLANTS

This Kearney-Soto portion of the Santa Ana Freeway, 1.6 miles in length, is located through an area which was occupied by many substandard dwellings, and skirts housing projects that were constructed prior to the war; but these housing projects were located to conform to the freeway right of way. The freeway also skirts many industrial plants; but it was possible to avoid interfering with any of the large establishments.

Mr. H. C. Studer is job superintendent for Peter Kiewit Sons' Co.; and Mr. E. A. Parker is Resident Engineer

for the State on this job. Mr. George K. Thatcher is job superintendent for Byerts & Dunn; and Mr. A. K. Gilbert is Resident Engineer on the two bridges.

BAYSHORE FREEWAY

(Continued from page 4)

feet of R.D. 8 tractors and carryalls of various capacities, four 15-cubic yard Woolbridge Terra-Cobras, a fleet of 20-cubic yard dump trucks and a 2½-cubic yard shovel.

Barring unforeseen delays, this project should be opened early in 1947.

The roadwork is being executed under the general direction of Jno. H. Skeggs, District Engineer, with Mr. Walsh, Resident Engineer, in immediate charge.

Ancient "Weather Map" on U. S. Highway 40

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

SOME 30,000,000 years ago, more or less, there was being slowly laid down in an ancient river channel an orderly sequence of gravel deposits which became eventually a record indicative of the climatic conditions of the times. A huge "weather map," so to speak.

When in 1932, U. S. Highway 40 in the vicinity of Gold Run was rerouted and moved to the southern side of the railroad tracks and carried across the old pit of the Stewart hydraulic mine it made easily accessible to the traveling public a portion of the cross-section of one of these ancient "weather maps." For a distance of nearly a mile a remnant of an old Tertiary channel constitutes the prominent cut-bank on the northerly side of the highway.

Next time business or pleasure takes you over this portion of Highway 40, and your time will permit, pause for a moment and examine closely the face of this bank. There are more than 250,000 square feet of it spread out before you. Study the character of the deposits that compose it and observe how a succession of layers of diminishing coarseness that may indicate a period of gradually decreasing annual rainfall is followed by layers of increasing coarseness showing a gradual return to normal conditions and you will realize how this old weather map is trying to tell you that the climate of California 40,000,000 years ago was quite similar to its climate of today.

STORY OF MAP

Now, the story of how this map came to be is, briefly, this:

According to the opinions of eminent geologists, who have made profound studies of the origin and history of the Sierra Nevada mountains, there once existed where these mountains now stand a sea in which there was laid down during a long period of time deposits of shale, sand, limestone, etc., until these beds of sedimentary rocks became thousands of feet thick. Upon the length of time all this may have taken the eminent geologists do not agree; some say it was 200,000,000 years; others assert that it was only 100,000,000; be that as it may, we can agree that it must have been plenty long.



Section of gravel deposits, thirty million years old, on U. S. 40 near Gold Run

And then began widespread disturbances deep down in the earth's crust beneath this sea during which the sedimentary rocks were compressed, folded, crumpled and finally forced upward several miles above the level of the sea by the pressure and intrusion of granitic magma from beneath. Land appeared and the former sea retreated westward.

And then followed a long, long period of erosion during which the

fractured sedimentary rocks were gradually carried away from the higher portions of the range to be re-deposited in the western sea, leaving most of the underlying granite exposed. A system of drainage developed where rivers flowing in broad valleys separated by low-rolling divides carried the products of erosion down to the sea. Among these products was the gold which came from the disintegrating quartz veins that once filled the



Thirty million years ago, this Section of U. S. 40 was a river channel of Tertiary times and now is a "weather map" of ancient eras

cracks and fissures in the shattered sedimentary rocks. The gold, however, being of higher specific gravity than the rocks remained behind and slowly concentrated in the gravel at the bottom of the streams.

And forests also developed. How do we know this? From our "weather map" in whose gravels have been preserved for us casts of leaves, fragments of trees, even whole trees, whose wood is so completely silicified that botanists are able to determine the species.

Had there been human hunters or fishermen roaming the Sierras in those days of long ago they would have found themselves among trees like those of today, cedars, oaks and laurel. They would have seen our "weather map" in the making, and noticed how the

river bars were composed of very coarse gravels because the rains of the preceding seasons had been heavier than usual; perhaps they would have seen a tree trunk lodged against a boulder and half buried in the bar; or perhaps had they visited this stream some years later they might have found the river's bars composed mostly of sand or fine pebbles because lack of normal rainfall in the preceding seasons had reduced the power of the current to transport the heavier cobbles.

This long period of erosion came to a close toward the end of Tertiary time, perhaps 10,000,000 years ago, if we accept as before the estimates of the eminent geologists. By this time the rugged hills had been reduced to gentler lines; their slopes were covered

with a forest growth, and the beds of the rivers were full of gravel and loaded with gold.

Again the forces long pent up within the earth demanded release. Along the crest of the range vents and volcanoes opened and spewed forth enormous quantities of andesite ashes, breccia and mud that flowed far down the slopes of the range destroying every living thing, filling the valleys, covering the hills and burying completely the existing watercourses.

A new system of drainage developed that had little in common with the one that had been obliterated either as to location or direction. The streams began to cut new channels in the surface of the andesite flows and the work of erosion carried on once more. The

(Continued on page 31)

CALIFORNIA MISSIONS

(Continued from page 19)

The missionaries found the Indians in the immediate vicinity very friendly, but they frequently were attacked by enemy tribes from what now is Contra Costa and remained away from the mission for long periods.

Fr. Serra arrived unannounced at Mission Dolores on October 1 and remained there until the 10th. On September 14, 1779, Captain Juan Francisco de la Bodega y Cuadra anchored his ship *La Favorita* in the bay and out of gratitude for having weathered severe storms presented to the mission a beautiful large bronze engraving of Our Lady of Help which was placed in the mission with due ceremony. On October 28th, Fr. Serra again visited Dolores and viewed the gift of Captain Cuadra with joy. He confirmed 69 persons during his stay.

On April 25, 1782, the first stone for the new church was laid and blessed. Building records from 1782 to 1793 are missing, but when Captain George Vancouver, British navigator and writer, visited there in November, 1792, he made note of the fact that the missionary establishment had grown considerable proportions. Fr. Engelhardt believes the new mission church, begun by Fr. Palou was dedicated on Sunday, April 3, 1791.

RUNAWAY INDIANS

At the mission in 1796, 20 habitations for neophytes and their families were built. During the first half of the last decade of the eighteenth century the mission made great strides in both spiritual and material progress. The number of baptisms rose from 1031 at the end of 1791 to 1861 at the close of 1795. During the same period the annual yield of wheat, barley and corn was 4,000 bushels.

Beginning in 1795, the fathers had considerable trouble with runaway Indians who left the mission because of an epidemic of measles which caused many deaths in 1794 and 1795. At one time 200 Indians disappeared into the interior across San Francisco Bay. There were several battles between presidio troops and neighboring tribes.

In 1797 the padres and the civil and military authorities clashed over the question of rights to Rancho del Rey which was taken for the troops necessitating the pasturing of mission stock far down the peninsula.

Building activities were brisk up to 1806 when another epidemic of measles brought death to 236 neophytes in nine months. And then in June and July, 1808, severe earthquakes did great damage at the presidio. Little is recorded of the years 1810 to 1816 except that in 1810 Fathers Abella and Lucio reported that the interior of the church had been much adorned.

HIGH INDIAN DEATH RATE

The increase of mortality among the San Francisco Indians resulted in the establishment across the bay in Marin County on December 14, 1817, of an asistencia, or missionary ranch having a chapel, baptistry and cemetery, under the patronage of St. Raphael, the Archangel, out of which grew Mission San Rafael.

In 1818, there were only 600 natives at Dolores while 382 dwelt at San Rafael. Governor Luis Arguello with the approval of Fr. Altimira, who acted without authority, in 1823 planned to discontinue Mission Dolores and Mission San Rafael and move both to a site in what now is Sonoma County and on which later was erected Mission San Francisco Solano at Sonoma. The Franciscan Superiors of the missions succeeded in defeating the scheme.

Lack of space here prevents any detailed account of the hardships endured by Mission Dolores beginning with the regime of Governor Echeandia in 1825 and continuing through secularization up to its confiscation by Governor Figueroa in August, 1834. Mission Dolores was among the first of the Franciscan stations to be confiscated. In September, Jose Joaquin Estudillo was appointed commissioner to take over the mission. Two months later he reported that the debts of the mission amounted to \$10,089.63.

FIRST ADOBE HOUSE

In 1836, William A. Richardson built the first adobe house on the site of Yerba Buena. This was the beginning of present day San Francisco.

When Governor Pio Pico began to sell the California missions no buyer could be found for Mission Dolores, so impoverished had it become. During the gold rush, Mission Dolores had many unwelcome guests and was all but abandoned. In February, 1849, Fr. Brouillet was authorized to erect

In Memoriam

William E. Dobbins

THE Division of Highways lost another of its faithful and capable employees in the sudden passing of William E. Dobbins who succumbed to a heart attack while on duty near Westmorland, California, on March 19, 1946.

"Bill" as he was familiarly called, was born in Kansas nearly 58 years ago and received his early education in Kansas later attending Polytechnic Engineering School in Oakland, California after which he served in the Armed Forces in Europe in World War I.

He entered the employ of Division of Highways in the summer of 1928 in the northern part of the State as construction foreman later transferring to San Diego County where he served as construction foreman during construction of highway at Lake Henshaw and Moosa Canyon. In April, 1943, he was transferred to Westmorland as maintenance foreman which position he ably filled until time of his death.

He was a member of Table Mountain Masonic Lodge No. 124 and San Diego "Scottish Rite Bodies."

He is survived by his wife, Louella Dobbins, his daughter Mrs. Paul Meier, recently discharged from service in European war zone, a brother Carl Dobbins of Hemet, California, and sisters Mrs. Geo. Griffith and Mrs. Anna Brazee.

a church at San Francisco, Fr. Santillan, the resident missionary, seldom officiating at the mission. He established the church of St. Francis and some of the church goods of Dolores were given to it.

On March 3, 1858, President James Buchanan returned Mission Dolores to the Catholic church.

Mission Dolores today is surrounded by modern buildings and only the small chapel structure with its charming facade remains. Its old paintings, some of the original floor tiles, ancient vestments, original choir loft and interior decorations executed by Indians of long ago make a visit to Dolores well worth while.

Mission Dolores is located on Sixteenth and Dolores streets in San Francisco, three miles from Third and Market streets and Valencia and Howard street cars will take the mission visitors directly to its doors.

Next—Mission San Rafael Arcangel and Mission San Francisco Solano.

Highway Bids and Contract Awards for February and March 1946

February 1946

COLUSA COUNTY—Between 3 miles north of Arbuckle and four miles south of Williams, about 3.3 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and a reinforced concrete bridge to be constructed across Cortina Creek. District III, Route 7, Sections A,B. E. B. Bishop, Orland, \$236,681; A. R. McEwen & C. M. Syar, Sacramento, \$248,657; J. R. Reeves, Sacramento, \$281,546; Parish Bros., Benicia, \$311,069; Guerin Bros., South San Francisco, \$370,261. Contract awarded to Harms Bros., Sacramento, \$219,031.

EL DORADO COUNTY—Between Shingle Springs and 1 1/4 miles west of El Dorado, about 3.4 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 11, Section B. E. W. Elliott Construction Co., San Francisco, \$289,798; J. R. Reeves, Sacramento, \$290,599; Larsen Bros., Sacramento, \$315,681; Guy F. Atkinson Company, South San Francisco, \$345,330; E. B. Bishop, Orland, \$348,661; Elmer J. Warner, Stockton, \$349,518; A. Teichert & Son, Inc., Sacramento, \$353,140; Piombo Bros. & Co., San Francisco, \$360,256; Macco Construction Co., Clearwater, \$363,443; Frederickson & Watson Construction Co., Oakland, \$375,689; Louis Biasotti & Son, Stockton, \$400,384. Contract awarded to Utah Construction Co., San Francisco, \$260,925.

KERN COUNTY—At Freeman Gulch, a steel beam span bridge to be constructed and about one mile to be graded and bituminous treatment applied. District IX, Route 23, Section D. R. R. Hensler, Glendale, \$110,007; Combs Brothers, San Leandro, \$112,153; Vinnell Company, Alhambra, \$112,572; Haddock-Engineers Limited, Oceanside, \$128,680. Contract awarded to E. W. Elliott Construction Co., San Francisco, \$79,807.

LOS ANGELES COUNTY—On Hollywood Parkway at Benton Way in the city of Los Angeles, a reinforced concrete overcrossing to be constructed. District VII, Route 2. Oberg Bros., Inglewood, \$137,422; Mitty Bros. Construction Co., Los Angeles, \$143,123; J. E. Haddock, Ltd., Pasadena, \$159,669; Baruch Corp., Los Angeles, \$164,866; Norman I. Fadel, North Hollywood, \$214,828. Contract awarded to Byerts & Dunn, Los Angeles, \$134,269.

SAN DIEGO COUNTY—In the city of San Diego, between "A" Street and 0.4 mile south of Mission Valley Road, about 2.9 miles to be graded and surfaced with Portland cement concrete pavement. District XI, Route 77. H. Earl Parker & N. M. Ball & Sons, Los Angeles, \$1,421,672; E. W. Elliott Construction Co., San Francisco, \$1,471,484; V. R. Dennis Construction Co., San Diego, \$1,485,651; Basich Bros. & Basich Bros. Construction Co., Alhambra, \$1,485,859; Griffith Co., Los Angeles, \$1,488,864; Daley Corporation, San Diego, \$1,552,130; Bressi & Bevanda Constructors, Inc., Los Angeles, \$1,586,328; R. E. Hazard & Sons Contracting Co., San Diego, \$1,758,891. Contract awarded to Mitty Bros. Construction Co., Los Angeles, \$1,338,002.

SAN DIEGO COUNTY—A reinforced concrete overcrossing over Balboa Parkway at Richmond Street in the city of San Diego to be constructed. District XI, Route 77. Carroll & Foster, San Diego, \$71,359. Mitty Bros. Construction Co., Los Angeles, \$83,214; Haddock Engineers, Ltd., Oceanside, \$96,793. Contract awarded to M. H. Golden Construction Co., San Diego, \$62,053.

SAN JOAQUIN COUNTY—About six miles east of Tracy, two bridges to be constructed, one a steel beam span bridge on concrete pile bents across Paradise Cut and the other a reinforced concrete slab bridge on

concrete pile bents across Paradise Cut Overflow. District X, Route 5, Section B. Macco Construction Co., Clearwater, \$122,715; George Pollock Co., Sacramento, \$129,744; Kiss Crane Company, San Pablo, \$134,538; A. Soda and Son, Oakland, \$135,709; Chittenden & Chittenden, Auburn, \$140,722; M.J.B. Construction Co., Stockton, \$142,652; Fred D. Kyle, Pasadena, \$143,898; Frederickson & Watson Construction Co., Oakland, \$144,931; M. & K. Corporation, San Francisco, \$151,818; Guy F. Atkinson Company, South San Francisco, \$152,676; Bechtel Brothers-McCone Company, San Francisco, \$158,205. Contract awarded to Stockton Construction Co., Stockton, \$119,997.

SOLANO COUNTY—In the city of Vallejo, Waterfront Road, between Virginia Street and Santa Clara Street, about 0.3 mile to be graded and paved with asphalt concrete on crusher run base. District X, Parish Bros., Benicia, \$29,611; E. A. Forde, San Anselmo, \$30,367; E. E. Lowell, Vallejo, \$30,918; A. G. Raisch Co., San Francisco, \$30,919; Lee J. Immel, San Pablo, \$31,558; J. Henry Harris, Berkeley, \$38,529. Contract awarded to C. M. Syar, Vallejo, \$27,494.

March 1946

ALAMEDA COUNTY—Between Warm Springs and Mission San Jose, and between Warm Springs and Centerville, about 8.3 miles, shoulders to be widened with imported borrow and surfaced with plant-mixed surfacing and penetration treatment. District IV, Routes 5 and 69, Sections C.A. Milo A. Browne, Palo Alto, \$43,228; Warren & Drayer, Alameda, \$48,181; Lee J. Immel, San Pablo, \$48,705; Union Paving Co., San

Francisco, \$50,786; A. J. Raisch Paving Co., San Jose, \$55,655; J. Henry Harris, Berkeley, \$58,396; East Bay Construction Co., Oakland, \$63,738. Contract awarded to A. S. Jones, Napa, \$40,823.

ALAMEDA COUNTY—In Oakland, between Distribution Structures and Seventh Street, about 1.4 miles, to be widened with Portland cement concrete pavement, and existing pavement to be resurfaced with asphalt concrete. District IV, Route 69. Louis Biasotti & Son, Stockton, \$136,170; Gallagher & Burk, Oakland, \$142,204; Independent Construction Co., Ltd., Oakland, \$147,991; Chas. L. Harney, San Francisco, \$148,552; N. M. Ball Sons, Berkeley, \$153,317; J. Henry Harris, Berkeley, \$154,731. Contract awarded to Lee J. Immel, San Pablo, \$135,659.

CONTRA COSTA COUNTY—Between Concord Avenue and 0.4 mile west of Ohmer Station, about 2.3 miles, to be graded and paved with Portland cement concrete. District IV, Routes 75,106, Sections E,Cnd.C. Frederickson & Watson Construction Co., Oakland, \$210,606; Gunner Corporation, Pasadena, \$219,231; Piombo Bros. & Co., San Francisco, \$221,068; N. M. Ball Sons, Berkeley, \$221,696; Louis Biasotti & Son, Stockton, \$236,015; Chas. L. Harney, San Francisco, \$244,888. Contract awarded to Guy F. Atkinson Company, South San Francisco, \$209,469.

LAKE COUNTY—Between 1.2 miles north of Rodman Narrows Road and Route 15, about 2 miles, to be graded and surfaced. District I, Route 89, Section E. Piombo Bros. & Co., San Francisco, \$179,509; M. J. Ruddy & Son, Modesto, \$197,910; Frederickson & Watson Construction Co., Oakland, \$208,408; Elmer J. Warner & Ted Watkins, Stockton, \$209,243; Guerin Bros., South San Francisco, \$210,408; A. Teichert & Son, Inc., Sacramento, \$219,721; A. R. McEwen & C. M. Syar, Sacramento, \$228,626; E. W. Elliott Construction Co., San Francisco, \$239,208; Guy F. Atkinson, South San Francisco, \$361,165. Contract awarded to Louis Biasotti & Son, Stockton, \$159,978.

LOS ANGELES COUNTY—On Santa Ana Parkway over Ramona Parkway, Ramp 4 in the City of Los Angeles, two overhead crossings and retaining walls to be constructed. District VII, Route 2. Oberg Bros., Inglewood, \$128,767; J. E. Haddock Ltd., Pasadena, \$133,101; Norman I. Fadel, North Hollywood, \$138,084; Griffith Co., Los Angeles, \$142,721; Spencer Webb, Los Angeles, \$149,685; Peter Kiewit Sons' Co., Los Angeles, \$155,138. Contract awarded to The Contracting Engineers Co., Los Angeles, \$127,632.

LOS ANGELES COUNTY—On Rosemead Blvd. between Huntington Drive and Colorado Street, about 1.1 miles to be graded and paved with asphalt concrete on cement treated base. District VII, Route 168, Section C. Vido Kovacevich Co., South Gate, \$133,883; J. E. Haddock Ltd., Pasadena, \$133,920; John S. Swigart Co., Torrance, \$139,511; Guerin Brothers, Los Angeles, \$139,905; Basich Bros. Construction Co. & Basich Bros., Alhambra, \$145,321. Contract awarded to Griffith Co., Los Angeles, \$128,126.

MONTEREY COUNTY—Between 2 miles south of Salinas and Salinas, about 1.9 miles to be graded, paved with asphalt concrete on cement treated base and on existing surfacing, and plant-mixed surfacing to be placed on the shoulders. District V, Route 2, Section B. Frederickson & Watson Construction Co., Oakland, \$243,650; Louis Biasotti & Son, Stockton, \$248,740; Union Paving Co., San Francisco, \$249,943; A. Teichert & Son, Inc., Sacramento, \$261,578. Contract awarded to Granite Construction Co., Watsonville, \$227,373.

In Memoriam Roland Harrison Lapp

THE Division of Highways, Department of Public Works, deeply regrets the tragic accidental passing of Roland Harrison Lapp on the morning of February 25, 1946 at the age of 58.

"Pop" Lapp as he was known to his many friends and associates was active in highway construction from 1921 until his retirement in 1944. Upwards of 100 miles of exceptionally good pavements will bear testimony to his skill for years to come. An excellent teacher, "Pop's" presence will be felt in construction for as many years as his assistants remain in the field.

Born in Elyria, Ohio, August 8, 1888, he came to California in 1906. He worked for the Southern Pacific Railway on the double-track from Rocklin to Sparks; for the Placer County Surveyors Office; during World War I he was aircraft machinist in an Oakland plant. In 1921 he went to work for the State and remained there until his retirement.

He is survived by his wife, Norma; sons, Fred, Clarence, Norman, and Harold; daughters, Dorothy, Nell, Eileen, and Clara; and grandchildren, Terry and Linda.

In Memoriam

Rex J. Allan

IN the passing of Rex J. Allan on March 5th, at Glendale, District VII of the Division of Highways not only lost one of its most valuable employees but one of the most beloved and highly esteemed men in the organization.

Mr. Allan was employed continuously by the Division of Highways in District VII and the Headquarters Laboratory from 1932 until the time of his death, with the exception of the time spent in the Army during the recent war. He was appointed to the position of District Materials Engineer in District VII in 1938 and under his supervision the District VII Laboratory at North Hollywood was organized and has grown into one of the most important branches of the Headquarters Laboratory.

Mr. Allan was born January 2, 1899, at Grand Island, Nebraska, and completed his education at the Colorado School of Mines. Shortly after completing his education he entered the employ of the Montezuma Copper Company, Sonora, Mexico, and served with that company and several other mining companies in the capacities of engineer, construction superintendent, and chief engineer until 1931.

Shortly after the recent war started, Mr. Allan, who was a World War I veteran, entered the service as Captain, Corps of Engineers, and served on the Pan-American Highway in Costa Rica as Chief of the Engineering Division of the San Jose area. On the suspension of work on that highway, he was transferred to continental United States where he served as Chief of the Engineering Division of the Seattle Engineering District, where he was promoted to the rank of major. At his own request he was transferred to active service in the Asiatic area, serving in the Philippines as Chief of the Testing Branch of the Engineering Construction Command, where he was promoted to the rank of lieutenant colonel, and later in Japan with the Army of Occupation.

Mr. Allan resumed his work in District VII on February 21, 1946, shortly after his release from the Army.

All who came in contact with Mr. Allan had the highest regard for him, both personally and professionally. His many years of efficient and loyal service won many friends for him and for the State.

He is survived by his widow, Mary A. Allan, a sister, Elsie Allan Tompkins, and a brother, Leo G. Allan.

Bridge Maintenance Practice On California Highway System

(Continued from page 24)

Vinsol in the field. It is prepared in both a powder form and solution.

Darex AEA is water soluble and may be either interground with the cement or added at the mixer.

Under normal conditions, around 0.02 per cent of the agent, in a solids form, by weight of the cement, is required for air entrainment.

The advantages claimed for air-entraining cement may be summarized as follows:

- (1) Increased durability.
- (2) Improved workability and plasticity.
- (3) Reduced bleeding, segregation and laitance; providing greater uniformity.
- (4) Reduction in water and sand content. This partly compensates for sacrifices in density due to air dispersion.

(f) CONCLUSION

In conclusion, it may be stated that further studies of the general problem of weathering will be continued in an endeavor to obtain a solution of it. Methods of repair discussed under "Repair of Deteriorated Surfaces" will be pursued further. It is also planned to use air-entraining cement in concrete for replacement of existing curbs and railings which have disintegrated beyond practicable repair. Laboratory research and field work will be coordinated to obtain maintenance and construction procedure resulting in adequate protection for concrete structures at high altitudes.

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In Memoriam

Albert Hardell

DISTRICT V personnel learned with regret of the death of Albert Hardell. "Mike," as he was known to his fellow employees, who passed away at the age of 45 after having been confined to the Santa Cruz sanatorium more than a year.

Mike's home-town region was Santa Cruz where he attended high school. His earlier work found him as a donkey engineer in the lumber work around Santa Cruz and later on survey parties in the San Francisco Bay region.

He came to work for District V of the Division of Highways as a rodman in June, 1930, and remained in that district until his death. While in the district, he served in the varied capacities of field office man on surveys and construction, inspector on construction and in the district office.

He is survived by his sister, Mrs. F. T. Smith of Santa Cruz, California.

Ancient "Weather Map"

(Continued from page 28)

new streams cut deeper and deeper into the soft materials and where they crossed their former locations, as they often did, the gravels and the gold were reconcentrated in the beds of the later rivers. The forests also crept slowly back over the broken landscape.

Following this period came the latest major alteration in the topography of the Sierras. Most of the mountain mass tilted as a unit; the eastern edge of the block moved upward along the line of an ancient fault so that now when one crosses the mountains from west to east in the region now under consideration one finds a long fairly uniform gradient upward for 50 miles or more and then comes the sudden drop-off, a nearly vertical descent of more than a thousand feet.

This increase in the gradient of the streams that ran directly down the western slopes of the range added greatly to the erosive action of the water in them and resulted in their cutting the deep and narrow V shaped canyons that we see today. High up on these canyon walls, sometimes 2,000 feet above the water level in the stream below and frequently cutting directly across the course of the present stream we find exposed an old river channel of Tertiary times.

One of these is our ancient "weather map."

All in Day's Work

February 12, 1946

The Superintendent
California Highway
Maintenance Department,
Bishop, Calif.

Dear Sir: The purpose of my writing you is to inform you of the most excellent assistance given my wife and self and our car yesterday on Towne's Pass.

A sudden blizzard caught us near the top and Foreman Dominik Wiget and his two helpers spent over three hours yesterday in the snowstorm, to come up to us (two miles from the top) to free our car and bring us safely back to Panamint.

It is entirely due to their untiring devotion to duty that I am able to write to you today and express our gratitude and admiration for their unselfish and splendid service.

Unable to compensate them in any way, I felt I had to bring this to your attention.

Yours very truly,

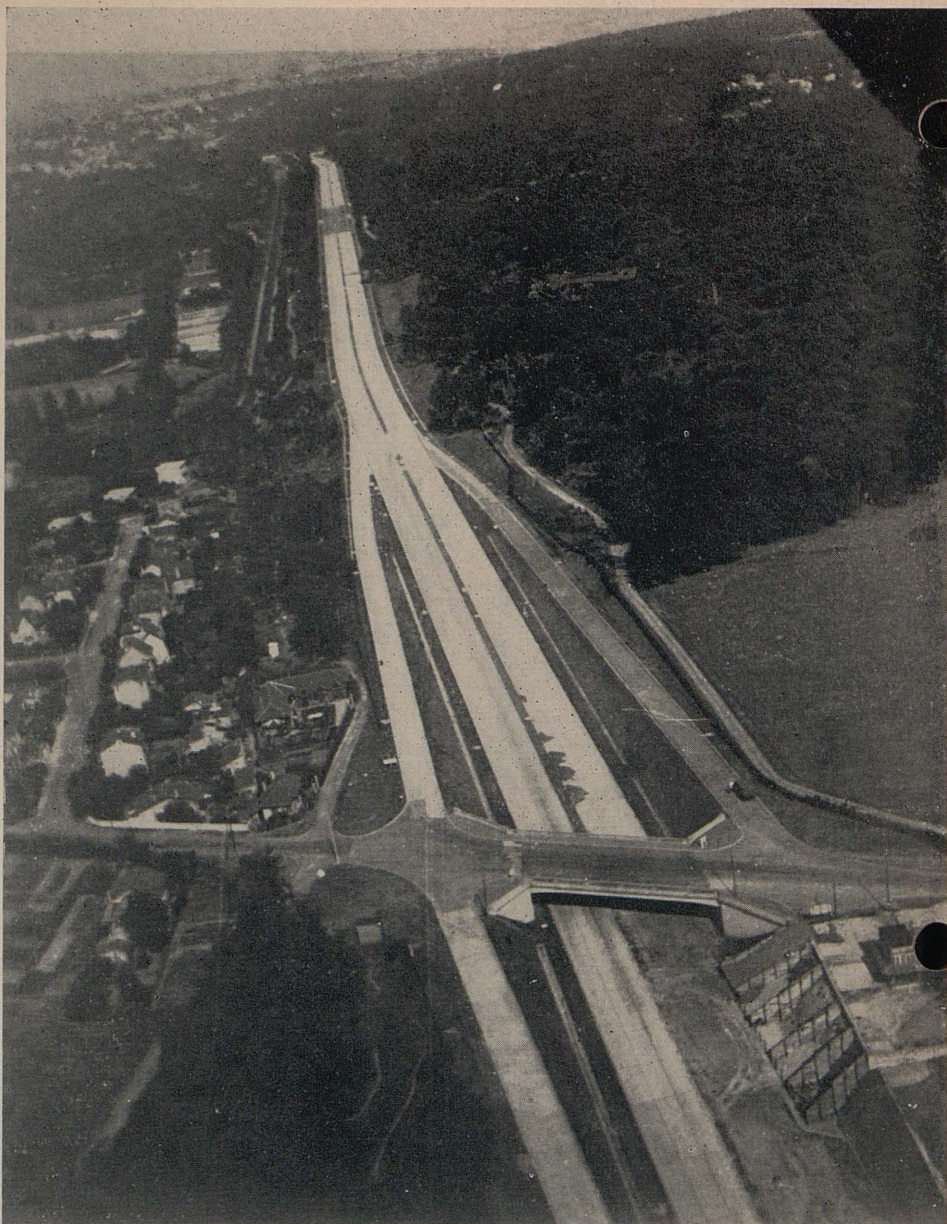
Victor B. Cranley
240 Central Park South
New York 19, N. Y.

Road Builders Pay High Honor To O. J. Porter

THE American Road Builders Association has honored Mr. O. J. Porter, Senior Testing Engineer, Materials and Research Laboratory, Division of Highways by appointing him Vice President of the Western District of the Airport Division of the Association.

Mr. Porter entered the employ of the Division of Highways in June, 1924. During the first four years of his service he was engaged in general testing work on all types of road materials in the Materials and Research Laboratory. For the last 18 years he has specialized in the study of foundations and in research and testing of soils and aggregates under the supervision of the Materials and Research Engineer. At the present time Mr. Porter is a Senior Testing Engineer.

Mr. Porter developed the method for determining the Maximum Compaction and Optimum Moisture of soils in 1929.



Super-Highway to Paris Nears Completion

THE new super-highway, which is to provide a far more direct and speedy link between Paris, Brittany and Normandy, is now nearing completion, in France.

This new route is part of a general highway plan laid out back in 1935 when French engineers tackled the problem of supplanting certain picturesque but narrow roads with miles of broad, modern highways. To minimize traffic congestion in the Paris area, the old St. Cloud bridge, which dates back to 1566, has been made over and a 60-foot-wide vaulted tunnel has been cut through the St. Cloud Hill to permit the passage of a large volume of traffic without marring the beauty of the famous park. At Rocquencourt near Versailles, a clover leaf intersection of six one-way lanes will keep converging traffic running smoothly.

This method has since become more or less standard practice among engineers throughout the world. In 1931 he developed the California Bearing Ratio

Test which was subsequently adopted by the United States Army for use in the design of airfield pavement during the war.

State of California
EARL WARREN, Governor

Department of Public Works

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

CHARLES H. PURCELL, Director of Public Works

A. H. HENDERSON, Assistant Director

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CARLETON PIERSON, Supervising Specification Writer
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C. A. HENDERLONG, Supervising Mechanical and Electrical
Engineer
WADE HALSTEAD, Associate Estimator of Building Construction

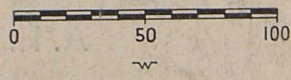
DIVISION OF CONTRACTS AND RIGHTS OF WAY (LEGAL)

C. C. CARLETON, Chief
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney

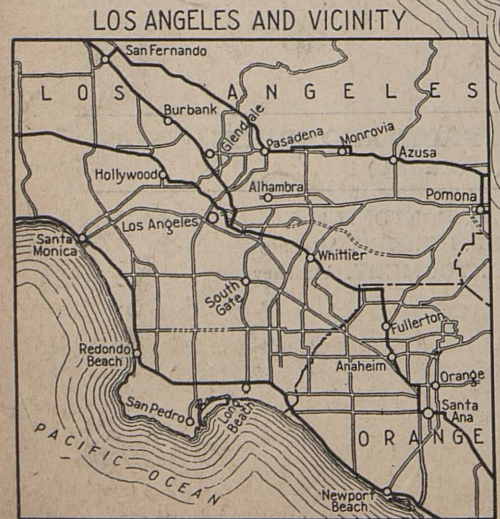
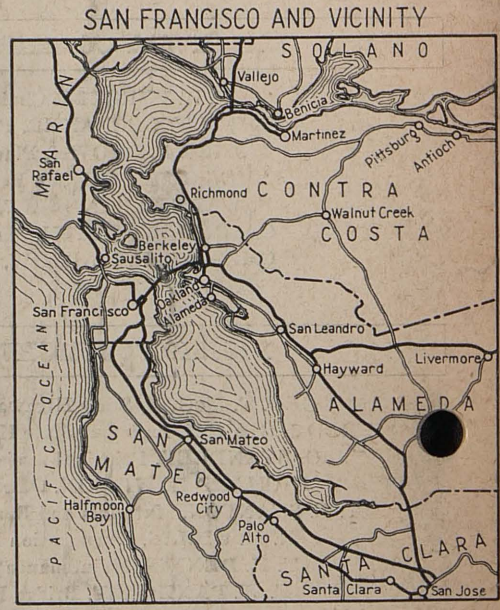
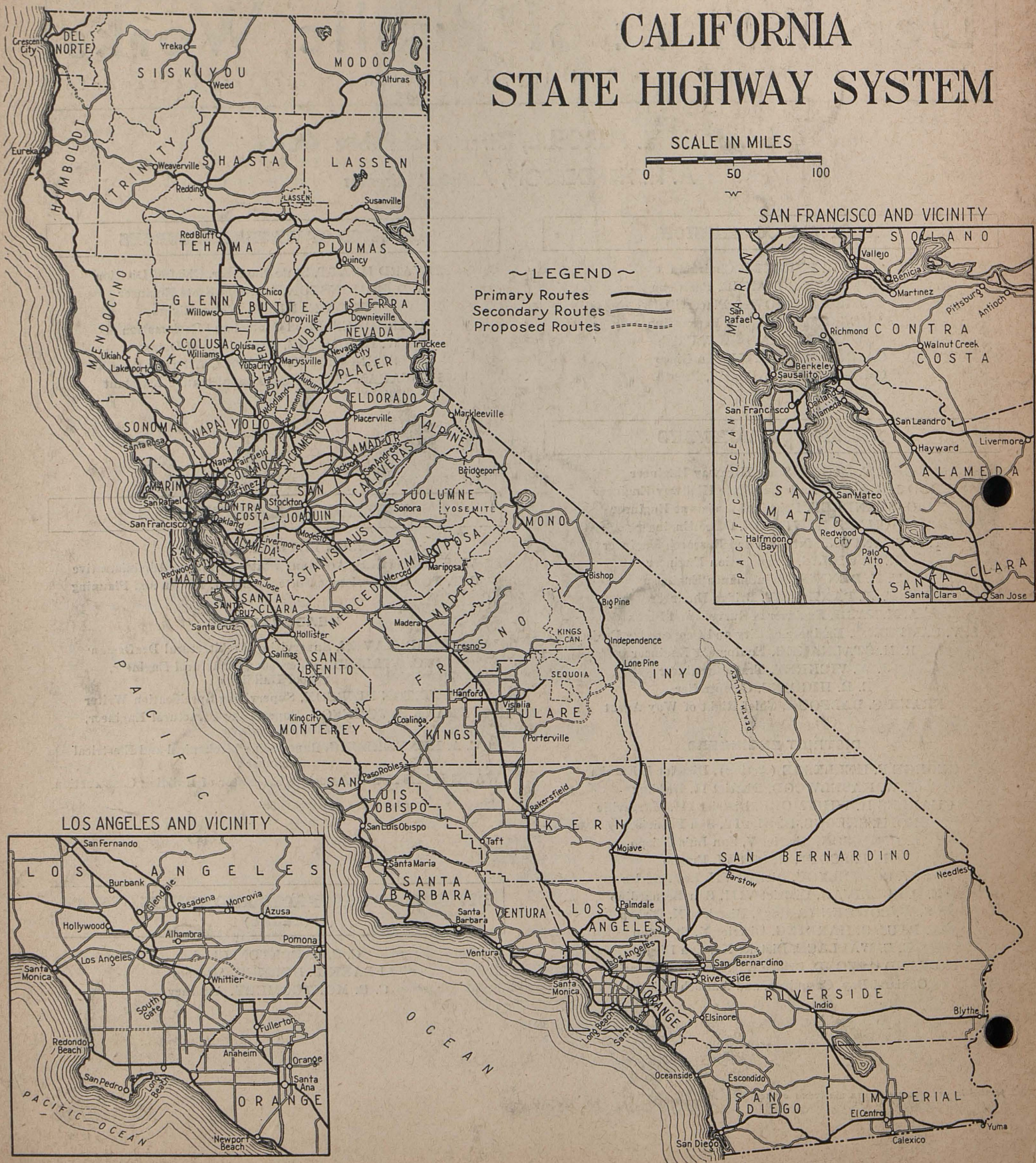
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CALIFORNIA STATE HIGHWAY SYSTEM

SCALE IN MILES



~ LEGEND ~
 Primary Routes ———
 Secondary Routes ———
 Proposed Routes - - - - -



centimeters

10 9 8 7 6 5 4 3 2 1 0

inches

4 3 2 1 0

1	2	3	4	5	6	7	8	9	10	11(A)	12	13	14	15
L*	39.12	65.43	49.87	44.26	55.56	70.82	63.51	39.92	52.24	97.06	92.02	87.34	82.14	72.05
a*	13.24	18.11	18.71	-4.34	34.26	11.81	48.55	43.96	52.79	-0.40	-0.60	-0.16	0.51	0.21
b*	15.07	18.72	-22.29	22.85	-24.49	-0.35	59.60	-46.07	18.51	1.13	0.23	0.21	0.43	0.28
Density										0.04	0.09	0.15	0.22	0.36

Golden Thread

Colors by Munsell Color Services Lab

D50 Illuminant, 2 degree observer